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INTERDEPENDENCE BETWEEN INVENTORY MANAGEMENT AND EMPLOYEES' SATISFACTION

ABSTRACT

The study determines the correlation between the application of advanced models and methods of inventory optimisation in the supply chain in relation to the satisfaction of employees who are responsible for managing the inventory optimisation processes. The previous studies confirm that the optimisation of inventory management in the supply chain insures competitive advantages on the market. There is space for further research of impact of the achieved inventory optimisation in the supply chain on the change of the employees' satisfaction. The paper establishes the interrelation of the interdependence of the achieved inventory optimisations on the satisfaction of the employees and the related synergy effects of acquiring added value of the companies on the market oriented to the satisfaction of the buyers and service users. The research has defined new knowledge in interdependence of inventory management optimisation on the change of indicators of employees' satisfaction. Based on the performed research an assumption has been created for the design of an application package (so-called XaaS-based services) for the management of interaction processes of inventory optimization in the supply chain, satisfaction of service users and employees.

KEY WORDS

inventory management, logistics, ICT, employees' satisfaction, supply chain, optimisation

1. INTRODUCTION

By managing the logistic supply chain it is possible to achieve the balance between meeting the requirements of the supply chain participants and the technology costs and other resources necessary to meet these requirements. Inventory management is thus

just one of the elements of a wider context of logistic management, i.e. of the entire supply chain management of post-sales in automotive industry. Supply chain management is described as integral management of resources, information, and processes oriented to optimal distribution of goods and services from the point of their origin to the end point of their usage. On the other hand, the logistic management deals with the management and optimisation of the elements of the logistic system which also includes the supply optimisation.

One of the basic functions of inventory management is the balancing of supply and demand and the protection of end users of the goods and services from the uncertainties and disturbances that may occur in the supply chain. In the conditions of world globalisation in the production and distribution of goods, optimisation of inventory management in all the elements of the supply chain represents the key element of the competitiveness of the product itself, i.e. finally also of the economic subjects in the supply chain that are in any way related to the product or service they deliver.

The paper will consider the operating method of the economic subjects whose everyday operative business involves inventory management. The aim of the study is to determine the interaction of inventory optimisation as well as the effects of implementing ICT in inventory optimisation in the supply chain on the change of the employees' satisfaction indicators. The analysis will include the method of inventory management in the supply chain of genuine spare parts for the Volkswagen make of car, and to show the relationship between positive effects of inventory optimisation and the employees' satisfaction, which are in direct relation with the achieved effects of optimisation. The aim of the inventory management optimisation models is

the rationalisation of the costs related to the inventories with harmonisation of the level of inventories in the supply chain with the market demand and the planned level of customer service [1, 2]. Apart from the key operation quality indicators which refer to total revenues, the market share or the market growth, the employees' satisfaction represents the key element used by the companies to assess their own success and to form assumptions of future growth and development. The study will attempt to identify the interaction of the elements, processes and functions within the implemented inventory optimisation model in the observed business system with the software tools for warehouse and purchase management, and in this way conclusions will be made about the interaction of the inventory management on the change in the employees' satisfaction indicators.

The analysis of the previous research of national and foreign authors shows insufficient presence of the problems related to inventory management optimization in the supply chain and interactions of the achieved optimization with the employees' satisfaction. The majority of authors in the recent scientific journals dealt with the problems of supply optimization and the interaction influences of inventory optimization in the supply chain, usually in the domain of production [2], global purchases [3] or variable demand [4]. One can observe insufficiently studied issues of the impact of inventory optimisation through the supply chain, recognising the criteria of differentiated approach in the inventory classification with the adaptation of the level of inventories to the variable demand. It is also necessary to direct the attention to interaction of the inventory optimisation effects on the satisfaction of the employees who are directly involved in the implementation of the model and performance of all the activities that are the assumption for inventory optimisation. Therefore, it is necessary to carry out a study which will recognise the criteria of inventory optimisation in the supply chain on the change in the employees' satisfaction indicators.

The study of inventory management in real business systems shows that there are currently no clearly defined modes that would provide an interactive connection with the concept of inventory optimisation on the change of the indicators of employees' satisfaction. With high-quality inventory management in the supply chain, it is possible to achieve a balance between meeting the requirements of the supply chain participants and the employees' satisfaction. The implementation of the inventory management system based on a significant application of ICT technologies and the differentiated approach of managing the level of customer service affect the increase of the employees' satisfaction index [5, 6, 7].

Following the carried out research one expects to define the knowledge about and to determine the el-

ements of interdependence of a successful inventory management system on the change in the employees' satisfaction indicators.

2. STUDY OF EMPLOYEES' MOTIVATION AND ENGAGEMENT

The study will analyse the method of inventory management in a real post-sales system in automotive industry. The interaction has been determined of the achieved inventory optimisation effects on the change in the employees' satisfaction index. The study of inventory optimisation impact has been carried out within a time period of one year. The aim of the one-year study cycle was to gather objective indicators and on the basis of the study to propose a change in the method of inventory management. Consequently to the change in the inventory management model the changes in the indicators of the employees' satisfaction index have been analysed.

