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Reengineering of Supply Chain Process in Production Systems – A Case Study

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Modern enterprises are faced with many challenges and continually changing competitive environment, such as globalization of the economy of developed countries, the increasing demands for the quality and lower sale price of products and services, deregulation of the economies of developed countries, demands for excellence and continuous improvement. Because of these and many other reasons, there are permanent requirements for changes in performances, innovations, increasing flexibility and improving the economic performance of the company.
The main objective of this paper was to explore the possibilities for improvement of important business processes, such as supply chain management in fast moving consumer goods industry (FMCG) with the technique of business process reengineering (BPR) and business process improvement (BPI). Methodology used in this paper included a step approach in line with the Harvard Business School Business (HBS, 2010) process improvement supported with value stream mapping (VSM) lean tools. First, the authors made a review of available literature on business process reengineering and supply chain management. In continuation, there have been analyzed the technique of BPI according to the HBS and then integrated appropriate aspects and steps of BPI in supply chain process of domestic company. They included: financial analysis of company before BPI act; implementation of BPI and second financial analysis of company's performances after BPI implementation.The paper presents a case study research performed to point out the significance of BPR in supply chain management. The authors tried to explain main areas of supply chain process in particular production company so as the improvements that can be achieved by using techniques of BPR.

Keywords: *reingeneering, business process improvement, supply chain management, lean tools, VSM, FMCG.*

Introduction

Business processes represent a group of related activities that provide satisfaction of the needs and providing value to the user. Since all the processes in an organization are directed towards strategic goals, it is necessary to manage properly all activities and tasks so they can meet the operational objectives (Berber *et al*., 2011). Business process reengineering is positioned as an important management practice because it provides organizations with means of increasing competitiveness and sustainability (Magutu *et al.,* 2010) in time of market uncertainty, increasing globalization and constantly changing business conditions.

The main objective of this paper was to explore the possibilities for improvement of important business processes, such as supply chain management with the technique of business process reengineering and business process improvement (BPI). Methodology used in this paper included step approach in line with the HBS Business Process Improvement. First, the authors made a review of available literature on business process reengineering and supply chain management. In continuation, there has been analyzed the technique of BPI. After theoretical analysis, the authors integrated appropriate steps of BPI in supply chain process of domestic company. They included: financial analysis of company before BPI act; implementation of BPI and second financial analysis of company's performances after BPI implementation. Also, non financial performances were discussed.

The paper presents one case study research performed to point out the significance of BPR in SCM. The authors tried to explain main areas of supply chain process in particular production company so as the improvements that can be achieved by using BPR techniques.

A Theoretical Review

Business Process Reengineering

Definitions of business processes are numerous and most of them are from the theory of BPR from 1990s. According to Hammer & Champy (1993) business process is a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer.

A business process has a goal and is affected by events occurring in the external world or in other processes. In book of the author Davenport (1993) a business process is defined as "a structured, measured set of activities designed to produce a specified output for a particular customer or market. It implies a strong emphasis on how work is done within an organization, in contrast to a product focus's emphasis on what. A process is thus a specific ordering of work activities across time and place, with a beginning, an end, and clearly identified inputs and outputs: a structure for action."

On the other hand (Rummler & Brache, 1995) stated that business process is a series of steps designed to produce a product or service. Most processes are cross – functional and include "white space" between the cubes on the organization chart. Some processes result in product or service that is required by the organization's external customers – the primary processes. Other processes produce products that are invisible to the customer, but are essential for the efficient conduct of the business – support processes. All these processes are properly managed by BPM model that can be understood as: an integrated management philosophy and set of practices that includes incremental change and radical change in business process, and emphasizes continuous improvement, customer satisfaction, and employee involvement (Hung, 2006).

Related to BPM concept, or better say the theoretical base for BPM is reengineering of business process. It is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary success criteria such as cost, quality and service and speed (Hammer & Champy, 1993). Reengineering is the process of redesign with the aim of improvement in the key areas of business followed by positive transformation of performances such as quality, cost, and speed (Altinkemer *et al*., 2011). Reengineering is the radical redesign of technological processes in order to improve economic efficiency. Radical redesign means starting from the beginning instead of changing or modifying the existing modes (Scekic *et al*., 2011).

In examples of successful reengineering there are encountering some themes that are common:

- Orientation towards the process - every improvement is achieved by concentrating on the entire process;
- Ambition - means that small improvements are not enough;
- Violation of rules - discards the unnecessary tradition during the re-engineering of business processes;
- Creative use of information technology - information technology acted as a tool to enable organizations to operate in a radically different way (Hammer & Champy, 2001).

Subject of reengineering is a process, not an organization. Companies do not redesign their sales or production department; they are redesigning business processes that people perform in these departments. Confusion over organizational units and process as objects of reengineering occurs because departments, divisions and groups are known to the people known but processes are not. Reengineering is not:

- Automation,
- Reduce of non-active parts of the organization,
- Reducing the scope of the organization,
- Reorganization,
- Making marginal changes.

There are four re-engineering perspectives: operational, dynamically-evolving, organizational and systemic. Operational perspective puts the focus on the re-engineering of business process management, and giving priority to activities that create added value. Dynamic-evolutionary perspective puts at the center of implementing radical reengineering activities aimed at continuous improvement of business processes. Organizational perspective means that re-engineering should provide follow-highly innovative vision by all employees. Finally, from the perspective of system re-engineering is to provide adequate business environment for the implementation of the changes to the prioritization of customers and their requirements (Dassisti, 2010).

