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How Does 5s Implementation Affect Company Performance? A Case Study Applied to a Subsidiary of a Rubber Goods Manufacturer from Serbia

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5S can be viewed as a system of workplace rules devised to create a safe and productive work environment and to provide efficient and effective realization of business tasks. Its implementation is expected to reduce defects, improve quality, increase safety and the morale of the employees, and improve employees' productivity. In the present paper, over the period of seven years, we investigate the case of a rubber goods manufacturer from Serbia which has implemented 5S in one of its subsidiaries. To assess the effects of the 5S implementation we use operational and financial performance indicators. Our results suggest that the implementation of 5S can contribute to performance of an organization in the short and medium term. In the case we analyze here, effects of 5S were not evident in longer term due to the influence of some external factors (increase in raw material prices and decrease in purchasing power of demand) and strong investment activity of the subsidiary. We argue that the performance of the subsidiary under the influence of these factors would be weaker if it did not implement 5S. In addition, subsidiary in our study implemented TDABC to make possible preparation of reports important for efficient decision making in the new business environment. This finding points to the importance of the management accounting system improvements after the continuous improvements implementation.

Keywords: *5S, Employees' Training, Continuous Improvements, Operational Performance, Financial Performance.*

Introduction

In order to improve quality, simplify business processes and reduce waste, companies rely on various continuous improvement programmes (CIPs) developed on concepts of quality or process improvements (Bhuiyan & Baghel, 2005). CIPs can be defined as processes of "focused and continuous incremental innovations" (Bessant *et al.*, 1994), "providing an important component of increased company competitiveness" (Hyland *et al.*, 2007). They can produce "results in market penetration, product quality attributes, quality assurance and/or manufacturing processes, customer satisfaction, cycle time and/or the cost of doing business" (Scott *et al.*, 2009). They can take place at different organizational levels; they affect organization's strategy at the management level, problem-solving at group level, and day-to-day tasks at individual level (Bhuiyan & Baghel, 2005).

The 5S is one of the best-known and most widely used CIPs (Bayo-Moriones *et al.*, 2010). It is often described as a tool which facilitates the introduction and development of other improvement methodologies (Gapp *et al.*, 2008; Ablanedo-Rosas *et al.*, 2010; Jaca *et al.*, 2014). It is also considered as one of the most relevant tools of lean manufacturing (Herron & Braiden, 2006) and one of the most important prerequisites for implementation of six sigma (van Iwaarden *et al.*, 2008). Often cited explanations of 5S are offered by Takashi Osada and Hiroyuki Hirano; while Osada views 5S conceptually, as a strategy for organisational development, learning and change, Hirano has a practical focus and views 5S as a tool to differentiate company from its competitors (Kobayashi *et al.*, 2008). 5S can be viewed as "an organisational wide strategy for improving organisation decision making and performance" (Gapp *et al.*, 2008), and as "a simple but effective tool to improve productivity through a better management of the working environment" (Ho, 1998).

Although many authors, as already mentioned, argue that 5S can contribute to organizational performance, empirical studies of this issue are scarce. We, therefore, address the following *research question*: how does the implementation of 5S influence the changes in the operational and financial indicators of the organization? To investigate specified question, we use *case study methodology*. We analyze the case of a rubber goods manufacturer from Serbia which has implemented 5S to improve business processes and performance in one of its subsidiaries. Selected subsidiary produces rubber footwear and exports major part of its production on European markets, characterised by the high level of price competition. Analysis of the selected case could, therefore, be interesting for researchers and practitioners concerned with the impact of the 5S implementation on performance of organizations facing strong competition. Also, given that the selected subsidiary has implemented several CIPs in the last 20 years, present paper provides useful insights for readers interested in motives, process and effects of 5S implementation in the organization devoted to and experienced in CIPs.

The main objective of our study is to determine the nature of the influence of 5S implementation on operational and financial performance indicators. To achieve this objective, we analyze the period of seven years - two years before and four years after the year of 5S

implementation. This allows us to also determine duration and sustainability of the effects of 5S implementation. *The secondary objective of our study* is to track changes in management accounting of the subsidiary during and after 5S implementation. Changes in management accounting are often found to be necessary to support CIPs (Hoque & Alam, 1999; Mia, 2000), and accommodate constantly changing business environment (Kujacic *et al.*, 2015).

Results of our study suggest that the implementation of 5S can contribute to performance of an organization in short and medium term. This is in line with argument that lean programs, including 5S, contribute significantly to short term improvements, and fall short of expectations in long term (Dombrowski & Mielke, 2014). In the case we analyze here, effects of 5S were not evident in longer term due to the influence of some external factors (increase in raw material prices and decrease in purchasing power of demand) and strong investment activity of the subsidiary. We argue that the performance of the subsidiary under the influence of these factors would be weaker if it did not implement 5S. Our results also point to the importance of the management accounting system improvements after CIPs implementation. Specifically, subsidiary in our study implemented time-driven activity based costing (TDABC) to make possible preparation of reports necessary for efficient decision making in the new business environment.

Our *study contributes* to the relevant literature in several ways. The empirical nature of the study provides practitioners seeking to deploy 5S with the empirical evidence of the effects 5S can produce. For researchers, our study provides a starting point for further analysis on the impact of 5S implementation on the organization's performance and management accounting. In addition, unlike majority of the previous studies investigating possible impact of the CIPs on the non-financial performance indicators, like product quality, customer satisfaction and employees' productivity (White *et al.*, 1999; Shah & Ward, 2003), we also include financial profitability indicators in our analysis.

There are several studies investigating implementation of various CIPs in the environment of European transition economies (Lee, *et al.*, 1992; Radosevic, *et al.*, 2014). However, to our knowledge, there are no prior studies on the impact of the CIPs on the organization's performance in these economies. Numerous studies point to the specific nature of business transformation processes in transition economies (Child & Czegledy, 1996; Uhlenbruck *et al.*, 2003). Our study does not consider the direct impact of the transition processes on the 5S implementation, but points to the specificities of 5S implementation in the environment of the South East European transition economy.

Theoretical Background

5S as a Continuous Improvement Methodology

According to the Institute of Quality Assurance, CIP can be defined as "gradual never-ending change" aimed at "getting better all the time" (as cited in Fryer *et al.*, 2007). In other words, the basic idea behind CIPs is that "nothing is ever perfect and no matter how much improvement has been made, there is still room for more" (Maskell, 1991, 28). CIPs are focused on maximizing quantitative results (e.g. financial performance), but also on making social and cultural changes in the company. Areas where they are most commonly implemented are: employee involvement, quality, labour and machine efficiency, volume flexibility, new product introduction, process throughput times, integration with customers, direct and overhead cost reduction, computer systems and customer satisfaction (Schmenner & Vollmann, 1994). CIPs that are most often mentioned in the literature are lean manufacturing, six sigma, business processes reengineering, activity based management (ABM), and kaizen (Bhuiyan & Baghel, 2005; Bhamu & Sangwan, 2014; Sahno, *et al*., 2015).