By implementing the research methods a comprehensive processing of the obtained research results has been achieved as well as the applicability of the results of studying the inventory optimisation in the supply chain on the change in the employees' satisfaction index indicators. In this research the initial study of the inventory management methodology in the post-sales of automotive industry has been carried out, as well as the study of the employees' satisfaction.

The inventory management optimisation concept in the post-sales of automotive industry as part of the production management system has become an important element of market competition. The competitive advantage is not achieved any more by the basic material resources important for the performance of activities. The key element of the quality of delivery and insurance of availability of post-sales services in automotive industry represents a phenomenon of high-quality inventory management with the parallel implementation of know-how, competences and motivation of the employees. It is therefore important to identify the interaction of inventory optimisation on the change in the employees' satisfaction index and to identify the element of feedback between the employees' satisfaction and their motivation with the improvement of the business results in the observed business system [8, 9]. By selecting the optimisation criteria, the knowledge about the interdependence of the inventory optimisation criteria in relation to the quality of service to the users, and their influence on the reduction of company costs, the logistic operators and the management realise the assumptions of successful operation [10].

The study has determined that the observed servicing centre carries out a yearly survey of the employees' satisfaction. The survey of motivation and satisfaction

STARS	EXCLAMATION MARKS
with the result of research > 80%	with the result of research 80% - 75%
<ul style="list-style-type: none"> - feel strong connection to the company - very loyal to the company - have the wish and initiative to provide help and motivation for colleagues 	<ul style="list-style-type: none"> - very satisfied with the company and job they perform - as a rule they know what their job is but sometimes need to be oriented - poor connection with the company's goals
QUESTION MARKS	UNCOMMITTED EMPLOYEES
with the result of research 75% - 65%	with the result of research < 65%
<ul style="list-style-type: none"> - have high negative opinion, they are difficult to manage - individualists, interested only in their own interests and benefits - ready to change job as soon as the opportunity arises 	<ul style="list-style-type: none"> - very dissatisfied - not connected with the company's goals - frustrated and not dedicated to work - hardly usable for the company

Figure 1 - Classification of the employees according to the research results

Source: Saratoga Price Waterhouse Cooper Institute, <http://www.pwc.com>

of the employees is carried out by the department for human resources management, according to the methodology developed at the Saratoga Price Waterhouse Cooper Institute [11]. The methodology of studying the employees' satisfaction is based on the Kaizen business philosophy (Jap. "Change for the better" which denotes Japanese business philosophy of life and work, search for continuous improvement and upgrading of various processes in a company). The research results obtained in this way can be directly correlated with the change of the business indicators in a certain area of activities of the observed servicing centre.

In the carried out research the employees have ranked their answers with grades from 1 to 6, thus avoiding the approach of the usual "school grading", and thus obtaining a more objective image of the real satisfaction of the employees. Also, by using different criteria in the definition of the questions for the employees included in the research, and by weighting the obtained results it is possible to make also other conclusions important for a wider grading of the employees' satisfaction and achieving competitive advantages of the company on the market.

Using initial study of employees' satisfaction in the observed business post-sales system and on the basis of the defined criteria and application of weighted values in the analysis of the research results, the index of the employees' satisfaction of 67.9% has been determined. The result has placed the employees from the concrete department into the category "Question marks". The determined index shows that the employees know only partially what is expected of them at their workplace, and that regarding the company activities they have limited knowledge regarding the work they perform. In further consideration of the research analysis it may be concluded that the employees are true individualists, that they are difficult to manage and that they are ready to change their job as soon as they get an opportunity for that. The connection with the company and the objectives also failed to be achieved, and the employees are a poorly usable re-

source for the company. The research results indicate low motivation of the employees. The employees are a poorly usable potential for the company.

The performed study has also determined that in the observed organisation the department for market research carries out monthly survey of the satisfaction of customers and service users of the post sales. The research results obtained in this way, with the indicators of the spare parts sales and the delivered work service have direct impact on the monthly income of the employees. In order to optimise the system of managing human resources, it is necessary to implement in the organisations the concept of the interaction of the research results of the employees' satisfaction as consequence of the implementation of new business philosophies, such as e.g. inventory optimisation [12].

3. STUDY OF INVENTORY MANAGEMENT MODEL IN AUTOMOTIVE INDUSTRY POST SALES

Inventory management represents one of the key roles of management of any organisation and it is reflected in making strategic, tactical and daily operative decisions on when, how much, and what to purchase [5]. The tendency of every inventory management concept is reflected in the realisation of minimal costs of inventory funding with simultaneous tendency towards maximising the level of service to the users and increasing the company revenues [3, 9]. The mentioned facts result from the implementation of the advanced inventory management optimisation methods.

The challenges of inventory management in automotive industry post sales are not reflected in the keeping of the highest possible levels of inventory, but rather in distinguishing the major from the minor (ABC analysis of inventory classification), insuring the highest possible turnover coefficient and adaptation of the level of inventories to the market demand. This is what keeps the quality of customer service at a high level.

ABC analysis allows distinguishing the major from the minor, and it is based on the Pareto analysis. Since Pareto determined that 80% of success proceeds from 20% of activities, this knowledge was transferred also to the area of inventory management with the aim of classification into three value groups (A, B and C) according to the share in the total value of consumption (sales). The ABC analysis categorises the items in inventory on the basis of their importance, turnover coefficient, i.e. realised sales [13].

