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Review paper

# JUST IN TIME AND TOTAL QUALITY MANAGEMENT FOR NEED OF ACHIEVING COMPETITIVE ADVANTAGE OF COMPANIES.

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Abstract. In recent decades, great number of companies have encountered drastic changes of business conditions. In such a situation, achieving and maintenance of competitive advantage becomes more difficult. The selection of an adequate strategy and appropriate key factors of success is based on the creation of value for the customers which becomes the essence of achieving permanent competitive advantage. Continuous search for new business ideas and new business systems results in highquality products at the moment when they are necessary, at a price that is acceptable for the customers. With the purpose of producing one such product, it is necessary to eliminate non-value-added activities, reduce, above all, inventories and defects and ensure 100% on-time delivery service. In the course of that process, special role and significance are given to Just in Time (JIT) business system, which changes the cost structure through the reduction of overhead costs, Backflush costing, which rationalizes the procedure of cost tracking and analysis, and total quality management, which ensures high quality of a product through the involvement of all employees and achieving of excellence of each aspect of a company.

Key Words: competitive advantage, Just in Time, Backflush Costing, Total Quality Management.

### INTRODUCTION

Achieving and maintaining competitive advantages within a dynamic and uncertain business environment has become an imperative for modern companies. Mastering specific skills and competences that enable companies to be superior in relation to the com-

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petition contributes to the creation of competitive advantages. Starting from the company's mission, that is, the purpose of existence of a company and its aims, company's management has to select strategic routes of development, that is, those strategies that will help the company in the process of achieving competitive advantage.

Since the global market makes it difficult for a company to achieve competitive advantage, managers are in constant search of new bases of creation of value for the customers. This involves continuous application of high production, information and communication technologies, acquisition of new and improvement of existent knowledge and skills with the purpose of achieving efficiency in production and business in general. Process of creating competitive advantages involves moving and motivating all employees to create value for the customers.

Achieving and maintaining competitive advantages also involves determination of the field of activities that a company performs excellently because this is the only way in which the goals and strategy of a company can be realized. Fields of activities determine the key factors of success that should be efficiently managed within a contemporary, dynamic and unstable business environment. Key factors of success direct and guide activities of management as well as the measurement of business efficiency towards the realization of defined strategy. Time, costs and quality stand for the key factors of success of a company. Production of new products and/or improvement of existent products faster than the competition and the resulting increase of revenues and reduction of costs stand for the basis for achieving key measures of performance of a contemporary company. Measurement of time of realization of activities in a company enables time management with the purpose of achieving the desired competitive position on the market. As a result, programs of quality improvement bring savings. Quality of products and processes, by nature, results in the increase of customers' satisfaction and contributes to the realization of higher revenues and lower costs.

The primary mission of a company is reflected in the satisfaction of customers' requirements. Under the contemporary business conditions customers' needs are quickly changing. For that reason, management's activities have to be concentrated on more efficient satisfaction of those needs. Seen in the long run, the selection of an adequate strategy and consideration of key factors of success enables the creation of value for the end customer, which stands for the basis of achieving competitive advantage. That value involves the production of a product that will be available at the time when it is needed, at a price that is acceptable for the customers, and at a quality that is better than the quality offered by the competition.

In that sense, the first part of the paper will deal with Just in Time business system, which enables the elimination of all types of waste within the business process, particularly inventories and defects, and makes the product available at the time when the customers want it. In addition, the paper will present the basic characteristics of Backflush costing, which efficiently responds to the requirements of Just in Time business system by moving backwards and allocating costs without separate work-in-process account. Finally, the paper will also deal with total quality management, which rests on the management of quality in all phases of business process and rational exploitation of resources with the purpose of achieving competitive advantage.

#### 1. JIT BUSINESS SYSTEM FOR THE NEEDS OF ACHIEVING COMPETITIVE ADVANTAGE

Business system "just in time" started being applied in 1960s in the "Toyota" car factory in Japan. In the starting phases of its development, this system aimed at elimination or reduction of inventories, work in process, finished products and goods, after which its focus spread to elimination of all kinds of business waste. Namely, companies apply JIT business system with the purpose of (Drury, 2002, p. 471):

- elimination of non-value-added activities,
- zero inventories,
- zero defects,
- batch sizes of one,
- zero breakdowns and
- a 100% on-time delivery service.