5S is one of the basic lean manufacturing techniques. Its name originally comes from five Japanese words that begin with the letter "S": seiri (sort), seiton (set, separate), seiso (shine, sweep), seiketsu (standardize) and shitsuke (sustain). Gapp *et al.* (2008) argue that there is sixth "S" which refers to safety. 5S is "both a philosophy and a set of guiding principles that lead to a continuously improving organisation" (Ablanedo-Rosas *et al.*, 2010). In this regard, Kobayashi *et al.* (2008) argues that "a balanced understanding of both '5S as a philosophy or way' and '5S as a technique or tool' could define the ultimate goal of 5S as a management approach to solve problems in the workplaces and processes of organisations".

Gapp *et al.* (2008) stress that some of the important benefits of implementing 5S are orderliness, cleanliness and discipline. Similarly, Abdulmalek & Rajgopal (2007) argue that 5S "focuses on effective work place organization and standardized work procedures". In other words, 5S represents a system of workplace rules devised to create a safe and productive work environment necessary for efficient and effective realization of business tasks. It helps company identify problems, create a culture of discipline and make opportunities for improvements more visible. Gapp *et al.* (2008) add that 5S is intended to "provide a mechanism for improving the workplace with minimal costs and disruption…through both high levels of managerial and organisational decision making while maintaining an environment of total participation".

Implementation of lean techniques, including 5S, depends on cooperation from employees. Lean manufacturing requires employees to have understanding of the production process and the analytical skills to identify the causes of problems in order to be able to resolve them as they appear (MacDuffie, 1995, 201). It relies on employees' empowerment, i.e. on encouraging employees to actively participate in the CIPs implementation. Employees' empowerment increases responsibilities and abilities of employees, and leads to an increase in their job satisfaction and performance (Vidal, 2007). Therefore, high degree of formalized training and education of employees becomes necessary to ensure effectiveness of lean initiatives. As regards to 5S, one of the 5 Ss – Sustain (Discipline), emphasizes the importance of employees' training and regular 5S audits, necessary to increase the level of employees' morale, quality of work/life and work standards (Gapp *et al*., 2008).

CIPs and Organization's Performance

Performance measurement system is expected to reinforce activities and processes that are in the best interest of company and to accommodate changes caused by CIPs implementation. At the same time, performance measures provide a mechanism for relating product or process improvement policies developed by senior management to actions at a local organisational level (Bond, 1999). In this regard, Ahmad & Dhafr (2002) argue that companies have to choose a range of performance indicators covering relevant dimensions of the business or CIPs. They add that company should continually calculate and review several short-term performance indicators, like financial performance indicators (business performance), technical performance indicators (productivity), and efficiency indicators (human contribution).

There is almost unanimous agreement among researchers that simple operational (e.g. productivity, efficiency), and not aggregate financial performance indicators (e.g. profitability ratios) should be used to measure the effects of the CIPs (e.g. Kaplan & Norton, 1992; Schmenner & Vollmann, 1994; Wruck & Jensen, 1994; Ittner & Larcker, 1995). For example, Wruck & Jensen (1994) argue that companies implementing TQM should use non-traditional customer and operation oriented measures (e.g. productivity, quality), rather than traditional financial measures. Ittner & Larcker (1995) find that TQM practices are associated with the greater use of non-traditional information and reward systems that rely on nonfinancial performance measures. They, nevertheless, find no support for the proposition that the highest performance levels should be achieved by companies making the greatest use of both TQM practices and non-traditional information and reward systems.

To facilitate CIPs, performance measures need to be calculated at the operational level and deployed to operational teams who use them to monitor, control and improve business processes. CIPs are usually expected to bring improvement in productivity (Shah & Ward, 2003; Gapp *et. al*., 2008), which makes productivity indicators natural choice to monitor implementation of CIPs. Shah & Ward (2003) find that lean manufacturing contributes substantially to the operational performance measured by manufacturing cycle time, scrap and rework costs, labour productivity, unit manufacturing costs, first pass yield and customer lead time. White *et al*. (1999) similarly find positive impact of JIT manufacturing on operational performance measured by throughput time, internal and external quality level, labour productivity, employee behaviour and training, inventory levels, unit cost, cost of equipment and administrative costs.

Many authors endorse the view that CIPs will generate profitability improvement if implemented properly (Tangen, 2003; Ahmed *et al*., 2005; Fullerton & Wempe, 2009). Tangen (2003) argues that the most common profitability measures are return on sales (ROS), return on asset (ROA) and return on equity (ROE), while Ahmed *et al*. (2005) suggest that the relevant profitability measures of the CIPs effects are ROA and sales growth. Fullerton & Wempe (2009), however, find that managers who implement lean manufacturing without utilizing non-financial manufacturing performance measures may experience disappointing financial results. Kaplan & Norton (1992) argue that the changes in financial performance indicators may be only partially caused by the CIPs, given that many other important factors, such as changes in customer demand or market competition can also affect them. They propose the use of Balance Scorecard - which relies not only on financial measures, but also on customer service, innovations and internal performance - to provide better view of the CIPs.

Management accounting system (MAS) is often described as major source of information necessary in managerial decision-making and utilisation of comparative advantage (Kujacic *et al.*, 2015; Odar *et al*., 2015). Kaplan (1994) argues that changes of MAS from 1984-1994 and development of the Activity Based Costing (ABC) were strongly connected to the CIPs and lean production. In a similar vein, some authors suggest that the adoption of new management practices (e.g. TQM, JIT) my lead to the development of broader MAS able to provide decision-makers with timely, accurate and relevant information (e.g. Hoque & Alam, 1999; Mia, 2000). Kaplan & Norton (2008, 190-208) propose implementation of the Time-Driven Activity Based Costing (TDABC) in lean environment. TDABC is a contemporary cost accounting system described as a “financial thermometer” of the lean operations (Pryor, 2010) and factor increasing CIPs efficiency (Everaert *et al*., 2012).

Research Methodology

Case Study Approach

We use a case study approach to examine how 5S affects organizations' operational and financial performance indicators. Yin (2014, 16) defines the case study research method as "an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context may not be clearly evident". Eisenhardt (1989) points out that case studies are excellent research method for generating creative, testable and empirically valid theories. She further adds that an initial definition of the research question, in at least broad terms, is important in building theory from case studies, because it helps researcher to specify the organization to be approached and the data to be gathered. Therefore, we specify the following research question: *how does the implementation of 5S influences the changes in the operational and financial indicators of the organization?*

Eisenhardt (1989) also emphasizes importance of the proper case selection, starting from the definition of a population. She stresses that the selection of an appropriate population helps to define the limits for generalizing the findings. We conduct our research at the subsidiary level of a manufacturing company over a seven-year period. We examine manufacturing company because there is a wide set of operational changes that can be conducted through 5S implementation. We focus on a subsidiary because it is semi-autonomous unit, and there is limited variability in the products that are made and in the production processes.