Optimal stocks of spare parts that are important for the delivery of optimal service to the customers can be maintained only by means of high-quality planning system, management and selection of decision-making criteria that provide the logistics engineers with the base for business process management of inventory optimisation. An excess in inventories stipulates unnecessary costs and can endanger the overall business operation of a company, whereas the shortage in inventories may cause problems in the continuity of operation and quality of delivery of service to the customers [7]. The expansion and wider availability of information and communication technology, as well as the development of the model of planning and control have resulted in significant advancement in inventory management [14].

The study consisted of two phases. In the first phase the inventories in the concrete servicing centre were analysed as well as the method of inventory management. The data about the study of the satisfaction and the motivation of the employees have been gathered and then these results were also analysed. In the second phase of the study the aim was to develop a conceptual model of inventory management optimisation, to present the results of optimisation to the employees responsible for the jobs in inventory management, and to make it possible to test the optimisation model based on the real market demands. After two months of parallel application of the actual inventory management system and the optimisation model that had been developed, there was a repeated survey of the satisfaction and motivation of the employees according to the same model as carried out in the regular annual survey performed by the internal department for the development of human resources. Such approach was an attempt to give sufficient time to all the employees to actively use the new inventory optimisation model, recognise their participation in improving the system, and after that express their impressions through participation in the survey about the satisfaction and motivation.

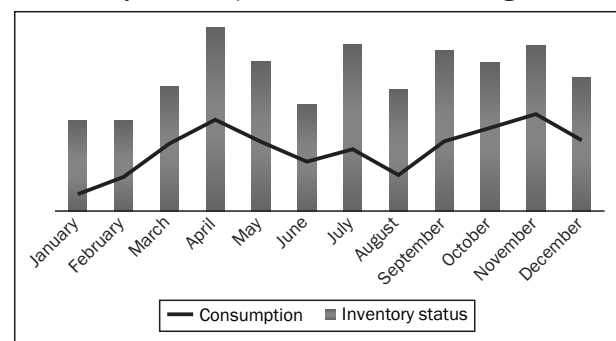
The carried out research on the concrete example in the post sales of automotive industry has shown that the concrete inventory management concept has been set linearly with the same approach in insuring the level of customer service for all types of goods. It has also been determined that there is no systemic

approach in studying the interaction of the inventory management results on the change of the indicators of the employees' satisfaction index, i.e. that there fails to be a feedback in the interaction of inventory optimisation and employees' satisfaction. The research clearly shows that there is need for a differentiated approach in the adaptation of the level of service (inventories) to the demand on the market in relation to specific goods which can result in significant rationalisation in the supply chain and increase the employees' satisfaction.

Before defining the concrete proposals of the solution for inventory optimisation in the post sales of automotive industry, it is necessary to analyse the current situation and the method of (non)management of inventories. Thus one may determine as follows:

- the basis for inventory management is not systemic analysis of the market nor customer demand structure;
- in inventory planning no systemic attention is paid to the planned level of customer service, but rather there is tendency towards generally high level of service;
- the basis for inventory management is not the ABC model of classification, nor active implementation of software tools for e-purchase and warehouse management;
- the persons responsible for inventory management lack knowledge and skills of logistic operators;
- in the daily business schedule the company management does not pay sufficient attention to the issues of inventory management;
- there is no concept of systemic education of the employees who manage the inventories as the high-value assets of the company;
- there are no sufficiently well developed systems of authorisation and responsibilities of inventory management.

The result of such partial approach in the tendency towards the optimisation of the inventory management systems has been shown in *Graph 1* on the example of monthly consumption of the brake linings in rela-



Graph 1 - Annual consumption and average inventory status in post sales of automotive industry on the example of brake lining

Source: PZ Auto d.o.o., 2011, adapted

tion to the inventory size of the concrete goods. The research and the curve of the consumption in *Graph 1* indicate the possibility of rationalisations related to inventories since the real condition of consumption of a certain goods deviates significantly from the real consumption. Such analysis is the assumption for the conclusion that the inventory management concept is not correlated to market demand and that the service users are provided with the level of service which is actually neither necessary nor required by the market.

This conclusion has been confirmed also because of the stable function of ordering and delivering the ordered goods from the logistic centre of the manufacturer located outside the Republic of Croatia to the concrete servicing centre in the Republic of Croatia. The delivery time of the goods is on the average from one to maximum three days from the moment of placing the order. Based on this concrete example it is concluded that the servicing centre maintains an excessively high level of back-up inventories which is later to be confirmed by further research. This research will be carried out on the basis of the analysis of total inventories and the performed classification of inventories according to the ABC method.

The carried out research resulted in the data that the manufacturers of vehicles and spare parts are the owners of operative information communication programmes used by the local servicing partners for goods ordering. The arguments for the interests of the spare parts manufacturers are the following facts:

- higher level of spare parts on stock of the local servicing partners in order to insure the availability of goods and high level of customer service;
- equal approach to planning of all the items that form the total inventory without using the ABC inventory classification model;
- due to rationalisation of costs the tendency towards low frequency of delivering greater amounts of goods;
- the possibility of returning the unsold goods.

