ADOPTION OF THE BALANCED SCORECARD APPROACH TO MAKE-TO-ORDER MANUFACTURING

Anna Saniuk, Sebastian Saniuk, Krzysztof Witkowski

INTRODUCTION

For many years, contemporary enterprises have focused a large part of their attention only on financial efficiency. Very advanced financial assessment systems have been applied, through which companies have focused primarily on ensuring a high return on investment (ROCE). However, it appears that for many of these companies, ROCE, while increasing ROI, reduces the potential for growth, which is not conducive to the long-term development of the company [23], [3]. Emphasis on the systematic achievement of high, short-term financial results enforces limiting exploration of sources of future growth and may cause a reduction in spending on development of new products, process improvement, staff development, information technology, database, systems, and the development of customers and markets. Financial measures only partly describe the activities carried out in the past and do not give adequate guidance as to what action to take today and tomorrow to create future economic value [12, p. 53-54], [14, p. 73].

The external environment of enterprises is constantly changing and they need to adjust their strategy and strategic goals to the changing conditions of company functioning. Many companies have observed that a reactive policy for dealing with increasingly challenging environmental issues is not enough [1], [4], [20]. The success of enterprises depends more often on factors which cannot be measured by means of financial metrics (e.g. the relationship with the client, rich and well organized network of suppliers, etc.) [7], [9], [21]. A financial system of measuring efficiency in such conditions is no longer efficient, and indeed prevents monitoring the implementation of the strategy [10].

In make-to-order manufacturing, fast, efficient and professional customer service, verification of orders based on accurate data from the production system, taking into account the strategic objectives of the company, etc. very often dictates the success of the company. These types of processes can only be measured and evaluated using non-financial indicators. The verification process of production orders is one of the most important processes in make-to-order manufacturing. Taking too many orders may cause delays in implementation and contractual penalties, whereas taking too few orders results in unused system capacity, and the costs of lost opportunities. A key element of enterprise success is a well prepared verification method for production orders and continuous monitoring and control of all business processes in the enterprise.

Balanced Scorecard (BSC) is a tool which enables the company's Board of Directors effective implementation of the strategy. The role of non-financial indicators in BSC is particularly important. These indicators are often omitted in traditional budgeting [18]. A business must take into account the performance measures of both the financial aspect and non-financial aspect. Key performance indicators (KPI's) allow effectiveness and efficiency of all business processes to be measured [10].

In this paper it is proposed that the Balanced Scorecard approach is implemented in make-to-order manufacturing. The application of key performance indicators (KPI's) can be used to connect an enterprise's strategy and strategic goals, established in the four different perspectives of finance, customer, internal processes, and learning and growth, with monitoring and control of business processes during order realization and conditions which have to be fulfilled for the production order to be realized in the production system. This solution can improve a decision-making process for accepting production orders for realization. A

set of production orders which allow the enterprise strategy to be achieved can be chosen.