Akkermans & Helden (2002) point out that case study approach can pose problems in ensuring rigor and

reliability, given that the conclusions can be based on accidental circumstances and researchers own biases, instead of on careful observations of reality. Following Akkermans & Helden (2002) we take several measures to limit our personal biases by using several independent perspectives and sources of data. Independent perspectives were obtained by separately interviewing three members of the company with different backgrounds – PR manager and Chief Financial Officer (CFO) of the company, as well as the subsidiary manager. Interviews took place in July 2010 to supplement the information gathered from the questionnaire filled out by the subsidiary manager in June 2010. Some preliminary results of our research were also presented and discussed at an international peer-reviewed academic conference (Todorovic & Cupic, 2014). We used additional sources of data, including annual reports of the company and financial statements of the subsidiary for 2006-2012, to cross check and supplement data collected from the questionnaire and interviews. We also used them to collect additional data for calculation of operational and profitability indicators of the subsidiary. They were downloaded from the Serbian Business Registers Office and Belgrade Stock Exchange website over 2010-2013.

Operational Measures

Following White *et al*. (1999), Shah & Ward (2003) and Ahmed *et al*. (2005), we investigate the influence of a continuous improvement tool (5S) on productivity indicators. We measure labour productivity with two ratios: 1) LP_1 calculated as the ratio of total physical output to number of employees and 2) LP_2 calculated as the ratio of total physical output to wages of employees. Subsidiary manager explained in the questionnaire that the subsidiary measures productivity by using the ratio of physical output to number of employees (our LP_1 ratio). Following Ahmed *et al.* (2005) we also calculate material productivity (MP) as the ratio of total physical output to material costs. Increase in this ratio indicates the raw material cost decrease and/or the number of units produced increase.

Following White *et al.* (1999) we examine impact of the 5S implementation on cost of employees' trainings and cost of employees' turnover by using two indicators: a) CET calculated as the ratio of cost of employees' training to total number of employees and b) CT calculated as the ratio of employees' turnover cost to total number of employees. Implementation of 5S should result in CET and CT decrease (White *et al*., 1999). Following Shah & Ward (2003), we examine influence of the 5S implementation on the cost of scrap and cost of equipment maintenance. To calculate operational performance indicators, we deflate nominal values by using GDP deflator based in 2005, which represents what it would have cost in the base year (2005) to acquire certain input. We assess operational performance indicators by taking into account their point values and directional trend. The trend of an indicator is determined by calculating indexes using 2008 as a base year, which is the year of 5S implementation.

Profitability Measures

Following some previous studies (Tangen, 2003; Ahmed *et al*., 2005; Fullerton & Wempe, 2009), we calculate three profitability measures: ROS (ratio of earnings before taxes (EBT) to total sales), ROA (ratio of EBT to total assets) and ROE (ratio of EBT to total equity). ROA can be very useful management tool because it can be easily decomposed and used to control and reward employees at subsidiary level, while ROE is more interesting to the shareholders because it indicates how effectively company uses equity capital. This does not mean that the latter have no significance for the managers, but that the possibilities for decomposing and using ROE to evaluate CIPs implemented at subsidiary level can be limited. We use ROS as a measure of organization's ability to generate profit and an implicit measure of organization's cost efficiency given that the increase in ROS implies decrease in the ratio of total costs (excluding income tax) to total sales. To calculate profitability indicators, we use real (deflated) values obtained by deflating the current values by using the GDP deflator with base year of 2005.

The Case Study: 5S Implementation In The Rubber Footwear Subsidiary

Case Setting

We label the company subject to our analysis as the Company XYZ. At the end of 2008, Company XYZ had 18 subsidiaries and 3 joint ventures in the areas of production, commerce and services. Company is a rubber goods manufacturer with the following three main lines of products: rubber footwear, technical rubber and chemical products. According to company's 2008 annual report, these basic products account for 43.14 % of total income and 41.55 % of the total assets of the company. In the same year company had 2,127 employees, mostly in production of rubber footwear (916, or 43.07 %) and production of technical rubber (263, or 12.36 %). Since 2005, shares of the company are listed on the Belgrade Stock Exchange (BSE) and Serbian government holds the largest ownership stake (33.72 %).

As summarized in its annual reports for 2008-2012, the company has established the Quality Management System (QMS), the Environmental Management System (EMS) and the Occupational Health and Safety Advisory Service (OHSAS) as integral parts of Integrated Management System (IMS). In the production processes, company maintains standards of quality, reliability and performance established by ISO 9001 and complies with environmental principles established by ISO 14001. For raw materials with hazardous properties, company requests confirmations from the suppliers on their compliance with the requirements of the European Commission REACH directive. Company manages occupational health and safety (OHS) through workplace risk assessment and implementation of the OHSAS 18001 Specification. Regular annual audits by the Serbian certification body, which is a member of the IQnet, confirm compliance of company's QMS, EMS and OHS with the requirements of ISO 9001, ISO 14001 and OHSAS 18001.

When interviewed about the company's objectives, the CFO answered in the following manner:

"Primary objective of the company is to sustain and increase value for shareholders, business partners and employees. At the subsidiary level objectives can be different, but are usually defined as increasing net income or market share through quality improvements and in accordance with the principles of sustainable development".

When interviewed about the company's performance measurement system, CFO answered as follows:

"The company uses wide range of financial indicators to evaluate business performance, including Net profit, Earnings before interest and taxes (EBIT), ROA, Total shareholder return (TSR) and Cash flow return on investment (CFROI). Operational measures of productivity and efficiency are used at the subsidiary level, along with the financial indicators".

We focus on a footwear subsidiary to investigate the relationship between 5S implementation and performance indicators. Subsidiary produces a variety of rubber footwear, but the main lines are: a) General purpose footwear, b) Rubber boots for hunting and fishing and c) Rubber safety boots and work boots. According to Company XYZ 2008 annual report, subsidiary hold about 75% of the domestic market, and exports more than 60% of the products to the European Union, United States and Canada. The report also explains that the national European markets for rubber footwear are relatively homogeneous and interconnected, and the products are almost identical; the level of competition, especially price competition, is very high and the producers are forced to focus on production costs.