The research has defined the actual purchase model in post-sales which functions so that the application software solution of the spare parts manufacturer for inventory management which is based on the application of advanced information and communication technologies on the basis of the analysis of the consumption of a concrete product in the previous period forms the arithmetic mean of the consumption of the previous period. Based on this data the future demand for the next 6 to 8 weeks is planned. After that follows the automatic inventory replenishment using the e-purchase system and the maximum level of inventory of the concrete goods is replenished for the planned consumption period in the next four to maximum eight calendar weeks. This describes the operative functioning of the software solution Autopart which is used in planning the order and inventories of the spare parts

in the post sales of servicing shops for the vehicles of the Volkswagen concern (Volkswagen passenger and commercial vehicles, Audi, Seat and Škoda). The advantage for the local service partner in filling the inventories by means of the software solution Autopart is indicated on the one hand by ensuring the same quality of service towards the users according to the standard stipulated by the spare parts manufacturer and by the possibility of return of the unsold goods to the manufacturer at the end of the calendar year. Although this benefit may seem at first glance favourable for the local servicing partner since they may return all the goods that they have not sold, it is assessed that from the level of possible occurrence of slow-moving and obsolete inventories and engagement of financial capital, such option is unfavourable.

As part of research there is the question whether the interests of the manufacturer of vehicles and spare parts is in correlation with the interests of the local servicing partner, i.e. whether the manufacturer's interests are oriented to the inventory optimisation of the local servicing centres. Based on the research it may be concluded that the interests of the local servicing centre should be:

- differentiated approach to inventory management in dependence with the structure of demand and planned level of customer service;
- increased frequency of delivery of smaller quantities of goods;
- rationalisation of the warehouse space, necessary equipment and organisation necessary to receive and manipulate the goods;
- the currency of the payment for the goods and engagement of the capital are not foremost in planning since the approach to ordering and delivering the goods ensures acceptable sales dynamics and inventory turnover coefficient.

Based on the aforesaid it may be concluded that the interests of the spare parts manufacturers and the local servicing partners are not correlated. Therefore, in the first place with the aim of inventory optimisation it is necessary to recognise the criterion of differentiated approach in inventory management for single groups of items in the context of the planned level of customer service thus affecting directly the level of safety inventory. The safety inventory is calculated with equation (1).

$$SS = \sqrt{\bar{R}(\sigma S^2) + \bar{S}^2(\sigma R^2)} \quad (1)$$

SS = necessary level of safety inventory;

\bar{R} = average replenishment cycle (time of purchase);

\bar{S} = average consumption;

σS = standard deviation of consumption;

σR = standard deviation of the replenishment cycle (time of purchase).

In order to develop an inventory optimisation system it is necessary to mathematically describe the parameters of standard deviation of the sales period as well as the deviation of the replenishment cycle.

Standard deviation of the sales period is described as follows:

$$\sigma S = \sqrt{\frac{\sum fd^2}{n-1}} \quad (2)$$

where

f = frequency of events;

d = deviation from sales mean (S);

n = total observations.

The deviation of the replenishment cycle is described by the following expression:

$$\sigma R = \sqrt{\frac{\sum fd^2}{n-1}} \quad (3)$$

where

f = frequency of events;

d = deviation from the mean of replenishment (R);

n = overall observations.

In the research period the analysis of consumption and the status of inventory of the most frequently demanded items of goods necessary for the scheduled maintenance of vehicles according to the servicing schedule of the manufacturer was carried out. Also, with the aim of realising the basic objectives of inven-

tory optimisation that should result in savings, the business operation with the inventories was studied also from the financial aspect. Since spare parts are imported and delivered from the logistic centre in Austria, the total calculation should include also the parameter of the time of delivery. The analysis of a part of inventories of classification C in which the existing system of automatic ordering by means of the software tools Autopart in the concretely analysed authorized servicing centre for the repair of Volkswagen vehicles has been implemented, will be used as the basis for the development of the inventory optimisation model. This was done because there are more than 5,000 unit product items on stock at the observed service centre, and the inventories of C classification are important for retaining the high level of customer service, and the respective effects of employees' satisfaction.

Classification C inventories within the frame of research and on the example of a concrete servicing centre, are inventories of low unit value and at the same time the category of inventory in which it is necessary to insure a very high level of service since the items of the mentioned classification refer to the level of inventory important for the delivery of services of scheduled vehicle maintenance according to the manufacturer's servicing schedule. The theoretical approach assigns the lowest value to C inventories, and that level of inventories which requires minimum attention from the logistics engineers within the activities of inventory

Table 1 - Actual status of monthly sales of a part of spare parts of classification C from the aspect of the sales value and the average number of days necessary to sell the inventories