By realization of the above-mentioned aims, companies manage to perform on-time delivery of high-quality products at the prices that are lower than the prices set by the competition. In that way, companies efficiently respond to customers' growing requirements. JIT system enables the companies to realize the defined goals in an easier way, respond to customers' requirements and maintain and improve their competitive position. Main characteristics of JIT business system refer to the following: (Horngren et al, 2002, p. 858-859)

- Reorganization of the production process by grouping of products with similar production requirements into families of similar products that are created in a specific production "cell" and by grouping of different types of machines that are used in the process of production. Necessary machines are set in a row, according to the schedule of performance of different operations that are necessary for the process of production. Material and components of a product are moved from one machine to another while at the same time conversion time and material handling costs are reduced and work-in-process inventories are eliminated.
- Engagement and keeping of employees that possess knowledge and skills that are needed for carrying out various operations and tasks. Within the process of "cell" production, employees have the access to a great number of machines. Employees at all levels have to be trained and well-organized so that they could perform operations that precede and follow their duties, which include minor modifications as well as routine equipment maintenance.
- Business in accordance with the system of Total Quality Management (TQM) with the purpose of elimination of defects. Due to a close relationship between different phases within the production process and zero or minimum inventories in each phase of production process, appearance of defects in just one phase would affect the realization of the following phases within the production process. JIT involves prompt problem solution and elimination of the causes of defects within the shortest possible period of time. The emphasis is placed on preventive maintenance and performance of an operation "properly at the first attempt". Defective pieces or machine defects stop the process of production under conditions characterized by zero or minimum inventories. Defective pieces stop the production process and require conversion and finishing, which results in late deliveries. By accepting the programs that raise awareness of the quality, great number of companies that apply JIT business system reduce defects and increase the quality of their products.

The emphasis is on the reduction of time necessary for the production preparation, as well as the production "lead" time. Production preparation time stands for the time that is needed for the adjustment of equipment, tools and materials that are necessary for the production of components or products. Long preparation makes the production of series of small number of products uneconomical, while the production of series of great number of products results in increase of inventories. JIT aims at reducing or even eliminating the production preparation time. In case the preparation time approaches zero, production of series of small number of products becomes more economical. At the same time, this results in the reduction of inventories. Production "lead" time stands for the time between the start of the process or activity and appearance of the results of that process or activity. Reduction of production "lead" time enables the company to respond to the changes in customers' requirements on time.

 Careful selection of suppliers who are ready to deliver the needed amount of highquality raw materials and materials on time.

JIT functioning rests on "the production and delivery of products at the moment when they should be sold; assemblies are produced when they should be assembled; parts are produced at the moment when they should be assembled into assemblies and subassemblies while material is supplied at the moment when parts should be produced" (Markovski, 1993, p.10). In other words, suppliers deliver material at the moment when it is needed for the production process, parts are finished at the moment when they should be assembled into finished goods and finished goods are completed when they should be delivered to the customer. Small number of companies succeed in realizing the concept of doing business without inventories consistently. Nevertheless, the very attempts of companies to put this concept into practice result in the reduction of inventories to insignificant or acceptable level and improvement of business.

JIT business philosophy resulted in "pull" production system (Drury, 2002, p. 472). Due to the grouping of machines into production "cells", moving of materials among operations is reduced to minimum. Efficient functioning of "pull" production system involves the existence of signaling systems with the help of which production and moving of pieces from one location to another are allowed. Signaling mechanism involves the use of the so-called "kanban" containers, which serve the purpose of moving materials or components from one work center to another. Kanban containers contain materials and components that should be converted and they are placed between machines. Employee at the first machine performs the conversion of materials or components and places the converted pieces into a container until it is full. Production is temporarily interrupted and starts again when the employee at the second machine takes the part from the full container. This enables smooth production flow with temporary interruptions within separate work center inside the "cell". In case of temporary interruptions, employees can use this period of time for preventive machine maintenance, which is a solution that is better than the accumulation of inventories and that prevents the machine's idle time. "Pull" production system is very sensitive to interruptions in all of its parts. Problems that appear in any part of the system immediately interrupt the entire production process. Work centers at the earlier stages do not receive the "pull" signal, whereas the work centers at the later stages do not answer the "pull" signal (Drury, 2002, p. 472). With the purpose of continuing the production process, it is necessary to solve the arising problem immediately.