5S Implementation in the Footwear Subsidiary

Footwear subsidiary has implemented several lean improvement techniques in the last 20 years. In the questionnaire, subsidiary manager confirms that the footwear subsidiary implemented Single-Minute Exchange of Die (SMED) in 1995, Total Productive Maintenance (TPM) in 2000 and Six Sigma in 2004. Along with the efforts to move the production of rubber footwear to a new location with modern equipment, footwear subsidiary began with the implementation of the 5S in 2008. Old rubber footwear industrial location was closed in June 2008 and all product lines were put into operations at the new location in September 2008. To prepare for this major change, at the end of 2007 and during the first quarter of 2008, the footwear subsidiary increased its stocks of standard products primarily intended for the domestic market. It was not able to prepare stocks of products intended for export, because these are produced according to the specific needs of the customers. Subsidiary has also conducted necessary preparations for the full implementation of the 5S, mainly through the employee trainings. Subsidiary manager explains in the questionnaire that 5S was fully implemented by the experts from the subsidiary, with no help from external consultants.

During the interview, subsidiary manager described the aim of 5S implementation as follows:

"Footwear subsidiary conducted full upgrade of production processes at the new production location with the aim of significant increase in productivity, shortening of the production and distribution time, reduction in production costs and alignment with customers' needs".

5S implementation was expected to result in the reductions in scraps and waste, and employee expenses. Lower costs were expected to facilitate development and introduction of new and more sophisticated products. This was especially important given that the subsidiary bought two major international brands in August 2008, which resulted in a wider range of internationally recognized brands and stronger requirements for technological and manufacturing process improvements. To describe the initial effects of 5S implementation, subsidiary manager said the following during the interview:

"Domestic and foreign buyers, who visited new production plant in 2008, were satisfied with implemented improvements and decided to place new orders".

Subsidiary manager explains in the questionnaire that the 5S was implemented through four phases: 1) *defining and planning* the improvements in the plant, equipment and employees necessary to implement 5S; 2) *measuring and analyzing* implemented changes in order to achieve defined objectives; 3) *lunching* the production after the change of the location and implementation of the improvements; 4) continuous *control* of the implemented improvements and taking corrective actions when needed. He further explains that the improvements were conducted with the use of internal software for operational planning and production management. These were conducted in all three primary phases of the production – preparation of materials, footwear production and footwear control and packing.

Primary indicator of 5S implementation effects was labour productivity. During the interview, subsidiary manager stated the following:

"New automated equipment allows for considerable decrease in material costs and increase in profitability".

According to its annual reports, Company XYZ had 2,127 employees at the end of the 2008, and the number declined to 1,818 by 2012. The declining trend was part of the efforts of the company to restructure business processes and reduce costs. Footwear subsidiary had the largest number of employees, representing around 40% of the total number of employees in the company between 2006 and 2012. During the interview, subsidiary manager noted the following:

"Improvements in the knowledge and skills of employees through a number of different trainings were the most important aspect of the 5S implementation".

Table 1 is prepared using Company XYZ annual reports. It shows the number of employees in the footwear subsidiary that received training, both internal and external, from 2006 to 2012. It should be noted that the number of employees decreases after the adoption of 5S in 2008, which is an indication of the productivity increase. The number of employees decreases the most in 2009 (by 12.06 %), which is in accordance with the plan to solve the problem of employee redundancy after changes in the production processes.

Table 1

Structure of employees' trainings in footwear subsidiary, 2006-2012

	2006	2007	2008	2009	2010	2011	2012	Average
External trainings	88	133	97	33	25	64	26	66.57
Internal trainings	819	596	1869	414	1074	863	510	877.86
All trainings	907	729	1966	447	1099	927	536	944.43
Average number of employees	903	962	945	831	862	835	962	849.43

Notes: Information in Table 1 is taken from Company XYZ annual reports for 2006–2012.

The number of external trainings is high in 2006 and 2007 (9.7 % and 18.2 % in the total number of trainings, respectively) partly due to the efforts to prepare employees for 5S implementation. After the implementation of 5S, the total number of trainings and especially number of external (more expensive) trainings decreases sharply. The number of employees that received training is in some years larger than the total number of employees, meaning that some employees received several trainings in a single year. The largest number of trainings is recorded in 2008, which was part of the efforts to implement 5S. Internal trainings of employees are dominant in the structure of total trainings.

As stated in Company XYZ 2008 annual report, in July 2008, an external audit confirmed continued validity of QMS and EMS certification for the subsidiary, and the audit team especially commended human resource and process management. As explained in the Company XYZ 2010 annual report, footwear subsidiary introduced OHSAS 18001 by 2010, in accordance to the action plan developed at the end of 2008. This evidence confirms usual argument that 5S represents a foundation for constructing ISO and OHSAS in IMS (Gapp *et al*., 2008). During the interview, subsidiary manager explained the following:

"The increase in the number of trainings in 2010 is partly a result of OHSAS 18001 introduction, which in turn was part of the 5S implementation and efforts to decrease employees' injuries".

Indeed, frequency and severity of employees' injuries showed downward trends in 2010. Employees who work with hazardous substances receive regular training, in accordance to standards and Serbian Chemical Law and Occupational Safety Law. According to the Company XYZ 2010 annual report, independent occupational medicine specialists prepares risk assessment for all workplaces, and documents stipulating measures which need to be undertaken to prevent hazards. Subsidiary organizes and provides trainings for all new employees in fire protection, use of personal safety aids, handling of hazardous and toxic substances and procedures to be followed in emergency situations. It also provides regular medical examinations of employees working in potentially hazardous environments and training of employees working with newly-acquired equipment.

Analysis of the Footwear Subsidiary's Performance Indicators

Implementation of the 5S caused changes in the cost and management accounting of the subsidiary. Subsidiary manager indicates in the questionnaire that the footwear subsidiary started to use TDABC, because it allows a) creation of monthly reports important and useful for efficient decision making and control in the new business environment; and b) detailed analysis of business processes' efficiency and capacity utilization. TDABC also brought to the fore measures of production productivity and efficiency. Subsidiary manager also indicates that the indirect costs represent around 15 % of total costs in the subsidiary, so the implementation and utilization of TDABC have made possible more precise allocation of these costs based on production time and capacity. He further explains that the indirect costs are allocated based on time needed for the production of one pair of footwear, which is on average 0.2h and includes the following times: a) preparation of the materials, 0.03h; footwear production, 0.15; footwear vulcanization, control and packing, 0.02h. Production times differ for different footwear.