According to this concept, every part of the organization is unique process, successful execution of which leads to the satisfaction and fulfillment of the process at a higher level. There are many ways for improvement of some organization processes (see Berber *et al*., 2012), but this paper examines the supply chain management process as one of the crucial parts in total business process improvement.

Supply Chain Management

Definitions of Supply Chain Management are numerous. SCM can be understood as "a systems approach to viewing the supply chain as a whole, and to managing the total flow of goods inventory from the supplier to the ultimate customer; a strategic orientation towards cooperative efforts to synchronize and converge intrafirm and interfirm operational and strategic capabilities into unified whole; and customer focus to create unique and individualized sources of customer value, leading to customer satisfaction" (Mentzer *et al*., 2001). Supply chain management is "an integrative philosophy to manage the total flow of a distribution channel from supplier to the ultimate user" (Cooper & Ellram, 1993). Supply Chain Management is the planning and control of all processes that connect partners in a supply chain with the purpose of servicing the needs of end users (Harrison & Van Hoek, 2005). It includes two or more firms in a supply chain entering into a long-term agreement; the development of trust and commitment to the relationship; the integration of logistics activities involving the sharing of demand and sales data; the potential for a shift in the locus of control of the logistics process (La Londe & Masters, 1994).

A comprehensive definition had offered the author Acimovic, who argues that "supply chain management includes all activities related to procurement of resources, the conversion of these resources, as well as all logistics activities that involve coordination and cooperation of partners in the supply chain, which can be suppliers, intermediaries, logistics providers and customers, in the finals, supply chain management integrates and coordinates supply and demand within a firm and between

all members of the supply channel; philosophy of the concept of supply chain management is that it is, based on the responsibility that each business function has, a major integrator of business functions within the company and between companies, in a cohesive and high-performance business model; supply chain management involves all operational logistics activities, production and establishes coordinating links with and through marketing, sales, product design and IT support" (Acimovic, 2006).

Stock & Lambert (2001) explicitly determine what it needs to do any process of supply chain management. According to them, these are: the structure of the supply chain, which are the relationship between the members of the supply system, the business processes within the supply system, as well as activities that sholud generate value for the customer who is at the end of chain, while the managerial components are methodological techniques that integrate processes and network in the supply chain.

In accordance with the above definitions, it is important to mention that the fundamental idea of the supply chain is directed to the sense that it (supply chain) must be controlled in order to be fast, reliable, cost-effective and flexible enough to meet the demands of their customers (Janvier-James, 2012). Reduction of cost and optimization of processes in supply chain, which has been dominant in the past within the organization, focuses on applying the same management paradigm and technology, but outside the internal supply chain. The goal of the management is to eliminate all forms of "waste" produced by individual entities in the supply chain, such as logistics, inventory, procurement, product development, finance and others. (Rejman Petrovic *et al*., 2012).

SCM involves complex relationships between companies and suppliers, on the one hand, and the company and customers on the other side (Figure 1).

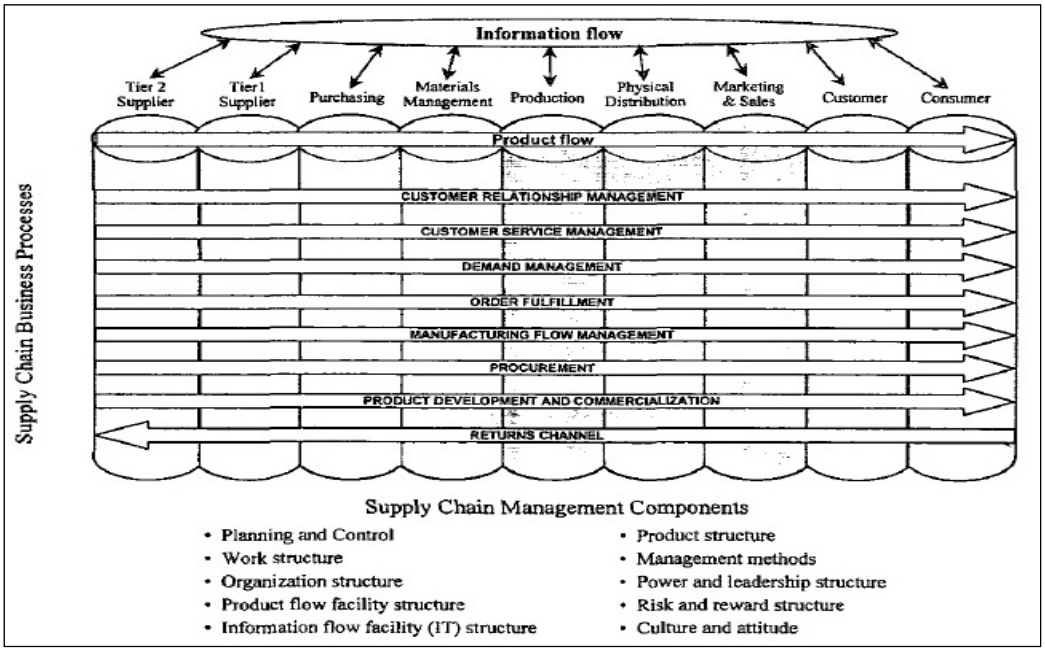

Figure 1. A Framework of Supply Chain Management
Source: Cooper, Lambert & Pagh, 1997.