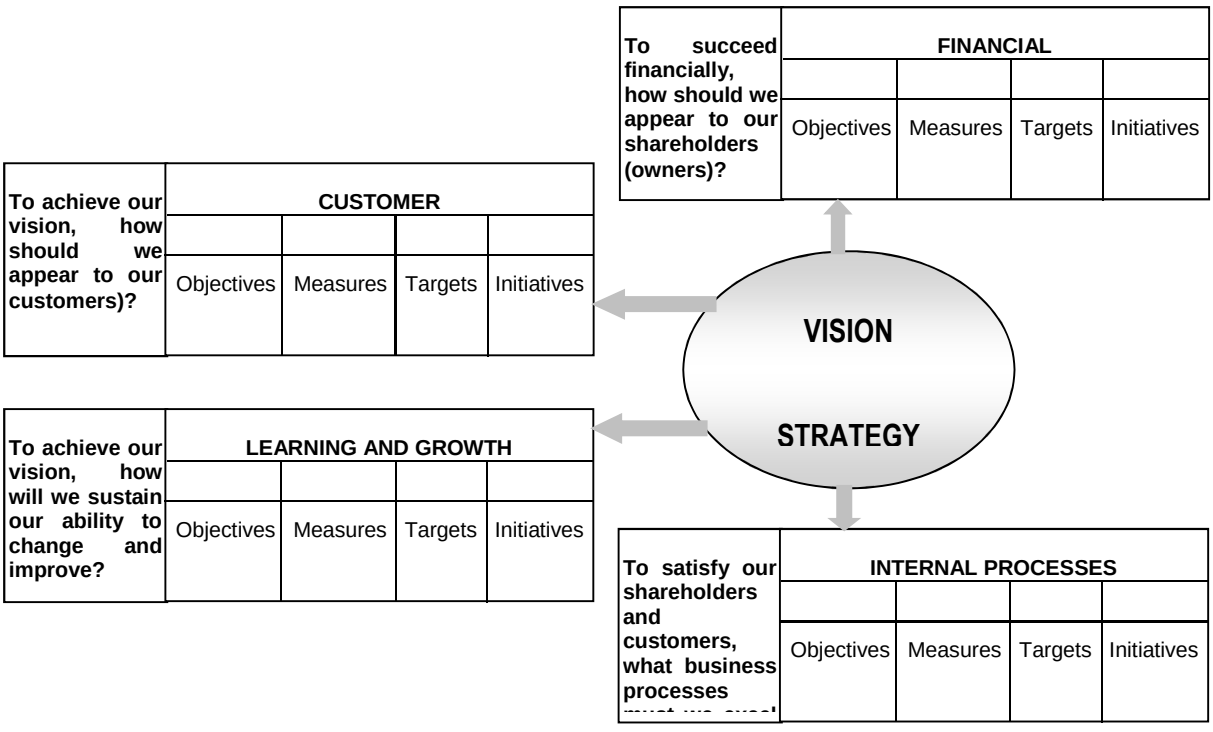
1. THE BALANCED SCORECARD CONCEPT

The Balanced Scorecard is a concept introduced by R. S. Kaplan and D. P. Norton as a strategic performance management system [13]. The main idea of BSC is to provide a structure of performance measures in different perspectives for focused and effective strategy management. BSC retains traditional financial measures whilst also allowing the creation of future value through investment in customers, suppliers, employees, processes, technology and innovations, showing long-term and short-term measures simultaneously. It can help to translate visions and strategies into an integrated set of performance and action. The structure provides managers with a complete and effective control tool for strategy realization [10], [13].

The Balanced Scorecard should be developed after the formulation of strategy and before the specification of actions to implement it. At this stage, the executive team has to address the many problems that may occur and delay or completely cease the implementation of the strategy. BSC is often called a "missing tool" for the strategic management process.

BSC measures organizational performance across four perspectives: financial, customer, internal processes, and learning and growth (fig. 1). Each of them should be determined by the strategic objectives, measures, specific objectives and activities [5], [6], [13].

Fig. 1: The structure of the Balanced Scorecard



Source: [13]

The financial perspective shows how the company should be perceived by owners (i.e. shareholders). It is an essential element of the construction of the Balanced Scorecard because the defined level of return on investment is the most important objective of the manufacturing enterprise's functioning. The other perspectives should contribute to the implementation of the financial perspective's

objectives. There are two main mechanisms for the implementation of the financial strategy: to maximize revenues and productivity. The perspective of the customer shows how the enterprise should be seen by customers. The internal processes perspective determines which processes should be improved to measure up to the expectations of clients and owners. In the perspective of lifelong learning and growth, ways to create the potential for change and improvement in the enterprise in the future should be sought. The potential here is understood to mean the intangible infrastructure, i.e. employees, organization of information systems, culture, etc.

Conventional management does not cover all the perspectives. Most often, the learning and growth perspective has not been emphasized for long-term performance. The measure of this perspective could strongly affect the internal processes perspective and therefore affect the financial perspective. [10].