Analysis of Operational Performance Indicators

Information necessary for assessing productivity of the subsidiary is taken from Company XYZ annual reports and subsidiary's financial statements for 2006–2012 and is shown in Table 2. Production (total output in physical units) of the subsidiary decreases considerably in 2008 after the outburst of the financial crisis in the second half of 2008 and discontinued production from June to September of 2008. It should be noted that stocks of finished goods and work-in-progress increase considerably in 2011 (by 37.60 %), meaning that large portion of total production was not finished or sold (production for inventories). Subsidiary managed to increase exports in 2011 only to a limited extent due to low level of net working capital available for growth financing. At the same time, the decrease in sales on the domestic market was strong because of the decreased ability of buyers to pay. Subsidiary, therefore, had to decrease production in 2012 and find the market for accumulated stocks.

There are two peaks in the material costs – lower one in 2008 and upper one in 2011 (see Table 2). They were increasing since the second half of 2009 mostly due to an increase in the oil prices and other prices on the market of the raw materials used in the subsidiary (part of this change is taken into account by deflating nominal values). Increase in the material costs was only partially transferred into the prices of finished products, and the decrease in the profit margin was expected to be compensated by the increase in productivity. Increase in material costs in 2011 was mostly due to the increase in prices on the global commodity exchanges and the increase in raw material purchases from EU distributors who offered short lead times at very high prices. Although the prices of finished products were increased two times during 2011, there were months of disparity between material costs and final

product prices which negatively affected profitability. Decrease in material costs in 2012 resulted from lower price of purchases from Far East manufacturers of raw materials under the terms negotiated at the end of 2011.

Panel A of Table 3 shows the productivity ratios of the footwear subsidiary from 2006 to 2012. We start our analysis in 2006 to avoid possible strong influence of the Six Sigma implementation in 2004. After a period of decline from 2006 to 2008, labour productivity measured by LP_1 increases from 2009 to 2011. This was possible because the subsidiary managed to significantly decrease number of employees in 2009 and to keep it low in the following years. More importantly, this result implies that – after implementation of 5S which included employees' trainings and quality initiatives - the subsidiary managed to increase the productivity of its employees. The decline in LP_1 in 2012 should be viewed in the light of the decrease in total output – which was already explained by external factors - and not as a result of a decrease in labour productivity. Labour productivity measured by LP_2 acts like LP_1 until 2010, but declines already in 2011, due to the increase in gross wages which followed the increase in inflation rate.

Table 2

Output and production costs of the footwear subsidiary, 2006–2012

	2006	2007	2008	2009	2010	2011	2012
Output in tones	2,263	2,178	1,790	1,870	2,054	2,047	1,517
Output in 000's of pairs	1,854.6	1,765.8	1,455.5	1,408.1	1,450.1	1,466.6	1,247.7
Material costs	514.33	560.51	422.41	444.04	554.21	885.31	608.70
Gross wages	317.93	396.26	357.99	330.19	361.69	448.97	364.99

Notes: Information in Table 2 is taken from Company XYZ annual reports and footwear subsidiary financial statements for 2006-2012. Material costs and Gross wages are in millions of Serbian dinars expressed in real 2005 terms.

Panel A of Table 3 shows that the material productivity measured by MP increases only in 2008, and decreases afterwards. This result was unexpected given that the new equipment was introduced to decrease material costs and increase profitability. However, the increase in material costs and decrease in MP was mostly due to the increase in raw material and oil prices, as was already explained. Material costs increased in 2009 mostly due to a 30.84% increase in cost of fuel. In the same year, cost of direct material increased by only 6.23%, closely following the increase in physical output (4.47%). Most importantly, costs of parts decreased by 84.12%, which can be viewed as a result of 5S implementation. MP decreases considerably in 2011 after the reorientation of the subsidiary towards the production of more complex products requiring more expensive raw materials. According to Company XYZ 2011 annual report, subsidiary introduced 48 new and 56 alternative materials, mostly in connection to 73 new products developed as a result of intensive R&D activities.

Table 3

Operational performance indicators of the footwear subsidiary, 2006–2012

	2006	2007	2008	2009	2010	2011	2012
Panel A: Labour and material productivity							
LP_1	2.5070	2.2655	1.8942	2.2503	2.3828	2.4515	2.1938
	(132.4)	(119.6)	(100.0)	(118.8)	(125.8)	(129.4)	(115.8)
LP_2	7.1167	5.4972	5.0001	5.6634	5.6789	4.5593	4.1562
	(142.3)	(109.9)	(100.0)	(113.3)	(113.6)	(91.2)	(83.1)
MP	4.3992	3.8863	4.2376	4.2113	3.7062	2.3122	2.4922
	(103.8)	(91.7)	(100.0)	(99.4)	(87.5)	(54.6)	(58.8)
Panel B: Cost of employees' training and turnover							
Cost of employees' training	4.4828	5.5476	3.4367	3.1699	1.8446	1.3020	0.5110
CET	0.0050	0.0058	0.0036	0.0038	0.0021	0.0016	0.0007
	(136.6)	(158.6)	(100.0)	(104.9)	(58.8)	(42.9)	(20.3)
Cost of employee turnover	7.3224	6.0790	9.7693	12.6659	2.7305	4.5906	2.4101
CT	0.0081	0.0063	0.0103	0.0152	0.0032	0.0055	0.0035
	(78.5)	(61.2)	(100.0)	(147.4)	(30.6)	(53.2)	(33.7)
Panel C: Costs of scrap and equipment maintenance							
Cost of scrap	0.0225	0.2311	2.0983	0.0347	0.2048	0.1451	0.4158
Cost of equipment maintenance	2.0122	2.2126	2.7095	2.3319	2.0279	1.7899	0.6719

Notes: LP_1 is ratio of output in tones to number of employees. LP_2 (ratio of output in tones to gross wages) and MP (ratio of output in tones to material costs) indicate tones per millions of Serbian dinars expressed in real 2005 terms. Cost of employees' training and turnover, cost of scrap and cost of equipment maintenance are in millions of Serbian dinars expressed in real 2005 terms. CET is ratio of cost of employees' training to number of employees and CET is the ratio of cost of employees' turnover to number of employees. Indexes are in parenthesis (base year is 2008).

Panel B of Table 3 shows the costs of employees' trainings and turnover for the footwear subsidiary from 2006 to 2012. Variations in cost of employees' trainings are consistent with the changes in the number of employees that received training, structure of trainings (see Table 1) and implementation of 5S. In addition, the decrease in cost of trainings was partly a result of the financial crisis which began in the second half of 2008 and was most pronounced in 2009. CET is very high until 2007 (before 5S implementation), it decreases in 2008 (during and after 5S implementation) and is relatively low since 2010. Increased number of trainings in 2010 and 2011 did

not result in CET increase because it included mostly less expensive internal trainings. Cost of employee turnover and CT are highest in 2009 because of the efforts to solve the problem of employee redundancy. It decreases significantly in 2011 and remains relatively low until 2012, which is in accordance with decreased employee turnover and stabilization in the number of employees.