One of the significant prerequisites for efficient functioning of JIT business system is the redesigning of relationships with the suppliers. Managers' belief that the engagement of more suppliers of raw materials and materials that are necessary for the production process as well as the increase of competition among them will ensure lower prices is not sustainable under the JIT business conditions. Supply of needed quantity of materials from different sources requires realization of additional activities related to the control of each delivery in relation to its quality and quantity and consequent increase of costs. In addition, it is difficult to ensure timely supply of the needed quantity of materials at the moment when the materials are necessary for the production process in coordination with several different suppliers. Under the conditions of JIT business system, companies establish relations by signing long-term contracts with limited number of reliable suppliers who are ready to adopt the philosophy of total quality management and who are ready to perform more frequent deliveries of small quantities of high-quality products at favourable prices. By establishing relations with one supplier or small number of suppliers, companies realize significant cost saving. The case is such due to the fact that companies order high quantities, which is why they get a discount and purchase at lower prices. In this situation, transport costs are reduced as well, due to the fact that suppliers enter into long-term agreements with carriers (Mc Watters et al, 2001, p. 436). Cost savings also occur on the basis of reducing the costs of ordering and reducing the costs of elimination of activities as well as on the basis of reducing the costs of quality control since suppliers do business following the principles of total quality management.

# 1.1 Performance measurement for the needs of selection of reliable suppliers – prerequisite for the application of JIT business system

Management accounting involves the system of performance measurement which is in accordance with contemporary business conditions. Within this system, special focus is placed on suppliers' performance measurement (Burch, 1994, p. 512-516). Suppliers' performance measurement significantly helps the companies that apply JIT business system in the process of selection of suppliers with which they will cooperate. With the help of certification programs, companies perform the selection of suppliers. Suppliers are evaluated on the basis of their quality, price and time of delivery of requested raw materials and materials. Companies enter into long-term agreements with certified suppliers, while non-certified suppliers are classified into acceptable, trial and unacceptable groups of suppliers. Certification programs enable companies to reduce the number of suppliers. For example, Xerox managed to reduce the number of suppliers from 5.000 to 400. In addition, this company involved the suppliers in the process of product design, provided them with specifications and informed them about production plans. All this resulted in the reduction of product costs by 10% per annum and reduction of waste by 93% (Burch, 1994, p. 512).

Suppliers' performance measurement can be financial and non-financial. Financial measurement of the suppliers' performances reveals all unnecessary costs that were incurred due to a supplier's bad organization concerning quality and delivery plans. The company also tracks and analyzes all the supplier's deliveries within a specific time period. Furthermore, the company files late deliveries and deliveries of raw materials of inappropriate quality which result in non-value-added activities such as waste examina-

Total

Total costs of supplied raw materials

tion and filing, finishing, activities related to the material that was supplied too early or too late and the like. Working hours spent on realization of these activities are valued at costs per working hour with the purpose of calculating the total costs of realization of non-value-added activities. These information are used for determination of supplier performance index (SPI), on the basis of which the company classifies and performs the selection of suppliers. The example of hypothetical company will serve the purpose of illustrating the process of classification and selection of suppliers with the help of SPI (Adapted from Burch, 1994, p. 512-513). Within this company, non-value-added activities, working hours spent on realization of these activities, costs amounting to 50 RSD per working hour and total costs of supplied raw materials amounting to 36.000 RSD were identified. All this is illustrated in Table 1.

Non-value-added activity Working hours Costs per working hour (50 RSD) Waste examination 0,6 30 Waste filing 0,2 10 Finishing in a company 6,0 300 Early supplied material 5,0 250 Late supplied material 10,0 500 Material surplus 2,0 100 5,0 Lack of materials 250

28,8

1.440 36.000

**Table 1.** Financial measurement of suppliers' performances

On the basis of the provided data, supplier performance index (SPI) can be calculated. It can be done according to the following formula: (costs of supplied raw materials + costs of non-value-added activities) / costs of supplied raw materials. In case the supplier delivers products of appropriate quality on time, costs of non-value-added activities will equal zero while supplier performance index will equal one. Index higher than one will point to the fact that the supplier failed to align the delivery with the company's requirements. In case the SPI ranges in the interval from 1,02 to 1,04, the supplier can be classified as acceptable. SPI above 1,04 points to the fact that the supplier is unacceptable. The supplier gets the certified status in case the SPI is close to one over a longer period of time. In our example, SPI amounts to 1,04 [(36.000 din. + 1.440 din.) / 36.000 din.], which means that the supplier is on the border of acceptability and that he has the status of trial supplier.