BSC is usually treated as a controlling system or strategic management system. However, there is also the so-called functional approach, the result of which is the multiplication of perspectives in BSC. Additional perspectives include: marketing perspective, technological perspective, innovation perspective, ecological perspective, etc. [15], [8], [11].

Current developments do not only include functional trends. In recent years, there is also a combination of two trends of assessing the effectiveness of enterprises. The first trend is based on the controlling school of thought, which uses the following methods: Cover Account Margin, budgeting, Activity-Based Costing Management and Time-Driven Activity-Based Costing [11]. The second trend is based on the concept of Total Quality Management. Measures used in this approach are mainly non-financial contributions and relate directly to the processes. This approach was presented by O. Wolter in the book "TQM Scorecard" [22].

Increasingly important is also the indicative approach for constructing integrated measurement systems, which clearly marks the Balanced Scorecard model as a management control system, sometimes called the "management control" [11].

2. BUSINESS PERFORMANCE MEASUREMENT IN MAKE-TO-ORDER MANUFACTURING

Nowadays, the external environment changes very quickly. Thus, companies must respond and adapt their strategy to market conditions at the same pace to guarantee the development of their organizations. It means that very often new strategies are not implemented or business processes are not realized with the same quality. Monitoring and control of business processes is needed in the present situation. Enterprises should constantly measure and assess performance of business processes and control the realization of strategy changes [16], [17].

BSC concentrates on two main areas: realization of the strategy of the enterprise and monitoring of results as a measurement system. In this paper another practical application of BSC is suggested. Enterprises operating make-to-order manufacturing can apply BSC not only for linking the strategy of the enterprise with operational planning, and for measuring the level of strategy realization, but also to develop conditions, which are investigated during production order verification. KPI's allow business process performance to be measured and expected levels of key performance indicators to be taken into consideration for the verification of production orders. KPI's can link the strategy of the enterprise with a decision-making process concerning production order acceptance, operational planning of order realization, and order realization, which is presented in Fig. 2.

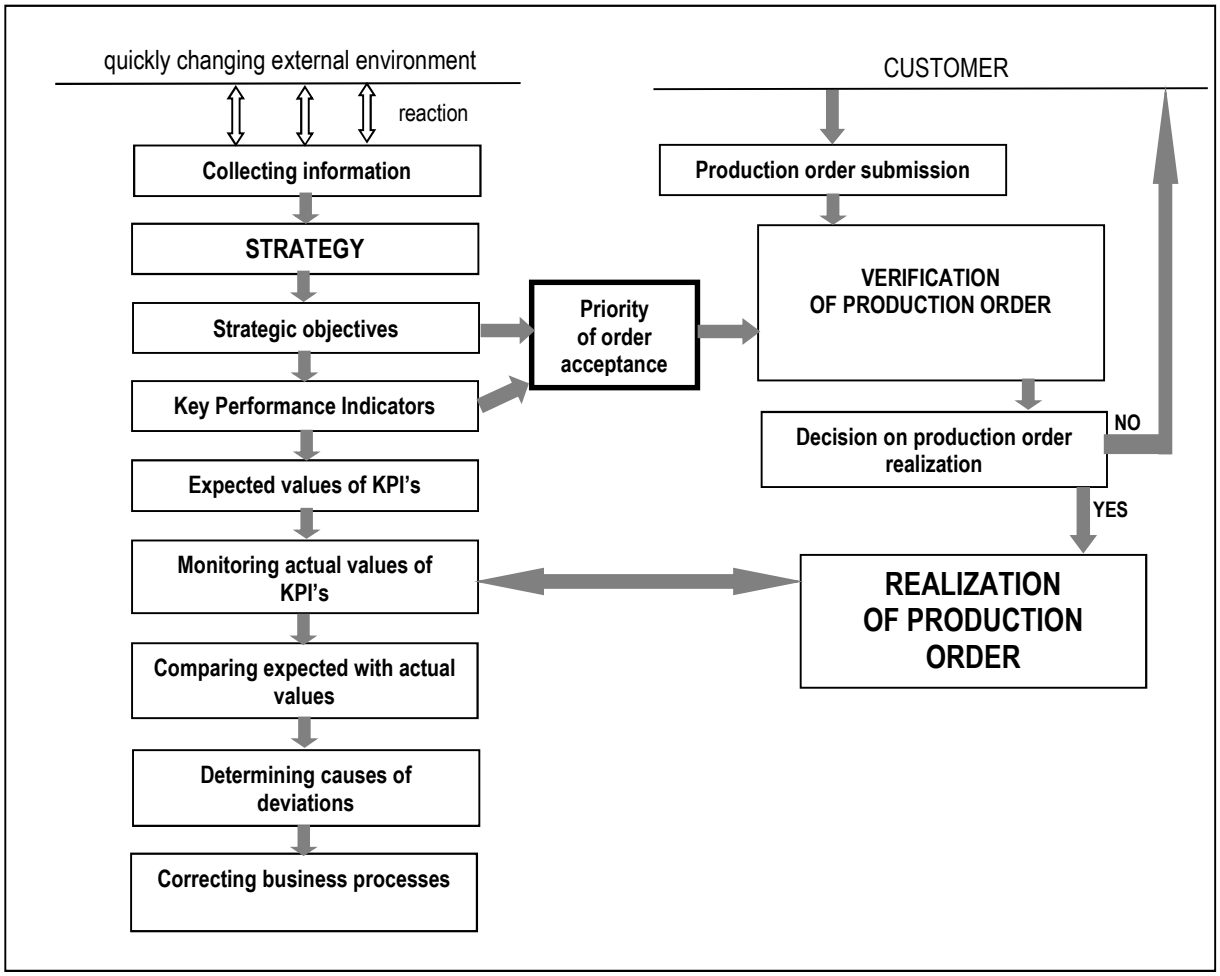
The proposed approach based on BSC for make-to-order manufacturing consists of ten steps:

1) collect information concerning changing environment and reaction(s);
2) clarify and translate vision and strategy;
3) determine strategic objectives in four perspectives;

4) determine key performance indicators (KPI's) for each strategic objective;
5) determine expected values of all KPI's;
6) monitor actual values of KPI's;
7) compare actual values with expected values of KPI's;
8) determine causes of deviations;
9) correction of business processes;
10) consider performance measurement in verification of production orders and a decision-making process about production order realization.

First, the company should design a system which can collect and analyse information concerning the changing external environment. A well designed information system is needed [2]. Then, the enterprise should clarify and define its vision and strategy. Most importantly, it is necessary to analyze an organizational chart, for deliverers and suppliers, key success factors and other strategic analysis.

Fig. 2: Scheme of adoption of BSC in make-to-order manufacturing



Source: own work

Next, strategic objectives in four perspectives: financial, customer, process, and learning and growth, are established. At this point, a strategy map can be designed. An example of a strategy map is presented in Fig. 3. The strategy map illustrates how strategic objectives are connected with cause-effect compounds leading to the implementation of the strategy, and shows how the implementation to one perspective (the cause of) affects the

achievement of the aim in the next term (effect) [19].

Building of the strategy map starts from the financial perspective, which is the long-term goal of the company. It can be measured using a variety of indicators. Most commonly applied are: the size of income, indicators of profitability as well as shareholder value [19]. According to Kaplan and Norton enterprise financial strategy can be realized by two levers: increasing revenue, and productivity growth [12]. Revenue growth can be obtained through new sources of revenue (e.g., new products, new customers, new markets, etc.) or by increasing the value of revenues from currently supported clients (e.g. creating new needs and their satisfaction, deepening customer relationships, offering new products to existing customers, etc.). Productivity growth strategy is based on the assumption that financial effects can be achieved by reducing costs or optimizing the utilization of assets held. Therefore, the strategy to improve productivity relies on the following:

- reducing direct or indirect production costs, improving the structure of expenditure,
- increasing efficiency in the use of assets held by minimizing the size of working capital as a result of raising the efficiency of operational processes.