Panel C of Table 3 presents the cost of scrap and cost of equipment maintenance for the footwear subsidiary from 2006 to 2012. Cost of scrape, representing waste of raw material, is extremely high in 2008, mostly as a result of initial problems after launching production at the new location and time necessary for employees to adopt new environment and manufacturing procedures. This cost is considerably lower after full implementation of 5S in 2009, but grows again in 2012 mostly due to fabrication of tools for new footwear models. Costs of equipment maintenance are considerably lower after 5S implementation, which is not surprising given that 5S was expected to reduce employees' workload and errors and increase work standards and quality of work. They are highest in 2008 for reasons similar to those that affected increase in cost of scrap in the same year.

Analysis of Financial Performance Indicators

Table 4 shows financial information from the subsidiary 2006-2012 financial statements necessary to calculate profitability indicators. Assets and equity increase in 2008 is mostly due to the investment of 427.2 millions of RSD (around 5 millions of EUR) in the new production facility, as well as to acquiring of major footwear brands. Total sales were lowest in 2008 because of the downtime between June and September and reduced export sales levels. Subsidiary manager offered the following explanation during the interview:

"*International buyers were uncertain about how long it would take footwear subsidiary to shut down old plant and resume operations at the new site, so they either suspended or substantially reduced their orders as of May 2008. This had a negative impact on subsidiary sales because May is the month during which customers start ordering for the next season*".

Sales are highest in 2011 mostly due to two increases in finished products prices and less to increased demand. EBT was negative in 2006 and 2007 due to highly unfavourable work conditions at the old location in terms of equipment layout causing high manufacturing costs relating to both raw material consumption and workforce. EBT was again negative in 2012 because the subsidiary lacked liquid assets to meet the needs of customers in the segment of off-take production, and so reduced chance for further market share increase. EBITDA was positive in only two years of the analyzed period – 2007 and 2010, indicating problems with profitability and operating cash flow. Lowest values of EBITDA correspond to lowest productivity ratios recorded in 2008 and 2012.

Table 4

Financial information for footwear subsidiary, 2006–2012

	2006	2007	2008	2009	2010	2011	2012
Total assets	599.71	763.96	1,584.14	1,507.67	1,877.88	2,132.13	2,367.43
Total equity	131.05	55.74	618.46	629.37	629.57	628.48	572.98
Total sales	903.42	894.29	676.05	727.08	912.54	1,114.37	909.96
EBT	-34.48	-43.56	28.74	30.15	5.06	125.56	-252.67
EBITDA	-15,94	10,87	-233,15	-45,38	20,41	-46,64	-177,94

Notes: Information in Table 4 is taken from footwear subsidiary financial statements for 2006-2012.EBT is earnings before taxes and EBITDA is earnings before interest, taxes, depreciation and amortization. Values are in millions of Serbian dinars expressed in real 2005 terms.

Table 5 shows profitability indicators for the footwear subsidiary from 2006 to 2012. Profitability and productivity are related because reducing cost through elimination of waste and shortening of process time can contribute to an increase of productivity and profitability (Bond, 1999). During 2007 and 2008 activities were focused on increasing the level of product quality and reducing the percentage of scrap. Therefore, it is not surprising that the profitability ratios were negative in 2006 and 2007, and started to increase in 2008. Increase in profitability in 2008 is surprising given that both the sales and productivity were at their lowest and implies that profitability was mostly determined by some other factors, like lower production costs (gross wages and material costs) and other expenses.

Table 5

Profitability ratios of the footwear subsidiary, 2006–2012

	2006	2007	2008	2009	2010	2011	2012
ROS	-3.82	-4.87	4.25	4.15	0.55	11.27	-27.77
ROA	-5.75	-5.70	1.81	2.00	0.27	5.89	-10.67
ROE	-26.31	-78.14	4.65	4.79	0.80	19.98	-44.10

Notes: ROS (return on sales), ROA (return on assets) and ROE (return of equity) are expressed in percentages.

ROS decreases in 2009 due to a decrease in non-operating income, and despite an increase in operating income (due to the lower production costs). This means that 5S implementation possibly helped the subsidiary to avoid more significant decrease in profitability. The same situation happened in 2010 when all the profitability ratios decreased considerably. After another increase in 2011, profitability ratios significantly decrease in 2012 which is in line with a decline in total output and total sales. Negative profitability indicators in 2012 imply that the achieved productivity levels were not sufficient to compensate the total costs increase in this year.

Nevertheless, this result – along with all previously analyzed changes in profitability ratios - is an indication of the influence 5S implementation can have on profitability of an organization, mostly through productivity increase, but also through cost decrease.

Conclusions

The 5S is often considered as one of the most widely used (Bayo-Moriones et al., 2010) and most relevant lean manufacturing tools (Herron & Braiden, 2006). It is also viewed as a strategy and an effective tool to improve company performance and competitiveness (Gapp et al., 2008; Kobayashi et al., 2008). Results of our study suggest that 5S improves operational and profitability indicators in the short and medium term. This is in line with the results of some previous studies indicating positive influence of 5S and other lean tools on organizations' performance (Shah & Ward, 2003; Bayo-Moriones *et al.*, 2010), and those indicating that this influence is short-lived (Jorgensen *et al*., 2007; Dombrowski & Mielke, 2014). It also implies that more research focus should be placed on factors supporting sustainability of 5S. Some of these factors could be employees' trainings and development (Jorgensen *et al.*, 2007), or lean leadership (Dombrowski & Mielke, 2014). In the case we analyze here, effects of 5S were not evident in longer term due to the influence of some external factors (increase in raw material prices and decrease in purchasing power of demand) and strong investment activity of the subsidiary. We argue that the performance of the subsidiary under the influence of these factors would be weaker if it did not implement 5S.

5S implementation involves team work and active participation of employees (Ablanedo-Rosas *et al*., 2010). At the same time, the most important benefits of the 5S implementation are safe work environment, stronger ethics and motivation of the employees, as well as the waste elimination, time savings and better efficiency (Jaca *et al.*, 2014). It is, therefore, no surprise that we find a significant increase in labour productivity of the footwear subsidiary after it has implemented 5S. This is line with relevant literature (Gapp *et al.*, 2008; Bayo-Moriones *et al.*, 2010) and implies that managers can increase productivity and competitiveness of the organization by making work environment more safe, orderly and clean, and even more through employees' trainings and participation.

We also find that 5S decreases manufacturing costs and positively affects profitability. This result is in line with the view that CIPs, including 5S, can generate profitability improvement if implemented properly (Tangen, 2003; Ahmed *et al.*, 2005; Fullerton & Wempe, 2009). In accordance with Fullerton & Wempe (2009), we find that influence of 5S on profitability indicators is indirect (through productivity and efficiency) and less obvious, due to the simultaneous influence of many other external and internal factors. Our finding implies that researchers should direct their interest, not only towards non-financial, but also towards financial indicators of 5S implementation. It also implies that managers can increase organization's profitability through lean initiatives resulting in more efficient processes and productive employees.