Spare part	Sold qty. during one month (pc.) and in %		Weekly sale				Weekly average (pc.)	Maximal sale (pc.)	Value of sales in the observed month	Average status of inventories (weekly)	Average value of inventories for average number of items on stock	Days of selling of average inventories according to value
			Week 1	Week 2	Week 3	Week 4						
Brake lining	18.0	2.3%	2.0	5.0	5.0	6.0	4.5	6.0	19,890.00 kn	21	23,412.19 kn	35
Hay filter	54.0	6.9%	10.0	13.0	16.0	15.0	13.5	16.0	14,446.62 kn	59	15,654.52 kn	33
Brake lining	15.0	1.9%	5.0	6.0	3.0	1.0	3.8	6.0	22,019.70 kn	9	13,028.32 kn	18
Bulb	11.0	1.4%	5.0	2.0	1.0	3.0	2.8	5.0	11,977.45 kn	6	5,653.39 kn	15
Filter	24.0	3.1%	5.0	6.0	6.0	7.0	6.0	7.0	10,210.32 kn	22	9,488.15 kn	28
Disc pad brakes	11.0	1.4%	1.0	8.0	-	2.0	2.8	8.0	7,718.15 kn	12	8,244.39 kn	32
Coolant	121.0	15.5%	24.0	33.0	29.0	35.0	31.0	35.0	8,186.86 kn	37	2,523.38 kn	9
Support	4.0	0.5%	2.0	2.0	-	-	1.0	2.0	5,681.80 kn	4	5,149.13 kn	27
Brake lining	10.0	1.3%	1.0	3.0	2.0	4.0	2.5	4.0	5,673.50 kn	19	10,765.47 kn	57
Brake lining	3.0	0.4%	1.0	1.0	1.0	-	0.8	1.0	5,359.35 kn	4	7,145.80 kn	40
Glassware	3.0	0.4%	-	-	2.0	1.0	0.8	2.0	6,403.35 kn	4	7,737.38 kn	36
Hay filter	30.0	3.8%	6.0	11.0	8.0	5.0	7.5	11.0	5,076.90 kn	17	2,876.91 kn	17
Wiper blades	38.0	4.9%	5.0	10.0	6.0	17.0	9.5	17.0	5,945.10 kn	34	5,246.16 kn	26
Oil filter	59.0	7.6%	13.0	18.0	15.0	13.0	14.8	18.0	5,041.55 kn	75	6,405.55 kn	38
Brake lining	10.0	1.3%	1.0	4.0	2.0	3.0	2.5	4.0	6,321.00 kn	8	4,819.76 kn	23
Joint head	11.0	1.4%	3.0	1.0	4.0	3.0	2.8	4.0	3,414.95 kn	7	2,056.73 kn	18
Disk pad brakes	4.0	0.5%	2.0	2.0	-	-	1.0	2.0	4,180.00 kn	5	5,225.00 kn	38
Oil filter	70.0	9.0%	15.0	22.0	19.0	14.0	17.5	22.0	3,867.50 kn	66	3,638.77 kn	28

Source: AutoZubak d.o.o., modified by the authors

optimisation. As part of research, and due to the specific characteristics of the activity, concrete categorisation of inventories has importance A from the aspect of service quality. Since these are the services which are according to the research in the authorised service shops most frequently required by the customers, and the services for which the customers are not willing to wait for several days because of the shortage of these items on stock, it follows that from the aspect of importance for the customer these are inventories of classification A. As the criterion of ABC classification of inventories the paper uses the methodology of annual consumption value so that further in the text the respective category of inventories will be classified as C inventories.

Table 1 shows that the servicing centre holds on stock an excessive level of goods inventories regarding the weekly i.e. monthly sales. It may be concluded that the parameters used to plan the future consumption of the information system Autopart for inventory management by means of e-purchase are not set in accordance with the expected demand. Using the identification method and the analysis of average weekly level of inventories at the concrete servicing centre, it may be concluded that the tendency is towards maximisation of the level of customer service since the average status of inventories exceeds by several times the number of average days of the consumption of certain items.

Since there are about 5,000 items of goods on stock at the concrete servicing centre, the carried out

Table 2 - Proposal of improving the e-purchase system for items of classification C based on the planned level of customer service