Setting objectives in the perspective of the client is subject primarily to the type of customers and their needs. A company must determine what constitutes value for the customer, which consists of a description of the products, prices, relationships, self-image, and other unique attributes [19].

In step four, key performance indicators for each strategic objective are determined, along with expected values of indicators. 4-6 of the most significant factors for each strategic objective should be determined and then the indicators which can measure this factor must be defined. Definition of too many factors and indicators means that business processes are not easy to control and monitor.

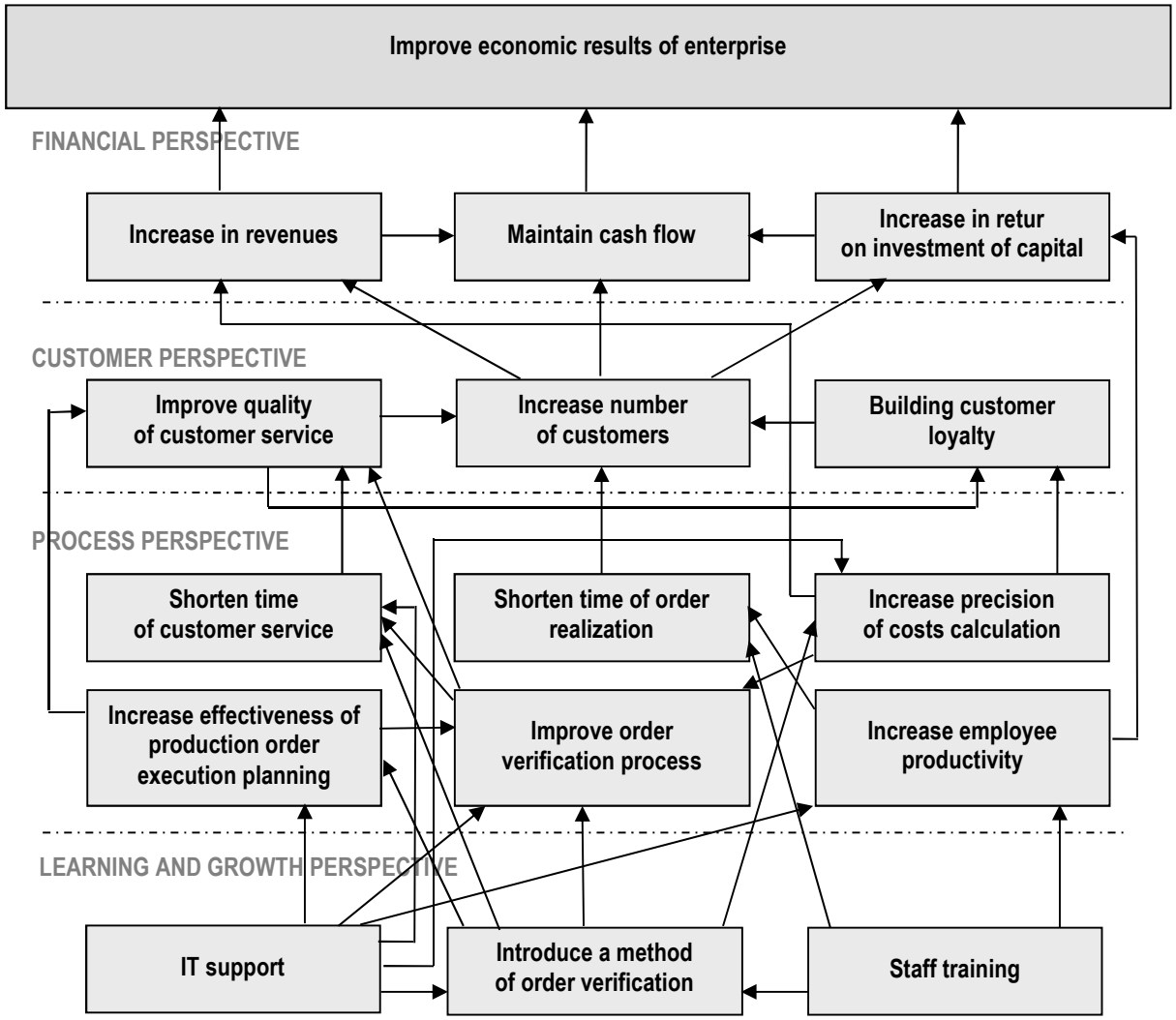
A production order acceptance process plays a key role in make-to-order manufacturing. The success of this kind of enterprise very often depends on conditions which are determined during the negotiation with a customer. The speed of decision, quality of information and speed of information processing very often decide the quantity of orders realized in the production system. This process can only be measured using non-financial indicators.