Companies that apply JIT business system aim at doing business with small number of reliable suppliers on whom they could rely in relation to quality and delivery time. In this situation, the price is not crucial. The supplier can get the certified status even if his prices are higher than those set by the competition in case he surpasses them by non-financial measures of performances. Non-financial measurement of suppliers' performances is based on quality, delivery time, simplicity and the like.

Measurement of performances regarding quality focuses on the evaluation of suppliers' abilities to deliver high-quality raw materials. This is expressed by the percent of

acceptability, which is calculated by determining the ratio of a number of accepted parts to a number of delivered parts. In case the supplier delivers 1.000 parts, among which 90 parts do not satisfy the company's requirements regarding quality, percent of acceptability amounts to 91% (910 accepted parts: 1.000 delivered parts). In case the company's aim is to reach the percent of acceptability that will amount to 99%, which will mean that 10 parts of inappropriate quality will stand in relation to 1.000 ordered parts, the supplier will be classified into the category of unacceptable suppliers.

Measurement of performances regarding timely delivery focuses on the ability of suppliers to deliver raw materials at the right time, neither too early nor too late. Early deliveries result in unnecessary accumulation of raw material inventories and increase of costs of their storage and it is known that JIT business system aims at doing business without inventories or at reducing them to a reasonable level. On the other hand, late deliveries result in the interruptions within the production process, which occurs due to the lack of raw materials. In addition, late deliveries increase the "lead" time of production, result in accumulation of work-in-process inventories, disable timely delivery of finished goods to the customers, increase costs and the like.

Measurement of performances regarding simplicity of suppliers is expressed by the number of suppliers per unit of raw material and the number of orders per unit of raw material. Great number of suppliers results in more orders and material handling activities.

By the application of the above-mentioned financial and non-financial measurements of performances, companies are in a position to track all deliveries of the suppliers over a certain period of time. Moreover, they are in a position to create the separate database for each supplier, on the basis of which valid profile of suppliers' performances can be determined.

#### 1.2. Backflush costing – system of costing in accordance with JIT business system

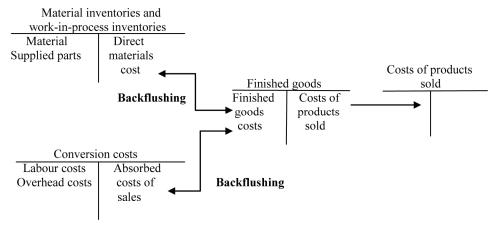
When consistently applied, JIT business system significantly simplifies costing. JIT affects the changes in cost structure and the character of certain types of costs. Overhead costs are reduced due to the elimination of activities related to the supply, storage, handling and control of materials. Overhead costs that are related to the realization of activities of machine preparation, preventive maintenance and quality control become direct costs of a worker trained to operate at several different machines within "cell" production.

Work-in-process inventories are kept for a short period of time, which is why less attention should be paid to evaluation of partly finished goods. Lack of material inventories, work-in-process inventories and finished goods inventories or the reduction of these inventories to a minimum reduces the number of accounting changes.

New system of costing that was conceived with the purpose of responding to the requirements of JIT production system is called Backflush costing (For more information about this costing, see: Antić et al, 2011, p. 1019-1029). It is also known as "delayed costing" or "post-deduct costing". This costing system significantly simplifies costing, which saves time and efforts. At the same time, it reduces the possibility of the occurrence of costing errors.

Backflush costing focuses on the output and then it moves backwards and allocates costs between the sold products and inventories without separate work-in-process account. Zero or minimum inventories simplifies costing procedures by direct charging of all costs to the account of "Costs of products sold". In case there are some inventories at

the end of the period, part of the period costs that were originally charged to the account of "Costs of products sold" is deducted and charged back to the appropriate accounts of inventories. In case there are work-in-process inventories, they are valued at the end of the costing period for the purposes of external reporting. Schematic diagram of Backflush costing is shown in Figure 1.



**Fig. 1.** Schematic diagram of Backflush costing Source: Mc Watters, Ch., Morse, D., Zimmerman, J., 2001, Management Accounting, McGraw-Hill, New York, p. 438.