Spare part	Sold monthly quantity (pc)	Weekly sales average	Standard deviation of sales	Value of monthly sales	Proposal of improving the e-purchase system								
					Planned level of service	Time of delivery of goods in days	Time between two orders (weeks)	Standard deviation of the level of service	Safety inventory (pc)	Average level in inventories (pc)	Safety inventory (days)	Average level of inventories (days)	
Brake lining	216.0	4.2	2.3	223,354.80 kn	99%	0.33	2	2.33	3.1	7.3	5.3	12.3	
Hay filter	815.0	15.7	5.7	205,893.45 kn	97%	0.33	2	1.88	6.6	22.3	3.0	10.0	
Brake lining	118.0	2.4	1.5	184,522.50 kn	97%	0.33	2	1.88	1.7	4.1	5.1	12.1	
Bulb	91.0	1.8	1.7	99,858.85 kn	97%	0.33	2	1.88	1.8	3.6	7.4	14.4	
Filter	285.0	5.5	3.0	105,150.75 kn	97%	0.33	2	1.88	3.3	8.8	4.3	11.3	
Disk pad brakes	142.0	2.7	2.7	98,711.30 kn	97%	0.33	2	1.88	2.9	5.7	7.6	14.6	
Coolant	1,300.3	25.0	10.4	85,374.42 kn	97%	0.33	2	1.88	11.9	36.9	3.3	10.4	
Support	62.0	1.2	1.4	86,444.12 kn	97%	0.33	2	1.88	1.5	2.7	9.1	16.1	
Brake lining	165.0	3.2	2.1	89,032.35 kn	99%	0.33	2	2.33	2.8	6.0	6.3	13.3	
Extension	62.0	1.3	1.5	82,123.96 kn	99%	0.33	2	2.33	2.1	3.4	11.1	18.2	
Brake lining	52.0	1.0	1.0	88,231.00 kn	99%	0.33	2	2.33	1.3	2.3	9.4	16.4	
Saugrohr	26.0	0.5	0.9	76,090.82 kn	97%	0.33	2	1.88	0.9	1.4	13.0	20.0	
Glassware	39.0	0.8	0.8	79,558.05 kn	97%	0.33	2	1.88	0.9	1.6	8.3	15.4	
Hay filter	493.0	9.5	3.0	82,883.16 kn	97%	0.33	2	1.88	3.6	13.0	2.6	9.7	
Wiper blades	429.0	8.3	4.7	66,392.04 kn	97%	0.33	2	1.88	5.3	13.5	4.5	11.5	
Oil filter	840.0	16.2	5.5	65,209.20 kn	97%	0.33	2	1.88	6.4	22.6	2.8	9.8	
Brake lining	89.0	1.7	1.7	58,101.87 kn	99%	0.33	2	2.33	2.3	4.0	9.3	16.3	
Joint head	155.0	3.0	2.4	46,234.95 kn	97%	0.33	2	1.88	2.6	5.6	6.1	13.1	
Disk pad brakes	52.0	1.0	1.3	52,777.40 kn	99%	0.33	2	2.33	1.7	2.7	12.2	19.2	
Oil filter	1,017.0	19.6	5.9	55,467.18 kn	99%	0.33	2	2.33	8.7	28.2	3.1	10.1	
Brake lining	137.0	2.6	1.7	50,817.41 kn	99%	0.33	2	2.33	2.3	5.0	6.2	13.2	
Hay filter	551.0	10.6	4.0	55,403.05 kn	99%	0.33	2	2.33	5.7	16.3	3.8	10.8	
Filter cartridge	408.0	7.8	3.9	55,251.36 kn	97%	0.33	2	1.88	4.4	12.2	3.9	10.9	
Hay filter	553.0	10.3	3.9	55,869.06 kn	99%	0.33	2	2.33	5.6	15.8	3.8	10.8	
Brake lining	57.0	1.1	0.7	47,629.20 kn	99%	0.33	2	2.33	1.0	2.1	6.6	13.6	
Valve	48.0	0.9	2.6	44,681.76 kn	99%	0.33	2	2.33	3.5	4.4	26.4	33.4	
Windshield wiper	151.0	2.9	1.6	43,259.99 kn	97%	0.33	2	1.88	1.8	4.7	4.4	11.4	
Hay filter	180.0	3.5	1.5	47,541.60 kn	97%	0.33	2	1.88	1.7	5.1	3.4	10.4	
Filter cartridge	363.0	7.0	3.3	45,723.48 kn	97%	0.33	2	1.88	3.8	10.8	3.8	10.8	
ATF oil	232.0	4.5	5.6	34,377.76 kn	97%	0.33	2	1.88	6.1	10.5	9.6	16.6	
Hay filter	131.0	2.5	6.4	33,094.53 kn	97%	0.33	2	1.88	6.9	9.4	19.3	26.3	
Indicator	249.0	4.8	3.1	31,784.85 kn	97%	0.33	2	1.88	3.5	8.3	5.1	12.1	
Total value of sales at annual level				2,476,846.20 kn									

analysis encompassed a part of items of classification C of relatively low individual value, but of stable turnover and at the same time high importance for the assessment of the business quality by the service users. The occurrence of identical name of certain spare parts on several occasions occurs due to the consumption of a single item regarding name, but of different catalogue number. The catalogue number is the order code of the product for the concrete make and type of vehicle. The carried out analysis is the assumption for the conclusion that the stock of the servicing centre holds too many items of goods regarding the average consumption. Therefore, there is real danger of over-standard engagement of capital necessary to finance the inventories, as well as risk of increase of total business costs that are generated by increased demand for warehouse and manipulation space and increased need for human workforce engagement. The final consequence may be the occurrence of obsolete inventories since the actual methodology of inventory management in the concrete servicing centre is identical also for the items of classification A and B.

The proposal of e-purchase management optimization was done on the basis of the analysis of the average consumption of concrete products, in relation to the level of service and the time of delivery. Table 2 shows the results of simulation of the required level of inventories of classification C (spare parts necessary for scheduled maintenance of vehicles) in the system in such a way that for the concrete items a high level of service was defined, ranging from 97 to 99 percent.

When requiring repair in which inventories of classification C are used, the service users are not willing to wait for the service realisation for a day or two, but rather expect the service to be performed immediately upon request. The proposed inventory optimisation concept plans a differentiation in inventory management regarding individual groups of inventories (classification). Therefore, for the respective classification C of the inventories a high level of service has been defined from 97 to even 99 percent. This means that for the services of scheduled servicing and vehicle repair we have insured for the market an extremely high level of service, and that the shortage of goods on stock are allowed only in one to maximally three percent of cases.