The next step relies on formulating the expected values of KPI's. The enterprise managers should be informed what values of KPI's guarantee realization of the strategy in the defined time.

Then, an enterprise must control and monitor strategy realization. Actual values of KPI's are tested and compared with expected values of KPI's. Causes of deviations should be carefully identified. A plan of business process correction must be defined according to them.

The main part of the proposed new approach is considering performance measurement in the verification of production orders and a decision-making process concerning production order realization. It is suggested that indicators are determined, which are called "priorities". Priorities are indicators which have the highest significance for the enterprise's strategy realization. Checking of priorities helps to choose a set of orders to realize which best fulfils the most important assumptions of the company strategy. This solution allows strategy realization to be commenced, beginning from the decision-making process concerning order acceptance.

Fig. 3: The strategy map



Source: own work

CONCLUSION

The proposed approach allows the long-term strategy of a company to be linked with the daily decision-making process concerning order realization. It guarantees verification of production orders based on the indicators which help the strategy to be realized in the company.

A decision-making process for production order acceptance plays a key part in an enterprise with make-to-order manufacturing. Contracts with clients are concluded before production order realization, which means there is a need for highly detailed monitoring and control of business processes and a significant role of the verification process.

The Balanced Scorecard approach helps to measure performance of business processes and improve their monitoring and control. Key performance indicators help to guarantee an appropriate degree of product quality, execution time and costs of orders and also allow the re-planning of strategic objectives. Furthermore, KPI's can be used to support a decision-making process concerning acceptance and execution of production orders.

BIBLIOGRAPHY

[1] BABČAN, M., VIDOVÁ, H., BABČANOVÁ, D. Logistics and its impacts to environment. In: *Environmental Economics, Policy and International Environmental Relations*: Proceedings 12th Annual International Conference of PhD. students, young scientists and researchers. Prague, October 11-12, 2010, Prague: University of Economics, 2010, p. 56-62.

[2] BASL, J., BLAZICEK, R., *Podnikove informacni systemy: podnik v informaci spolecnosti*, Praha: Grada Publishing, 2008, p. 283. ISBN: 978-80-247-2279-5

[3] BRAGG S. M., *Wskaźniki w analizie działalności przedsiębiorstwa*, Oficyna Wolters Kluwer Business, Warszawa 2010, s. 8-13.

[4] ČAMBÁL, M. HOLKOVÁ, A. LENHARDTOVÁ, Z. *Základy manažmentu*. First Edition. Trnava: Alumni Press 2011, p. 195, ISBN 978-80-8096-138-1.

[5] CEBECI, U., Fuzzy AHP-based decision support system for selecting ERP systems in textile industry by using balanced scorecard, in: *Expert System with Applications*, Vol. 36, Issue 5, July 2009, pp. 8900-8909.

[6] DVORAKOVA, L., HOROVA, M., Integrace udrzitelnosti do financniho rizeni podniku a jeji vliv na hodnoceni vykonnosti podniku, w: *Aktualne Problemy Podnikovej Sfery*, Vydavatelst'stvo EKONOM, Bratislava 2012, s. 80-85.

[7] EDL, M., KURKIN, O., The product Lifecycle Management, In: *Innovations in Information Management Systems,* (ed. A. S. Saniuk), Monograph, University of Zielona Góra, Pixel, 2011, p. 30-43, ISBN: 978-83-933843-0-3

[8] ENGELHARDT, C., *Balanced Scorecard in der Beschaffung*, Carl Hanser Verlag Munchen, Wien, 2002, s. 64.