Other authors proposed unified business process design framework based on the paradigm of intelligence that allows humans and human-designed systems cope with environmental volatility, and argue that its principles applied to the context of organizational processes can increase the success rate of business operations, in intelligent supply chain (Siurdyban & Moller, 2012).

Methodology

At the beginning of the analysis it should be noted several ideas by foreign researchers, when it comes to this. Zellner (2011) attempted to provide a structured overview of the approach to improve business processes (BPI) and their contribution to the improvement of the current act. Although a lot of talk about the BPI, there is still a lack of support for the act to improve the process. Most approaches concentrate on what needs to be done before and after the improvement, but the act of improving still appears to be a "black box." Authors have performed the analysis and critical evaluation of a large number of accesses to BPR (see Zellner, 2011; Reijers *et al*., 2005). Framers of reengineering are Hammer and Champy (1993), but today there are many different approaches (see Hammer & Champy, 1993; Guha *et al*., 1993; Kettinger *et al*., 1997; Miladinovic & Adamovic, 2010; HBS, 2010). This paper presents a methodology for application of the Harvard Business School (Harvard Business School, HBS, 2010) for the implementation of re-engineering project in the food industry in the procurement process. Steps in the analysis included:

- analysis of financial indicators before BPI;
- implementation of BPI ;
- financial analysis of company's performances after BPI implementation;
- also, non financial performances were discussed.

A study of the process of improving supply chain management is performed in a company for production of fast moved consumer goods (FMCG) – food industry, which we will mention in this study as the SFC (the real name of the company is protected through an agreement with the top management). SFC is a company founded in 1995 in northern part of Serbia that operates under HACCP and ISO 14001:2004, ISO 22000:2007 certified factory which has about 1300 employees. In order to get insight into the company's financial position and business success, key indicators of efficiency are calculated (Table 1).

Table 1

Indicators of efficiency of the SFC Company's business for 2011

INDICATORS	FORMULA	UNIT	VALUE
BEP (breakeven point)	$BEP = \frac{TF}{\%Mp} = \frac{TF}{(R-TV)/R}$	€	46.550.839,17
ROE (return on equity)	$ROE = \frac{P}{C}$	%	0,2634175
ROA (return on assets)	$ROA = \frac{P}{BA}$	%	0,321157
Liquidity	$L = \frac{WA}{STL}$	ratio	1,478649
Solvency	$S = \frac{BA}{TD}$	ratio	1,3762735
Stocks of final products	From financial data	days	10
Stocks of material	From financial data	days	20
Stocks of raw materials	From financial data	days	45
Time for the change of tools due to shifting of production lines	From financial data	days	0,5
Out of Stock – Lost sales due to lack of available goods	CS=(NDOSxAUSPDxPPU)+CC	%	12% of Revenue
Write-off of finished products and raw materials	From financial data	€	218.476,191
Cost of renting a warehouse	From financial data	€	1.100.828,571
Cost of transporting	From financial data	€	1.162.342,857

Source: Analysis of the authors

TF – total fixed costs;
TV – total variable costs;
R – revenue;
C – Capital engaged;
TC – total costs;
%Mp – % of marginal profit;
Bl – business leverage;
Bp – Business profit, without financial incomes and expenditures;
L – Liquidity;
WA – working assets;
STL – short term liabilities;
S – Solvency;
BA – Business assets;
TD – total short term and long term debt;
CS = Cost of a Stock out;
NDOS = Number of Days Out of Stock;
AUSPD = Average Units Sold Per Day;
PPU = Price per Unit (some use Profit Per Unit);
CC = Cost of Consequences.

What is important in re-engineering of business processes is that the observed company, although have profitable business, realized that at a given level of efficiency and effectiveness it should not deter, but should make improvements, integrate and standardize processes (Kušar *et al*., 2009) wherever is possible to determine the position and promote on competitive market. In this sense, there has been performed the analysis of the business processes that are of importance for the company. The authors identified one of the key processes that have a significant impact on the overall business. That was supply chain process.

According Harvard Business School (HBS, 2010) methodology for BPI is consisted from six mutually conditioned phases for the reengineering of the business processes:

The initial step to improve business processes (BPI) is planning that involves three important elements that are critical for the proper introduction of the problem: selection of existing process that the company wants to improve, defining the scope of the improvement project and selecting the team to implement reengineering.

The next step in the process of BPI is the analysis of existing processes in the organization, which includes mapping of process, problem identification, interviewing stakeholders in order to establish facts and valid information about the process, and benchmarking in terms of revealing how other organizations have solved determined or similar problems.

After analyzing the existing process, it is necessary to redesign the process, which is conducted through several steps: prediction of better process; test ideas of the team for improving; consideration of the implications of the potential design of process; documentation; obtaining feedback from stakeholders, and trimming the redesigned processes.

When the process is redefined, it is necessary to perform the fourth step: obtaining resources, which is often related to human resources (HR), information technology (IT) and financial resources. What is important in the process of change is that the new process often requires a change in the resources used. Changes in power, performance, and scope of work, responsibilities, and even the number of employees are some of the most common changes related to human resources. In addition to new employment, the introduction of new technology is almost always an aspect of reengineering, especially in the domestic business environment.