Table 3 shows the results of simulation and comparative analysis which makes it possible to see on a concrete example the result of implementing inventory management optimisation in the way of differentiated approach to inventory management of a certain classification, adaptation of the system of e-purchase in accordance with the demand and planned level of user service and reduced delivery time. The result of simulation on items of classification C by using the optimisation indicates possible rationalisation of inventories of classification C on the average by 35% in relation to the number of days of average consumption, i.e. by ca. 30% on a monthly basis from the aspect of freeing the financial means that the servicing centre had engaged earlier for financing of the inventories.

Table 3 - Rationalisation of the inventories of spare parts of classification C as result of redefinition of the e-purchase system in compliance with the market demand

Spare part	Current situation (prior to optimisation)				Rationalisation of inventories					
	Sold qty. during one month (pc.) and in %	Value of sales in the observed month	Days of sales of average inventories acc. to value	Reduced inventories by: pc.	Value of reduced engaged capital = SAVING	Average value of inventories on stock	Days of sales of average inventories	Reduction in average days of sales of inventories in pc. and in %		
Brake lining	18.0	2.3%	19,890.00 kn	35	14	9,995.27 kn	7,704.62 kn	12	24	67%
Hay filter	54.0	6.9%	14,446.62 kn	33	41	6,709.15 kn	4,552.96 kn	9	23	71%
Brake lining	15.0	1.9%	22,019.70 kn	18	3	2,820.00 kn	9,135.24 kn	12	5	30%
Bulb	11.0	1.4%	11,977.45 kn	15	1	779.59 kn	4,640.56 kn	13	3	18%
Filter	24.0	3.1%	10,210.32 kn	28	15	3,550.72 kn	3,090.90 kn	9	19	67%
Disc pad brakes	11.0	1.4%	7,718.15 kn	32	5	2,399.19 kn	4,683.16 kn	18	14	43%
Coolant	121.0	15.5%	8,186.86 kn	9	-1	-36.21 kn	2,573.80 kn	9	0	-2%
Support	4.0	0.5%	5,681.80 kn	27	1	1,329.42 kn	3,214.28 kn	17	10	38%
Brake lining	10.0	1.3%	5,673.50 kn	57	15	5,386.28 kn	2,436.94	13	44	77%
Brake lining	3.0	0.4%	5,359.35 kn	40	3	2,862.81 kn	2,565.18 kn	14	26	64%
Glassware	3.0	0.4%	6,403.35 kn	36	2	2,612.09 kn	3,832.95 kn	18	18	50%
Hay filter	30.0	3.8%	5,076.90 kn	17	6	690.08 kn	1,791.58 kn	11	6	38%
Wiper blades	38.0	4.9%	5,945.10 kn	26	18	1,944.28 kn	2,438.23 kn	12	14	54%
Oil filter	59.0	7.6%	5,041.55 kn	38	57	2,822.82 kn	1,550.27 kn	9	29	76%
Brake lining	10.0	1.3%	6,321.00 kn	23	3	1,470.90 kn	2,715.06 kn	13	10	44%
Joint head	11.0	1.4%	3,414.95 kn	18	2	598.62 kn	1,296.95 kn	11	7	37%
Disk pad brakes	4.0	0.5%	4,180.00 kn	38	2	1,669.50 kn	2,677.32 kn	19	18	49%
Oil filter	70.0	9.0%	3,867.50 kn	28	42	1,480.95 kn	1,294.96 kn	10	18	64%
Total value of sales	150,414.10 kn			49,085.47 kn						

4. IMPACT OF INVENTORY MANAGEMENT OPTIMISATION ON THE EMPLOYEES' SATISFACTION

Following the carried out inventory optimisation on the basis of implementing the conceptual model of optimisation and using it at the concrete servicing centre, the second cycle of studying employees' satisfaction followed. The survey of the entire business model, particularly the approach in the analysis of motivation and satisfaction of employees indicates the possibility of further improvement of the model for analysing the satisfaction of employees so that the questions are structured into four key areas – resources, working environment, information, motivation. Such a structural approach to studying the satisfaction of employees could ensure more precise acting on the observed deviations in the organisation, i.e. ensure a feedback in the interaction of the inventory management quality and the employees' satisfaction [12, 15].

The analysis of the obtained research results of the employees' satisfaction according to the created questionnaire, i.e. classification according to *Figure 1* indicates an increase in the employees' satisfaction index to 78.45% from the initial 67.9%. The index determined in this way indicates also the change of employees' categorisation that now belong to the category "Question marks". According to the methodology of analysis results of the survey questionnaire, employees now know what they are expected to do at work, with the need of occasional orientation which is only logical regarding the short time of implementation of the new optimisation model. Since the area of information of the employees involved in the business process is expanded, and since the element of open communica-

tion with the superiors has been introduced together with active monitoring of the set business objectives, in studying their satisfaction the employees have expressed that they feel important for the realisation of the high positioning of the company on the market. There is still insufficiently expressed connection to the objectives of the company. In further consideration of the second cycle of research, the employees have assessed that they now perform exactly those tasks that they think they do best and that they think that the associates appreciate them at a satisfactory level.