We point to the importance of the cost and management accounting system improvements after the CIPs implementation. Subsidiary in our study implemented TDABC to make possible preparation of the reports necessary for efficient decision making and control in the new business environment. This finding is in line with the argument that changes in management accounting are necessary to support CIPs (Hoque & Alam, 1999; Mia, 2000). Therefore, we believe that future research should focus more to the analysis of usefulness and reliability of alternative cost accounting methodologies in the process of CIPs implementation.

As a final theoretical contribution, our study shows that CIPs, including lean tools such as 5S, can positively affect operational and profitability performance indicators of the organizations operating in European transition economies. CIPs are potentially even more important in transition economies, still struggling with macroeconomic and market instabilities. Our finding that 5S contributes to profitability increase through increase in productivity and efficiency provide useful indication for managers facing adverse influence of the economic environment. It also implies that more research is necessary on the process and effects of CIPs implementation in transition economies.

Finally, we would like to point to several limitations of our study. Partial productivity ratios calculated in our study overemphasize one input and neglect others, and give no indication of the total productivity of the subsidiary or company. Case study methodology also has some limitations stemming from the fact that the analyzed case may be unusual, i.e. insufficiently representative to make general conclusions about the problem. It is a data-driven rather that theory-driven approach and it does not allow the use of statistical or econometrical analysis. We, nevertheless, believe that our study offers useful insight into the effects of 5S implementation in Serbian companies. Future research should try to investigate effects of other CIPs and to cover more companies implementing these programmes in transition economies like Serbia.

References

Abdulmalek, F. A., & Rajgopal, J. (2007). Analyzing the benefits of lean manufacturing and value stream mapping via simulation: A process sector case study. *International Journal of Production Economics*, 107(1), 223–236. http://dx.doi.org/10.1016/j.ijpe.2006.09.009

Ablanedo-Rosas, J. H., Alidaee, B., Moreno, J. C., & Urbina, J. (2010). Quality improvement supported by the 5S, an empirical case study of Mexican organisations. *International Journal of Production Research*, 48(23), 7063–7087. http://dx.doi.org/10.1080/00207540903382865

Ahmad, M. M., & Dhafr, N. (2002). Establishing and improving manufacturing performance measures. *Robotics and Computer-Integrated Manufacturing*, 18(3-4), 171–176. http://dx.doi.org/10.1016/S0736-5845(02)00007-8

Ahmed, S., Hassan, M. H., & Fen, Y. H. (2005). Performance measurement and evaluation in an innovative modern manufacturing system. *Journal of Applied Sciences*, 5(2), 385–401. http://scialert.net/qredirect.php?doi=jas.2005.385.401&linkid=pdf; https://doi.org/10.3923/jas.2005.385.401

Akkermans, H., & Van Helden, K. (2002). Vicious and virtuous cycles in ERP implementation: A case study of interrelations between critical success factors. *European Journal of Information Systems*, 11(1), 35–46. http://dx.doi.org/10.1057/palgrave.ejis.3000418

Bayo-Moriones, A., Bello-Pintado, A., & Merino-Diaz de Cerio, J. (2010) 5S use in manufacturing plants: contextual factors and impact on operating performance. *International Journal of Quality & Reliability Management*, 27(2), 217–230. http://dx.doi.org/10.1108/02656711011014320

Bessant, J., Caffyn, S., Gilbert, J., Harding, R., & Webb, S. (1994). Rediscovering continuous improvement. *Technovation*, 14(1), 17–29. http://dx.doi.org/10.1016/0166-4972(94)90067-1

Bhamu, J., & Sangwan, K. S. (2014). Lean manufacturing: literature review and research issues. *International Journal of Operations & Production Management*, 34(7), 876-940. http://dx.doi.org/10.1108/IJOPM-08-2012-0315

Bhuiyan, N., & Baghel, A. (2005). An overview of continuous improvement: from the past to the present. *Management Decision*, 43(5), 761–771. http://dx.doi.org/10.1108/00251740510597761

Bond, T. C. (1999). The Role of Performance Measurement in Continuous Improvement. International Journal of *Operations and Production Management*, 19(12), 1318–1334. http://dx.doi.org/10.1108/01443579910294291

Child, J., & Czegledy, A. P. (1996). Managerial Learning in the Transformation of Eastern Europe: Some Key Issues. *Organization Studies*, 17(2), 167–179. http://dx.doi.org/10.1177/017084069601700202

Dombrowski, U., & Mielke, T. (2014). Lean Leadership – 15 Rules for a sustainable Lean Implementation, *Procedia CIRP*, 17, 565 – 570. http://dx.doi.org/10.1016/j.procir.2014.01.146

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Academy of Management Review*, 14(4), 532–550. http://dx.doi.org/10.5465/AMR.1989.4308385

Everaert, P., Cleuren, G., & Hoozee, S. (2012). Using Time-Driven ABC to identify operational improvements: a case study in a university restaurant. *Journal of Cost Management*, 26(2), 41–48.

Fryer, K. J., Antony, J., & Douglas, A. (2007). Critical success factors of continuous improvement in the public sector: a literature review and some key findings. *TQM Magazine*, 19(5), 497–517. http://dx.doi.org/10.1108/09544780710817900

Fullerton, R. R., & Wempe, W. F. (2009). Lean manufacturing, non-financial performance measures, and financial performance. *International Journal of Operations & Production Management*, 29(3), 214–240. http://dx.doi.org/10. 1108/01443570910938970

Gapp, R., Fisher, R., & Kobayashi, K. (2008). Implementing 5S within a Japanese context: an integrated management system. *Management Decision*, 46(4), 565–579. http://dx.doi.org/10.1108/00251740810865067

Herron, C., & Braiden, M. (2006). A methodology for developing sustainable quantifiable productivity improvement in manufacturing companies. *International Journal of Production Economics*, 104(1), 143–153. http://dx.doi.org/10.1016/j.ijpe.2005.10.004

Ho, S. K. M. (1998). 5-S practice: a new tool for industrial management. *Industrial Management & Data Systems*, 98(2), 55–62. http://dx.doi.org/10.1108/02635579810207726

Hoque, Z., & Alam, M. (1999). TQM adoption, institutionalism and changes in management accounting systems: a case study. *Accounting and Business Research*, 29(3), 199–210. http://dx.doi.org/10.1080/00014788.1999.9729580

Hyland, P. W., Mellor, R., & Sloan. T. (2007). Performance measurement and continuous improvement: are they linked to manufacturing strategy? *International Journal of Technology Management*, 37(3-4), 237–246. http://dx.doi.org/10.1504/IJTM.2007.012260