Fifth stage of BPI is implementing of a new process. This is the most difficult step in the improvement of process, since the new process is put into operation. What is important in this step is to identify possible barriers to implementation and facilitate the work process. The key roles here go to top manager, leader of the company and owners of the process. If the redesigned process through the implementation is accepted, we can move on the next step, which means continuous improvement. Specifically, the new process is required to continually yield results that are expected of him. In this sense there is used a measure of the performance of business processes (quality, turnaround time, customer satisfaction, cost, etc.), identifying potential problems and update that changes in performance measures and targets as necessary.

Business Process Improvement in the Company

Analysis of existing process included mapping of process, identifying problems, interviewing stakeholders in order to establish facts and valid information about the process. Map of process occurs as a result of the mapping process (Van Ackere *et al*., 1993). It is a graphical representation of the process with the display of order of tasks using different versions of the description of the process, eg. DTP-flow diagrams, AS2, IDEF, etc. (Giaglis, 2001). The authors have applied in this case Sigma Flow VSM – lean and six sigma tools for mapping process (see Bozickovic *et al*., 2012; Pavletic *et al*., 2007; Sokovic *et al*., 2005). Mapping "represents one of the starting foundations in data gathering and system analysis that, next to the vision of the top management and staff training, represents the foundation for successful reengineering process" (Radosevic *et al*., 2011).

Due to the complexity of the mapping with VSM – lean methodology in the following picture there is given simplified representation of the process of given enterprise (Figure 2). Sales' plan is a sub process of SCM that is responsible for disseminating information about the sales plan for a period of time. Based on the annual budget, managers in the department of marketing and sales are planning to create annual, semi-annual, quarterly and monthly sales plans.

Production plan involves planning of capacities, both manpower and machinery to carry out the plans created in the sub process sales planning. Production plan involves taking into account the condition and capacity constraints (the maximum amount of production per month and weekly breakdown of machines, the speed of machines and the like). Based on the sales plan, production planners make their plans, including weekly and daily production plans and work capacity. Also, the production plan is communicated with suppliers and this function sent them also a plan of required purchases of raw materials. There are two possibilities for the company:

- Contact with the suppliers directly exercise planners, built on the quantities and rate of delivery;
- Plan expenditure of resources on the basis of the sales plan (MRP and MRPII) can be transferred sector of procurement, and they will select a supplier that will work with, how many suppliers of second priority will they have, and to make the deal price, which transport and ordered volume must be depending on the characteristics of products and volume of discounts.

The third sub process that receives the information is the plan of distribution centers supply of the company. The task of this sub process is to create conditions for the smooth and continuous outpost of the products of when and where they are needed in distribution centers. The necessity of the distribution as a specific economic activity arises from the gap, mismatch between the production of products and consumption place, time, quantity and quality (product range) (Pranulis *et al*., 2008).

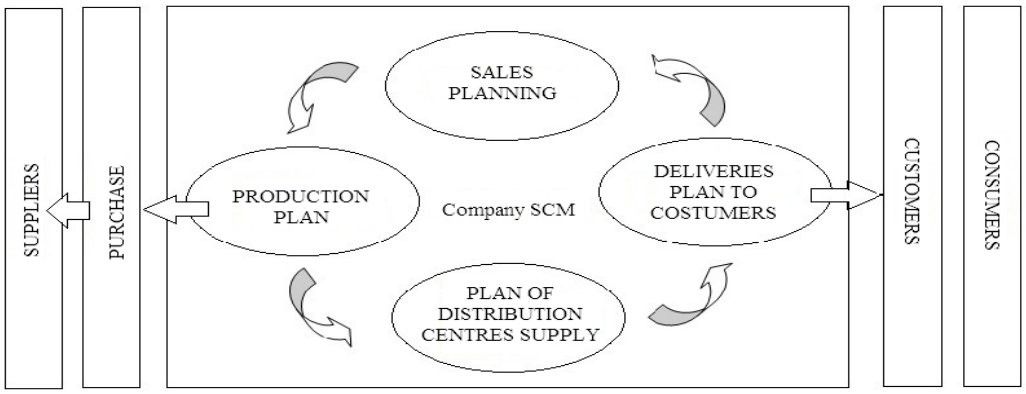

Figure 2. Compny's SCM before BPI implementation

Source: Display by the company on the basis of documents and interviews with manager SCM

Based on the production plan, as well as information received from planners for delivery of goods to the customers, manager of distribution center supply sector should direct the daily transport of the finished products. In their paper, the authors (Park *et al*., 2007) propose an algorithm based on the transport agents. This system consists of multiple entities - the agents who collect and share information. The agents are divided on the role of agents for the distribution, manufacturing and procurement. Multiagent system includes an optional integrated SCM planning agent that is used for the integrated planning of production and distribution (Gligoric *et al*., 2011). What is revealed here as an aggravating circumstance is often mismatching between market information and sales plan

that this is the basis for the production, inventory and delivery plans.