[9] HRABLIK CHOVANOVÁ, H., SAKÁL, P. *Operačná analýza časť* I, First Edition. Trnava: AlumniPress 2011, p. 242, ISBN 978-80-8096-151-0.

[10] HSU, Y.-L., LIU, C.-C., Environmental performance evaluation and strategy management using balanced scorecard, in: *Environ Monit Assess*, Springer 2012, Vol. 170, pp. 599-607.

[11] JABŁOŃSKI, A., JABŁOŃSKI, M., *Strategiczna Karta Wyników (Balanced Scorecard) Teoria i Praktyka*, Difin, Warszawa 2011, s. 22-24.

[12] KAPLAN, R. S., NORTON, D. P., Strategiczna karta wyników. Jak przełożyć strategię na działanie?, PWN, Warszawa 2001.

[13] KAPLAN, R. S., NORTON, D. P., Linking the Balanced Scorecard to Strategy, in: *California Management Review*, Fall 1996, Vol. 39, pp. 53-79.

[14] PORTER, M. E., Capital Disadventage: America's Failing Capital Investment System, in: *Harvard Business Review*, September-October 1992.

[15] PREISSNER, A., Balanced Scorecard in Vetrieb und Marketing, Planung und Kontrolle mit Kennzahlen, Carl Hanser Verlag Munchen, Wien, 2002, s. 24.

[16] PUDŁO, P., MESAROS, P., MESAROS, F., Influence of quality costs on the structure of total costs in medium-sized companies, In: *Acta oeconomica cassoviensia*, No 1/2009, p. 23-34.

[17] STRAKA, M., MALINDŽÁK, D. Systém alokácie a layoutu výrobných a obalových zariadení firmy KAPA SERVIS, a.s. Košice, In: *INVENCE - INOVACE – INVESTICE*, VŠB-TU Ostrava, 2009, p. 529-534.

[18] ŚWIDERSKA G. K. *Controlling kosztów i rachunkowość zarządcza*, Difin, Warszawa 2010.

[19] ŚWIERK J., *Mapa strategii i strategiczna karta wyników w planowaniu działań przedsiębiorstwa*, Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej, Lublin 2009, s. 94-98.

[20] URDZIKOVÁ, J., JAKÁBOVÁ, M. Complaints management in terms of business practice in Slovakia, In: IC3K 2011. 3rd International Joint Conference on Knowledge Discovery, *Knowledge Engineering and Knowledge Management*. Paris, France 26-29 October, 2011. IJCCI 2011. 3rd International Joint Conference on Computational Intelligence. Paris, France 24-26 October, 2011 : KMIS 2011, International Conference on Knowledge Management and Information Sharing, SciTePress, 2011. - ISBN 978-989-8425-81-2, s. 302-305.

[21] URDZIKOVÁ, J., MOLNÁROVÁ, D., Customer - the key to competitive advantage. In: *Management, Economics and Business Development in the New European Conditions*: IV. International Scientific Conference. Brno, 26.-27.5.2006, Brno, University of Technology, 2006,

[22] WOLTER, O., TQM Scorecard, die Balanced Scorecard in TQM – gefurten Unternehmen umsetzen, Carl Hanser Verlag Munchen, Wien, 2002, s. 275.

[23] Implementing the Balanced Scorecard at FMC Corporation: An Interview with Larry Brady, *Harvard Business Review*, September-October 1993, p. 143-147.

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Abstract: In the paper, implementation of the Balanced Scorecard approach in make-to-order manufacturing is proposed, not only for linking the strategy of the enterprise with operational planning, and for measuring the level of strategy realization, but also to develop conditions which are investigated during production order verification. This is one of the most important processes in make-to-order manufacturing. Taking too many orders may cause delays in implementation and contractual penalties, whereas taking too few orders results in unused system capacity, and the costs of lost opportunities.

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Keywords: Balanced Scorecard, make-to-order manufacturing, performance measurement

JEL Classification: M11, M21