Ittner, C. D., & Larcker, D. F. (1995). Total Quality Management and the Choice of Information and Reward Systems. *Journal of Accounting Research*, 33 (Studies on Managerial Accounting), 1–34. http://dx.doi.org/10.2307/2491371

Jaca, C., Viles, E., Paipa-Galeano, P., Santos, J., & Mateo, R. (2014). Learning 5S principles from Japanese best practitioners: case studies of five manufacturing companies. *International Journal of Production Research*, 52(15), 4574–4586. http://dx.doi.org/10.1080/00207543.2013.878481

Jørgensen, F., Matthiesen, R., Nielsen, J., & Johansen J. (2007). Lean Maturity, Lean Sustainability. In J. Olhager, & F. Persson (Eds.), *Advances in Production Management Systems* (pp. 371–378). Boston, MA: International Federation for Information Processing. http://www.harianregional.com/ ; https://doi.org/10.1007/978-0-387-74157-4_44

Kaplan, R. S. (1994). Management accounting (1984-1994): development of new practice and theory. *Management Accounting Research*, 5(3), 247–260. http://dx.doi.org/10.1006/mare.1994.1015

Kaplan, R. S., & Norton, D. P. (1992). The Balanced Scorecard: Measures that Drive Performance. *Harvard Business Review*, 70(1), 71–79. https://hbr.org/1992/01/the-balanced-scorecard-measures-that-drive-performance-2

Kaplan, R. S., & Norton, D. P. (2008). The Execution Premium, Linking Strategy to Operations for Competitive Advantage. Boston, MA: Harvard Business Press.

Kobayashi, K., Fisher, R., & Gapp, R. (2008). Business improvement strategy or useful tool? Analysis of the application of the 5S concept in Japan, the UK and the US. *Total Quality Management and Business Excellence*, 19(3), 245–262. http://dx.doi.org/10.1080/14783360701600704

Kujačić, M., Blagojević, M., Šarac, D., & Vešović, V. (2015). The Modified Activity-Based Costing Method in Universal Postal Service Area: Case Study of the Montenegro Post. *Inzinerine Ekonomika-Engineering Economics*, 26(2), 142–151. http://dx.doi.org/10.5755/j01.ee.26.2.2818

Lee, S. M., Luthans, F., & Richard M. H. (1992). Total quality management: implications for Central and Eastern Europe. *Organizational Dynamics*, 20(4), 42–55. http://dx.doi.org/10.1016/0090-2616(92)90074-W

MacDuffie, J. P. (1995). Human Resource Bundles and Manufacturing Performance: Organizational Logic and Flexible Production Systems in the World Auto Industry. *Industrial and Labor Relations Review*, 48(2), 197–221. http://dx.doi.org/10.2307/2524483

Maskell, B. (1991). Performance Measurement for World Class Manufacturing: A Model for American companies. New York, NY: Productivity Press.

Mia, L. (2000). Just-in-time manufacturing, management accounting systems and profitability. *Accounting and Business Research*, 30(2), 137–151. http://dx.doi.org/10.1080/00014788.2000.9728931

Odar, M., Kavčič, S., & Jerman. M. (2015). The Role of a Management Accounting System in the Decision/Making Process: Evidence from a Post-Transition Economy. *Inzinerine Ekonomika-Engineering Economics*, 26(1), 82–94. http://dx.doi.org/10.5755/j01.ee.26.1.4873

Pryor, T. (2010). A financial thermometer for lean operations. *Journal of Corporate Accounting & Finance*, 21(2), 81–91. http://dx.doi.org/10.1002/jcaf.20566

Radosevic, M., Baosic, M., Caric, M., Jovanovic, V., Beric D., Bojic, Z., & Avramovic, N. (2014) Implementation of Business Process Reengineering in Human Resource Management. *Inzinerine Ekonomika-Engineering Economics*, 25(2), 211–222. http://dx.doi.org/10.5755/j01.ee.25.2.4590

Scott, B. S., Wilcock, A. E., & Kanetkar, V. (2009). A survey of structured continuous improvement programs in the Canadian food sector. *Food Control*, 20(3), 209–217. http://dx.doi.org/10.1016/j.foodcont.2008.04.008

Sahno, J., Shevtshenko, E., Karaulova, T., & Tahera, K. (2015). Framework for Continuous Improvement of Production Processes. *Inzinerine Ekonomika-Engineering Economics*, 26(2), 169–180. http://dx.doi.org/10.5755/j01.ee. 26.2.6969

Shah, R., & Ward, P. T. (2003). Lean manufacturing: context, practice bundles, and performance. *Journal of Operations Management*, 21(2), 129–149. http://dx.doi.org/10.1016/S0272-6963(02)00108-0

Schmenner, R. W., & Vollmann, T. E. (1994). Performance measures: gaps, false alarms, and the "usual suspects". *International Journal of Operations & Production Management*, 14(12), 58–69. http://dx.doi.org/10.1108/01 443579410072391

Tangen, S. (2003). An overview of frequently used performance measures. *Work study*, 52(7), 347–354. http://dx.doi.org/10.1108/00438020310502651

Todorovic, M., & Cupic, M. 2014. Influence of continuous improvement programs on company performance. *Paper presented at the International Finance and Banking Conference* FI BA 2014, March 27-28, 2014, Bucharest, Romania.

Uhlenbruck, K., Mayer, K. E., & Hitt, M. A. (2003). Organizational transformation in transition economies: resource-based and organizational learning perspectives. *Journal of Management Studies*, 40(2), 257–282. http://dx.doi.org/10.1111/1467-6486.00340

van Iwaarden, J., van der Wiele, T., Dale, B., Williams, R., & Bertsch, B. (2008). The Six Sigma improvement approach: a transnational comparison. *International Journal of Production Research*, 46(23): 6739–6758. http://dx.doi.org/10. 1080/00207540802234050

Vidal, M. (2007). Lean production, worker empowerment, and job satisfaction: A qualitative analysis and critique. *Critical Sociology*, 33(1-2), 247–278. http://dx.doi.org/10.1163/156916307X168656

White, R. E., Pearson, J. N., & Wilson, J. R. (1999). JIT manufacturing: a survey of implementations in small and large US manufacturers. *Management science*, 45(1), 1–15. http://dx.doi.org/10.1287/mnsc.45.1.1

Wruck, K. H., & Jensen, M. C. (1994). Science, specific knowledge, and total quality management. *Journal of Accounting and Economics*, 18(3), 247–287. http://dx.doi.org/10.1016/0165-4101(94)90023-X

Yin, R. K. (2014). Case Study Research: Design and Methods. Thousand Oaks, CA: Sage Publications, Inc.

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