After analyzing the current processes in the SCM where were determined certain issues that boil down to poor awareness of certain activities in the process, redesigning of the process included:

- Introduction (extract from the sales planning process) of a new process that would have focused on the planning of needs (demand planning).
- Employment of at least two workers, one for Serbian market, which is the largest, about 70 % of the total company market, and one for the export markets.
- Closely linking of demand plan with the sale plans, because on the joint analysis those can determine accurate and precise information on the quantities of products that are needed in the market, which leads to better utilization of capacity, smaller stocks, adequate supply and sales, and thus a greater satisfaction of customers, and ultimately consumers.
- Improving relations with the company's customers and suppliers. Integration of the largest buyers in the company's information system can increase the efficiency of sales in such a way that the buyers (wholesalers) by emptying shelves and warehouses to the level of safety stock send request to distribution centers only for those products that are really missing. Distribution centers would automatically respond to requests by contacting delivery planners, and those (delivery planners) will contact supply planners about what products, in what quantity and when are needed.
- Integration of suppliers in SCM information system. The access to information about resources that are consumed in time, key suppliers could plan their own capacity and exercise delivery to the company when raw materials are really needed. Two-way communication means that the company also receives information and questions from the vendor about which raw materials are available, and whether it is needed to plan more or less raw material. This is a very important part of the process since certain raw materials are not produced in Serbia - it takes several weeks for the acquisition from Latin American countries. Improving the process is shown in Figure 3.

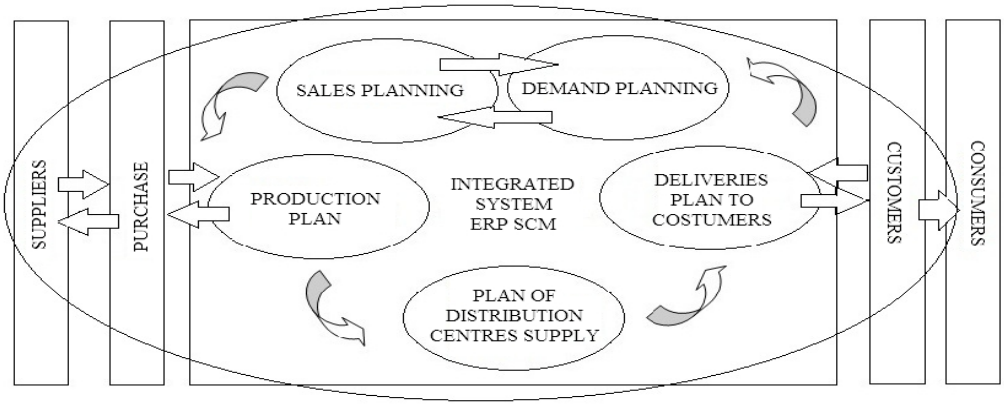

Figure 3. SCM process after BPI implementation

Source: Suggestions of the authors for new process

In Figure 3 we can see clearly the changed relationship between the company and suppliers; company and customers and developing strategic cooperative and collaborative approach. Also there is evident the separation of demand planning from the sales plan, and their networking and facilitating of creating accurate plans which would then become the basis for the production plan (there are add the trade marketing activities, new product development and launch, which are build upon the demand and supply plan). Production in this way gets rather specific requirements for the product on monthly, biweekly or even weekly plan, and increasing the efficiency in terms of capacity utilization of machinery and labor. Also, a large circle on the map that includes suppliers, customers and the company is ERP software that focuses on the integration of internal processes such as sales, production and material handling. Integration supports different tools that combine information on all participants in the chain. When you get an insight into the production of suppliers and the delivery schedule, the purchaser may use the data in real time, in order to plan its own inventory levels and production plans. Sharing information about the current state of order among the members of the chain increases the quality of services, accelerating the payment cycle and provides productivity (Kelle & Akbulut, 2005). The speed of delivery, guaranteed supply and a possibility to purchase products, convenience for buyers and other things may improve the relationship between buyers and sellers and enhance consumer satisfaction (Banyte *et al*., 2011).

Discussions

After performing the SCM process improvement it is necessary to point out all the qualitative and quantitative changes that have been implemented. In this case study, these effects are summarized and presented in table 2. Company managed to shorten the period of holding stocks for an average of 27 % by using a new SCM process:

- Decrease in stocks of finished goods from 10 to 6 days (an improvement of 40 %);
- Decrease in stocks of material from 20 to 15 days (improvement of 25 %);
- Decrease in inventories of raw materials from 45 to 38 days (an improvement of 16 %).

Table 2

Effects of BPI on SCM of the Company

Operation/activity	Situation	
	Before BPI	**After BPI**
Stocks of final products	**10 days**	**6 days**
Stocks of material	**20 days**	**15 days**
Stocks of raw materials	**45 days**	**38 days**
Reducing the time required to change tools due to less shifting of production lines	**Reduction for 30 %**	
Out of Stock – Lost sales due to lack of available goods	**12 %**	**7 %**
Reducing the write-off of finished products and raw materials	**Reduction for 45 %**	
Reducing the cost of renting a warehouse - reduce the need for higher stock	**Reduction for 15 %**	
Reducing the cost of transporting finished products to distribution centers	**Reduction for 21 %**	

Source: Calculation of the authors

When it comes to stocks, it is necessary to reiterate the fact that the company had inventory management problem in the sense that higher inventory levels over optimal because of inaccurate information on market needs, "tied" liquid assets, and at the same time exaggerated costs of storage space and the unnecessary inventory. The introduction of a new process SCM reduced costs of holding inventories, leading to the release of liquid assets of the company. Special attention must be paid to the supply of raw materials, which come from companies in Latin American countries.