5. CONCLUSION

After the carried out research new knowledge has been defined and the elements of interdependence of the successful inventory management system on the change of employees' satisfaction indicators have been determined, thus confirming the hypothesis stated in the paper. The appearance of new information-communication services has provided the base for changing the inventory management methodology, differentiated approach of optimisation towards items of single classification, and harmonisation of the inventories with the market demand. This makes it possible to achieve balance between meeting the requirements of the service users as participants in the supply chain and the employees' satisfaction. By precisely defining the employees' obligations and their integration in the planning and realisation of the business goals, the employees' satisfaction index has been increased, which insures long-term achievement of competitive advantages on the market. Also, the possibility has been opened for further improvement of the model of analysing the employees' satisfaction in a way of clearer

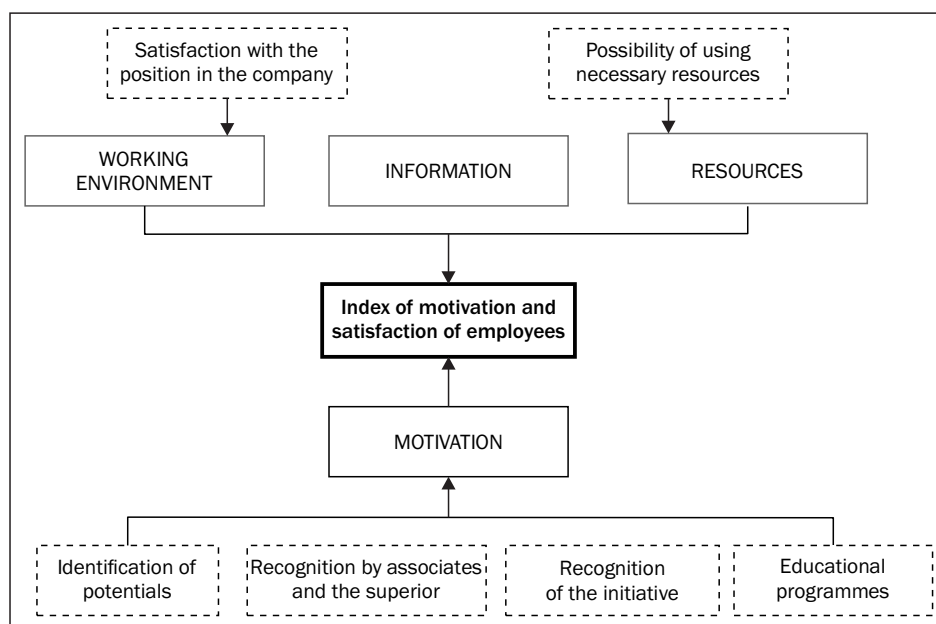


Figure 2 - Proposal of the model for supplementing the criteria of employees' satisfaction survey

structuring of the questionnaire through four key areas – resources, working environment, information, motivation. Such approach to the study of the employees' satisfaction allows more precise identification of the failures in the organisation and insures feedback in the interaction of the inventory management quality and the employees' satisfaction.

By implementing the proposed model of supplementing the criteria of surveying the employees' satisfaction it is possible to achieve the interaction of the inventory optimisation with the increase of the employees' satisfaction index, thus creating the assumption for the design of the applicative package for the management of interaction inventory optimisation processes in the supply chain, satisfaction of service users and employees. Such applicative package can find wider implementation in the industry and can be the infrastructure for the supply, the so-called XaaS-based services in this business area and it can also provide incentive to others to continue research in this area.

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SAŽETAK

MEĐUZAVISNOST UPRAVLJANJA ZALIHAMA I ZADOVOLJSTVA ZAPOSLENIKA

Istraživanjem se utvrđuje korelacija primjene suvremenih metoda optimizacije zaliha u opskrbnom lancu s obzirom na zadovoljstvo zaposlenika koji su odgovorni za upravljanje procesima optimizacije zaliha. Prethodna istraživanja potvrđuju da optimizacija upravljanja zalihama u opskrbnom lancu osigurava konkurentne prednosti na tržištu. Ima prostora za daljnje istraživanje utjecaja postignute optimizacije zaliha u opskrbnom lancu na promjene u zadovoljstvu zaposlenika. Rad utvrđuje odnos međuzavisnosti postignute optimizacije zaliha na zadovoljstvo zaposlenika i s tim povezanih sinergijskih učinaka postizanja dodatne vrijednosti kompanija na tržištu usmjerenih na zadovoljstvo kupaca i korisnika usluga. Istraživanjem se došlo do novih spoznaja o međuzavisnosti optimizacije upravljanja zalihama na promjenu indikatora zadovoljstva zaposlenika. Na osnovu provedenog istraživanja stvorena je pretpostavka za izradu aplikacijskog paketa (tzv. usluge na bazi XaaS) za upravljanje procesima interakcije optimizacije zaliha u opskrbnom lancu, zadovoljstva korisnika usluga i zaposlenika.

KLJUČNE RIJEČI

upravljanje zalihama, ICT, zadovoljstvo zaposlenika, opskrbeni lanac, optimizacija

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