Basic characteristics of Backflush costing as shown in Figure 1 are the following (Mc Watters et al. 2001, p. 438):

- One raw materials and in-process materials inventory account (RIP) is used.
- No separate work-in-process account exists, and work-in-process tracking is eliminated
- Raw materials and purchased parts issued to production are charged to RIP.
- One account for labor and overhead costs (conversion costs) exists for each JIT flow line.
- Material costs are charged directly to products.
- Conversion costs are assigned based on machine or throughput time directly to the finished goods inventory account (FG).
- When units are completed, RIP is reduced by material costs, and FG is charged for the materials.

#### 2. TOTAL QUALITY MANAGEMENT – BASIS FOR ACHIEVING COMPETITIVE ADVANTAGE

Under the conditions when the world is becoming a big and global market, traditional classification into local, regional and national market is becoming less relevant and companies are facing fierce competition that offer high-quality products at low prices. Under such conditions, quality stands for the important factor of success. Having in mind the significance of the quality for efficient business of companies under changed business

conditions, it is necessary to define what quality means. Customers may regard high-quality products as products made of special materials, products made by application of special procedures, long life products, reliable products, products of particular brand, luxury products or products that contain all these features. In that sense, quality does not stand for an absolute but for a relative category.

In a situation in which high-quality products were obtained by the control and modification of already finished goods, the companies linked the improvement of quality with increase of costs and reduction of profitability. With the purpose of protecting from defects caused by the production of low-quality parts during previous phases of production, companies accumulated inventories in each phase of production. Contemporary approach to quality management involves ensuring of quality before the start of the production process and providing customers with post-production services. Creation of high-quality products requires coordination of work of all employees, including direct producers as well as top management. Quality of products, services and all business processes becomes a paradigm of competitiveness. In that kind of situation, not only the quality of products and services should be taken into consideration, but also the quality of all business processes. Companies adopt programs that raise awareness of the quality, which enables them to reduce the rate of defects, inventories, increase quality, respond to customers' requirements efficiently and reduce costs.

Over time, quality management evolved from quality inspection and control, via quality assurance to total quality management (Todorović et al. 1997, p. 492). Inspection represented the simplest way for ensuring quality and was carried out by comparing and checking the product's characteristics with regard to defined requirements. This quality inspection failed to provide satisfactory results due to the fact that it was based on the inspection of already finished goods. The next phase, quality control, focuses the quality management on the revealing and elimination of causes of defects rather than on the control of already finished goods. Quality assurance means that the quality control is carried out through planning and systematic activities. In this situation, quality control does not only refer to the production phase but to the phases of design, development, installation and servicing of a product. Experience of world companies' numerous and various approaches in this field was rationalized and shaped into series of standards ISO 9000. During the 1980s, quality management principle started being applied in all aspects of doing business, which resulted in the concept of total quality management (TQM). The word total expresses the idea that all employees at all positions and levels within an organization aim at quality; the word quality suggests the excellence of each aspect of organization; the word management points to the fact that what is aimed at is the quality as the result of the process of quality management (Todorović et al. 1997, p. 493).

Total quality management is based on the following principles (Novićević et al, 1999, p. 5):

- Focus is on the satisfaction of various and more refined needs of the customers,
  - Focus is on the processes and their continuous improvement,
  - Best way for achieving quality is through the management of all activities in the value chain,
  - Focus is on prevention rather than on the control at the end of the production process,
  - Each individual should be involved in the process of quality improvement and should be responsible for the quality of his or her work,

- Processes can be improved and high quality can be achieved only by team work,
- Decision making should be based on reliable and relevant information,
- Company should cooperate with those suppliers who are able to provide high-quality inputs,
- Focus is on cost reduction,
- Quality assurance is a permanent process,
- Customer is the one who determines quality and not the producer.

With the purpose of company's efficient response to the customers' requirements regarding quality, it is necessary to devise the system of measurement of quality performances. Common measures of quality performances refer to the suppliers' abilities to deliver high-quality raw materials, product design, quality of business processes, quality of provision of services to the customers and the like. Measurements can be financial and non-financial. Relevant financial measurement will ensure that the quality is maintained at the desired level and will create solid basis for defining non-financial performance measures. Non-financial performance measures can be classified into internal and external (Blocher, str. 764). With the purpose of satisfying the customers' needs, managers have to take into consideration the internal dimension of quality on which they must focus. Non-financial measures of internal performance which serve as indicators of quality are the following: number of defects for each production flow line, process output (ratio of quality output to total output), employee turnover (ratio of a number of employees who left the company to a total number of employees) and the like.