The next improvement in the table is the reduction of time and changes in the number of production lines due adequate planning. As mentioned earlier, production planning process was burdened by unrealistic information about the needs of the market, and because of frequent changes in plans product line often suffered frequent adjustments. Preparation of the line and workers, or capacities now is determined on better plan that emerges from more realistic information about the needs of the market for certain products. As a result of this it has been noticed a reduction in the number of capacity adjustments and time for the preparation of production by 30 % compared to the state as it was before the introduction of the new SCM. In this improvement it can be specified also the reduction of energy costs, fuel, materials, equipment.

Stocks may be disproportionately increased over the optimum, but also reduced to levels below the optimal inventory. In the company certain raw materials used to be insufficient, which has led to the changes in the production plan, the reduction of number of products, although those were really needed in the market. Due to the lack of certain product on the market, company recorded losses in terms of unrealized product sale for which there was a demand at the moment. This percentage has decreased from 12 % to 7 %; actually this was improvement for 42 %. For example, on the report on operations, that would specifically accounted for savings of 1.214.964 € (as the expenses of contractual obligations to customers were 2.892.771 € in 2011). Losses due to write-offs of products and raw materials were reduced by 45 % as new plans enable more accurate alignment of production and procurement in terms of ordering quantity of raw materials that is really needed, while producing needed quantity of the products for the market. This is very important since those are products used for human consumption. Their shelf life is from several months to a year, as the shelf life of raw materials that are organic.

Reducing the cost of renting warehouse is also one of the improvements that company made. Needs for more stocks were reduced, and this reduction is about 15 %. Also, there was a reduction in transport costs of finished products to distribution centers by 21 % (for 232.469 € compared to the previous financial period).

Although these quantitative effects are most easily to be determined, changes that have occurred have also a qualitative nature. Model of planning market demand in addition to reducing costs also enabled greater efficiency in the production, a higher quality of service delivery, which can be measured by customer (wholesalers) and consumers' satisfaction surveys. Also, meeting of planners from SCM process, which used to be painful in the sense that everyone defends their own performances and try to prove to their superior, now have a different character. Weekly meetings are now being held in order to better plan a program of weekly and daily production of those products that meet the needs of consumers and customers. Beside mentioned improvements, there has been reduced unnecessary and unproductive overtime staying on job because deviation from such plans is analyzing as the possibilities and are subject to certain planning responses. Communication between certain activities of SCM process is speeded up; information is more accurate and reliable at the time, which in turn leads to more efficient work of members integrated into the process.

Conclusions

Reengineering is a complex process that consists of several important elements that companies, wanting to implement it, have to pay attention. First of all, it is necessary to observe the processes rather than functions and activities of the company. Also, it is necessary to form a team that will carry out reengineering, to find a methodology by which the changes will be implemented, to measure and analyze all the changes and improvements that will take place. During the implementation of reengineering it is inevitable the use of modern information technology. Also, necessary to implement the changes through a phased approach, and that a top-down approach (from top to bottom) in terms of defining the goals of the business processes, resources, and so on.

The main objective of this paper was to explore the possibilities for improvement of important business processes, such as supply chain management with the technique of business process reengineering and business process improvement (BPI). Methodology used in this paper

included step approach in line with the HBS Business Process Improvement which is consisted from six mutually conditioned phases for the reengineering of the business processes: Planning of reengineering; Analysis of indentified process; Redesign of process; Obtaining resources; Implementation; Continuous process improvement.

After analyzing the current processes in the SCM it was determined that there are certain issues that boil down to poor awareness of certain activities in the process. Redesigning of the process that is carried out included the creation of the following elements of the process: introduction of a new process that would has focused on demand planning; employment of at least two workers, one for Serbian market and one for the export markets; closely linking of demand plan with the sale plans, improving relations with the company's customers and suppliers. Integration of the largest buyers in the company's information system (SCM process) can increase the efficiency of sales in such a way that the buyers (wholesalers) by emptying shelves and warehouses to the level of safety stock send request to distribution centers only for those products that are really missing; integration of suppliers in SCM information system.

With adequate implementation of BPR presented company has managed to shorten the period of holding stocks for an average of 27 % by using a new process:

- Decrease in stocks of finished goods from 10 to 6 days (an improvement of 40 %);
- Decrease in stocks of material from 20 to 15 days (improvement of 25 %);
- Decrease in inventories of raw materials from 45 to 38 days (an improvement of 16 %).

As a result of BPI there has been noticed a reduction in the number of capacity adjustments and time for the preparation of production by 30% compared to the state as it was before the introduction of the new SCM. Another very important indicator of change is the reduction of losses due to the lack of products, where company succeeded to reduce this lack for 42 %. Losses due to write-offs of products and raw materials were reduced by 45 % as new plans enable more accurate alignment of production and procurement in terms of ordering quantity of raw materials that are really needed, while producing needed quantity of the products for the market. Reducing the cost of renting warehouse is also one of the improvements that company made. Needs for more stocks were reduced, and this reduction is about 15%, and there was a reduction in transport costs of products to distribution centers by 21 %. Besides these financial indicators, it has been detected that communication between certain activities of SCM process is speeded up; information is more accurate and reliable at the time, which in turn leads to more efficient work of members integrated into the process. These all lead to the greater efficiency of the processes and higher satisfaction of the experts involved in SCM of the company.

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Gamybos sistemų tiekimo grandinės proceso pertvarkymo tyrimas

Santrauka

Šiuolaikinės įmonės susiduria su daugybe iššūkių ir nuolat kintančia konkurencine aplinka, tokia kaip išsivysčiusių šalių ekononomikos globalizacija, didėjantys reikalavimai kokybei ir mažesnei gaminių ir paslaugų kainai, išsivysčiusių šalių ekonomikos išreguliavimas, reikalavimai meistriškumui ir nuolatiniam tobulėjimui. Tai ilgalaikiai reikalavimai naujovėms, didėjančiam lankstumui ir gerėjančiai ekonominei kompanijos veiklai.

Tam tikros įmonės tiekimo grandinės valdymas (TGV) yra apibūdinamas kaip vienas iš pagrindinių procesų, nuo kurio priklauso visos kompanijos rentabilumas. Šiame procese, kuris apima didelio kiekio *sub-procesų* valdymą, buvo nustatytas iracionalumas, kuris sukėlė didesnius kaštus, ilgesnius atsargų saugojimo laikotarpius, didesnius atsargų kiekius ir sumažėjusį rentabilumą.

Pagrindinis šio *darbo tikslas* buvo nustatyti galimybes, kurios padėtų tobulinti svarbius verslo procesus, tokius kaip tiekimo grandinės valdymas su verslo procesų pertvarkymo ir verslo procesų tobulinimo (VPT) metodika. Šiame darbe naudojama metodika, kartu su *Harvardo verslo mokyklos* verslo proceso tobulinimu, apima *žingsnio metodą*.

Pirma, autoriai atliko galimos literatūros apie verslo procesų pertvarkymą ir tiekimo grandinės valdymą apžvalgą. Toliau buvo išanalizuota VPT metodika atitinkamai *Harvardo verslo mokyklai* (2010). Po teorinės analizės, autoriai įtraukė atitinkamus VPT aspektus ir žingsnius į vietinės kompanijos tiekimo grandinės procesą. Tai apėmė: kompanijos finansinę analizę prieš imantis VPT veiksmų, VPT įdiengimą ir antrą kompanijos veiklos finansinę analizę po VPT įdiegimo. Taip pat buvo aptariamos kai kurios ne finansinės veiklos.

Verslo procesai susiję su grupe veiklų, kurios patenkina poreikius ir pateikia vertę vartotojui. Kadangi visi procesai organizacijoje yra nukreipti į strateginius tikslus, būtina tinkamai valdyti visą veiklą ir užduotis taip, kad jos atitiktų operatyvinius tikslus (Berber ir kt., 2011). Verslo proceso pertvarkymas (VPP) yra svarbi valdymo praktika, nes jis pateikia organizacijoms didėjančio konkurencingumo ir stabilumo priemones (Magutu ir kt., 2010) rinkos neužtikrintumo, didėjančios globalizacijos laikotarpiu ir esant nuolat kintančioms verslo sąlygoms. Pertvarkymas yra *perkūrimo* procesas, turintis tikslą pagerinti pagrindines verslo sritis. Po perkūrimo proceso atsiranda teigiamų transformacijų versle: gerėjimas kokybės, kaštų ir laiko (Altinkemer ir kt., 2011). Pertvarkymas yra radikalus technologinio proceso perkūrimas, norint pagerinti ekonominį efektyvumą. Radikalus perkūrimas, tai pradėjimas viską nuo pradžių, užuot keitus ar modifikavus egzistuojančius režimus (Šćekić ir kt., 2011). Siekiant tyrimo tikslo, taip pat buvo svarbu aprašyti tiekimo grandinės valdymo procesą. TGM galima suprasti kaip "sisteminį metodą peržvelgti visą tiekimo grandinę ir valdyti bendrą prekių srautą nuo tiekėjo iki galutinio vartotojo, strateginį orientavimą į bendras pastangas sinchronizuoti ir suvesti firmos vidaus ir tarp firmų esančias operacinius ir strateginius pajėgumus į bendrą visumą, ir vartotojo susitelkimą sukurti unikalius ir individualizuotus vartotojo vertės šaltinius, suteikiančius pasitenkinimą vartotojui" (Mentzer ir kt., 2001).

Tiekimo grandinės tobulinimo proceso tyrimas atliktas greito vartojimo prekių (GVP) kompanijoje – maisto pramonėje. Verslo procesų pertvarkyme svarbu tai, kad stebima kompanija, nors ir rentabili, suprato, kad nereikia apsiribotu turimu našumu ir efektyvumu. Būtina tobulinti, integruoti ir standartizuoti procesus (Kušar ir kt., 2009), kur tik įmanoma skatinti juos konkuruoti. Remiantis šiais teiginiais, buvo atlikta verslo procesų analizė, kuri yra svarbi kompanijai, siekiančiai sukurti tam tikras sritis, kuriose galima būtų padaryti pakeitimus, kad būtų pagerinti svarbūs verslo rodikliai. Peržvelgus verslo procesus, kompanija nustatė vieną iš svarbiausių procesų, kuris daro svarbią įtaką visam verslui. Tai buvo tiekimo grandinės procesas. Remiantis *Harvardo verslo mokyklos* (HVM, 2010) metodika, skirta VPT, buvo sudarytos šešios tarpusavyje susijusios fazės:

1. Pertvarkymo planavimas;
2. Nustatyto proceso analizė;
3. Proceso perkūrimas;
4. Resursų įsigijimas;
5. Įdiegimas;
6. Besitęsiantis proceso tobulinimas.