External performance measures refer to the measurement of customers' satisfaction. Some companies use a number of delivered product units of inappropriate quality as the percent of total delivered product units, number of customers' complaints, index of full order realization, rate of timely deliveries and the like (Horngren et al, 2002, p. 812).

#### CONCLUSION

Contemporary business environment is characterized by numerous and dynamic changes within a company and its environment. Achieving and maintaining competitive advantage in such business environment becomes the prerequisite and the assumption of existence, growth and development of a company. With the purpose of becoming the leader on the market, the company has to start from the mission and its defined strategy. Analysis of environment and understanding its needs, analysis of the competition, listening to the growing and changing requirements of the customers and the like are some of the prerequisites for achieving competitive advantages. In that process, special attention is given to time, costs and quality. Aspiration towards satisfaction of more refined requirements of the customers forced the managers to conceive and find new business systems and new ways of costing and cost management that would facilitate business and ensure the creation of permanent competitiveness. Some of those systems are: Just in Time business system, Backflush costing and Total Quality Management.

"Just in Time" business system emerged in the 1960s as the aspiration towards the reduction of material inventories, work-in-process inventories and finished goods inventories. Elimination of non-value-added activities, zero inventories, zero defects as

well as 100% on-time delivery service are some of the characteristics of this system. Establishment of partner relations with suppliers is the prerequisite for the functioning of JIT system. By networking with the suppliers, companies try to realize significant cost savings and reduce the time of delivery of a product so that it could be available at the time when it is needed.

Application of "Just in Time" business system significantly simplifies costing. Cost structure and the character of certain costs change with the purpose of elimination of activities that are unnecessary in the process of production. This provides a solid basis for the application of backflush costing. By focusing on the outputs, backflush costing allocates costs between the sold products by charging all costs to the account of "Costs of products sold".

Over time, quality management evolves from the quality control to the quality assurance and total quality management. Quality assurance involves planning and systematic activities that refer to the production of a product as well as to the management of quality in the course of preproduction and postproduction phases.

Achieving and maintaining competitive advantages under contemporary business conditions depends on the company's abilities to search continuously for new ideas and resources. Placement of a product faster than the competition at the time when the market needs it and at a price that is lower than the competition's is achieved by the combination of resources and adequate resource management. This enables creation of higher value for the customers at the same or lower costs, which finally results in the realization of the defined strategy and achieving of permanent competitive advantage.

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# POSLOVANJE "JUST IN TIME" I UPRAVLJANJE UKUPNIM KVALITETOM U CILJU POSTIZANJA KONKURENTNE PREDNOSTI PREDUZEĆA

## Ljilja Antić, Bojana Novićević

Poslednjih decenija mnoga preduzeća se suočavaju sa drastičnim promenama u uslovima poslovanja. U takvim uslovima postizanje i održanje konkurentskih prednosti postaje znatno teže. Izbor adekvatne strategije i odgovarajućih faktora uspeha bazira se na stvaranju vrednosti za kupce koja postaje suština postizanja konkurentskih prednosti. Kontinuirano traganje za novim idejama i sistemima poslovanja obezbedjuje proizvode visokog kvaliteta u trenutku kada su potrebni i po ceni koja je prihvatljiva za kupce. Da bi se takav proizvod proizveo neophodno je eliminisati aktivnosti koje ne dodaju vrednost proizvodu, smanjiti, pre svega, zalihe i defekte, kao i obezbediti 100 % provovremenu isporuku. U tom procesu posebnu ulogu i značaj imaju sistem poslovanja "tačno na vreme" (Just in Time), koji menja strukturu troškova kroz smanjenje opštih troškova poslovanja, Backflush obračun troškova, koji racionalizuje postupak praćenja i analize troškova i upravljanje ukupnim kvalitetom (Total Quality Management), koje vodi obezbedjenju visokog kvaliteta proizvoda kroz uključivanje svih zaposlenih i postizanje izvrsnosti svakog aspekta preduzeća.

Ključne reči: konkurentska prednost, Just in Time, Backflush Costing, Total Quality Management.