Suplanavus pertvarkymą ir išanalizavus esamus TGV procesus, buvo nustatyta, kad yra dalykų, kurie kelia abejonių dėl jau esamų tam tikrų proceso veiklų. Atliktas proceso perkūrimas apima tokius proceso elementus: įdiegimas naujo proceso (išėmimas iš pardavimų planavimo seno proceso), kuris sutelktų dėmesį į poreikių planavimą (paklausos planavimas); mažiausiai dviejų darbuotojų įdarbinimas, vienoje iš Serbijos rinkų, kuri yra didžiausia. Ji sudaro apie 70% visos kompanijos rinkos. Kitas darbuotojas įdarbinamas eksporto rinkoje. *Paklausos plano* susiejimas su *pardavimų planu,* leidžia nustatyti tikslią ir aiškią informaciją apie rinkai reikalingų gaminių kiekius. Tai yra svarbu siekiant geriau, tikslingiau išnaudoti galimybes mažesnių sandėlių, tiekimo ir pardavimo. Tokiu būdu vartotojai geriau ir greičiau aptarnaujami. Sugaištas laikas ir kiekiai tų gaminių, kurie buvo prarasti dėl pardavimų, gamybos ir pristatymo neatitikimų, buvo sumažinti pagerinus santykius su kompanijos vartotojais ir tiekėjais. Geriausių pirkėjų įtraukimas į kompanijos informacinę sistemą (TGV procesas), padidino pardavimų našumą. Kai pirkėjai (didmenininkai), pasiima jiems reikalingas prekes, esančias sandėliuose ir sandėliuose jų nebelieka, arba lieka labai mažai, yra parašomas ir išsiunčiamas užsakymas *platinimo centrams* tik tų gaminių, kurių tikrai trūksta. Platinimo centrai priima užsakymus ir iš karto susisiekia su pristatymo planuotojais. Pastarieji (pristatymo planuotojai) susisiekia su tiekimo planuotojais dėl tų gaminių, kurių reikia, pateikdami jiems reikalingą kiekį ir pristatymo laiką. Tiekėjų įtraukimas į TGV informacinę sistemą yra taip pat svarbus kalbant apie TGV procesą. Pagrindiniai tiekėjai, turėdami priėjimą prie informacijos apie resursų atsargas, informaciją apie jų sunaudojimą per tam tikrą laiką, galėtų iš anksto planuoti savo galimybes pristatyti laiku produkciją kompanijai tada, kada jos iš tikrųjų reikia. Abipusis bendradarbiavimas suteikia galimybę kompanijai iš prekiautojo gauti tiksliausią informaciją apie tai, kokių žaliavų ir kiek jų reikia. Remdamasi esama informacija, pasinaudodama nauju TGV procesu, kompanija sutrumpina atsargų laikymo laiką vidutiniškai 27 %. Taip pat nustatyta, kad:

- Užbaigtų gaminių saugojimo laikas sumažėjo nuo 10 iki 6 dienų (pagerėjo 40 %).
- Medžiagų saugojimo laikas sumažėjo nuo 20 iki 15 dienų (pagerėjo 25 %).
- Žaliavų saugojimo laikas sumažėjo nuo 45 iki 38 dienų (pagerėjo 16 %).

Analizuojant VPT rezultatus buvo pastebėta, kad gamybos paruošimo ir pristatymo trukmė sumažėjo 30% lyginant su situacija, buvusia prieš įvedant naują TGV. Šis patobulinimas taip pat svarbus kalbant apie energijos, kuro, medžiagų, įrangos kaštų sumažėjimą. Paminėtina tai, kad sumažėjo nuostolių dėl gaminių trūkumo, (kompaniją sumažino šį trūkūmą 42 %). Nuostoliai dėl gaminių ir žaliavų nurašymo sumažėjo 45%, nes nauji planai leido daug tiksliau nustatyti žaliavų kiekį, reikalingą gaminant rinkai reikalingus gaminius. Išlaidų sumažinimas nuomojant sandėlius, taip pat yra vienas iš tobulinimų, kuriuos padarė kompanija. Sumažėjo pagamintų gaminių gabenimo į platinimo centrus kaštai (21%). Be šių finansinių rodiklių, buvo nustatyta, kad pagreitėjo bendravimas tarp tam tikrų TGV proceso veiklų; informacija yra daug tikslesnė ir patikimesnė. Tai lemia našesnį, į procesą įtrauktų narių darbą ir pasitenkinimą ekspertų, įtrauktų į kompanijos TGV procesą.

Darbe pateikiamas tyrimas, siekiant parodyti VPP svarbą tiekimo grandinės valdyme. Autoriai bandė paaiškinti pagrindines tiekimo grandinės proceso sritis konkrečioje gamybos kompanijoje taip, kad patobulinimus būtų galima pasiekti naudojant VPP metodus.

Raktažodžiai: *pertvarkymas, proceso tobulinimas, tiekimo grandinės valdymas, Lean įrankiai, VSŽ, GVP.*

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