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Lean Six Sigma in Slovenian and Serbian manufacturing companies

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Abstract

This paper deals with the Lean Six Sigma methodology used in Slovenian and Serbian manufacturing companies. The first part of the paper presents the Six Sigma, lean, supply chain and manufacturing environments. This is followed by a presentation of the results of the comparison study performed in Slovenian manufacturing companies in 2008 and Serbia in 2010. Experiences and trends from the Slovenia study in 2012 are also presented. The research presents the use of Lean Six Sigma in Slovenian and Serbian manufacturing companies, barriers and the key success factors of its implementation in the periods 2008-2010-2012. The results show many similarities. The main challenges in Slovenian and Serbian manufacturing companies are increased competition and customer product individualisation and focus on product quality. Managers in Serbia are often satisfied with the existing quality system and the results show that management in Serbia do not find Six Sigma a customer requirement. The third most common reason for not using Lean Six Sigma was a lack of human resources in the company to support its implementation.

Key words: Lean, manufacturing, Serbia, Six Sigma, Slovenia, supply chain

1. INTRODUCTION

Slovenia and Serbia are both transition economies. Slovenian manufacturing companies have been adopting Lean Six Sigma later than many other western economies, but nevertheless, in front of Serbian manufacturing companies. The findings in this paper show the experiences of Lean Six Sigma use in Slovenian manufacturing companies, the comparison study with Serbia and the latest detected trends of Lean Six Sigma use in Slovenia. The results from Slovenia (2008-2012) are interesting for Serbia from the perspective of how development of Lean Six Sigma methodology in Serbia could build up further on. During the last two decades, manufacturing paradigms have been subjected to transition. As a result, organizations are facing increased pressure from customers and competitors to deliver high quality products at low cost in the shortest period of time [9][18]. Increasing demand for high quality products and the need for highly capable business processes have led to organizations including Six Sigma, Lean and a combination of the two in their business strategy. Large

size organizations all over the world have already adopted Six Sigma and/or Lean, the latter of which is a process improvement and problem solving approach to enable higher-level performance through the achievement of a higher degree of quality.

Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects and minimizing variability in products [24]. Lean focuses on the smooth process flow while Lean Six Sigma integrates both Six Sigma and Lean concepts to bring out the advantages of both [18].

Achievement of goals related to high product quality, low product manufacturing costs and high innovativeness is related to the manufacturing process. Processes in any manufacturing company always include sub-processes such as processes in the supply chain (SC).

A basic condition for achieving low costs and a highly innovative product is to have and to manage low costs and lean and high quality processes throughout the entire SC. In the last decade, one very exposed and growing methodology for process optimisation

has been Six Sigma and the emerging Lean method, and their integration known as Lean Six Sigma (LSS). Therefore, suppliers in any manufacturing SC are forced to also use new tools and methods for process optimisation, such as LSS. Figure 1.

2. LSS IN MANUFACTURING ENVIRONMENT

2.1 Six sigma

Six Sigma is a well-established DMAIC (define – measure - analyze – improve - control) methodology that seeks to identify and eliminate defects, mistakes or failures in business processes or systems by focusing on those process performance characteristics that are of critical importance to customers [21] [22]. Four elements, that are distinctive to Six Sigma with respect to quality, are highlighted:

1. Focus on financial and business results is to some extent unique.
2. The use of a structured method for process improvement or new product and service introduction is also not entirely distinctive.
3. The use of specific metrics is also new with Six Sigma.
4. The use of a significant number of full-time improvement specialists in Six Sigma is new to many organisations [16].

The development and application of Six Sigma performance measures, both - strategic and operational performance measures, lead to a more sustainable approach to business improvement [8]. There are many aspects of the SS management business strategy which support development strategies [12].

Six Sigma places a clear focus on the bottom-line impact of costs and savings. However, not all Six Sigma projects produce large direct benefits, many produce only local improvements [19] and about 20 percent of projects are cancelled [2]. Six Sigma has been very successful in integrating both human aspects (cultural change, training, customer focus, etc.) and process aspects (process stability, variation reduction, capability, etc.) of continuous improvement.

Every single employee at all levels of the organization must perform their tasks in order to improve the company's success and efficiency. Six Sigma DMAIC methodology links the tools and techniques in a sequential manner. Six Sigma creates a powerful infrastructure for training Six Sigma experts: yellow belts, green belts, black belts and master black belts, as well as champions.

On the other hand, other rapidly emerging methodologies such as Lean manufacturing have emerged in western economies and abroad. The lean manufacturing methodology can, with support of Six Sigma (Lean Six Sigma), also increase process and company efficiency.

2.2 Lean

The source of the term lean manufacturing can be traced to the International Motor Vehicle Program (IMVP), and was first used by [10] [11]. However, the just-in-time (JIT) system or Toyota manufacturing system (TPS) was the forerunner of lean manufacturing, with the works of Taiichi Ohno, Shigeo Shingo, and Yasuhiro Monden representing notable markers of the rise of JIT/TPS/lean in the 1980s [20]. Later, Womack et al. (1990) reported on the results from the IMVP study and offered (coined by John Krafcik) lean manufacturing as a synonym for the practices pioneered by Toyota; the concepts and techniques under the lean label were the same as those of JIT a decade earlier [20].

Five lean principles have been defined [23]: value, value stream, flow, pull, and perfection, described in the following way:

1. Value is defined by the ultimate customer.
2. The value stream is the set of all specific activities required to bring a specific product through the internal value chain.
3. Flow is about making the value-creating steps flow.
4. Pull refers to using a pull schedule.
5. Perfection is concerned with making improvement a continuous effort.

The success of lean manufacturing is dependent upon contextual factors such as type of market, dominant technology, and supply chain structure. The more successfully a firm applies lean principles, the less it will engage in general innovative activity. Lean manufacturing by developing a value stream, helps us to eliminate all waste, including time, and ensures a level schedule. A level schedule means that the manufacturing process must be protected from uncertainty and variation. This makes high-capacity utilization possible, thus leading to lower manufacturing costs. Lean manufacturing in this sense is a programme aimed mainly at increasing the efficiency of operations. Integration of SS and lean are presented below in Figure 1.

Customer & Quality Six Sigma	Speed & Low Cost & Flexibility Lean
<ul style="list-style-type: none"> - Management engagement - Dedicated infrastructure - People - VOC, SPC - Design of Experiment - Poka-Yoke - Gage R&R, FMEA - Cause and Effect Analysis 	<ul style="list-style-type: none"> - "Pull" from the Customer - VSM to identify NVA - Time trap and removal - Setup and queue reduction - Process flow improvement - TPM - 5S - Kaizen
<p>Six sigma enables quality</p>	<p>Lean enables faster process flow</p>

Figure 1. Six Sigma and Lean support each other

SS improves the quality of value add steps. Lean reduces non-value add steps. Lean SS drives quality, speed and cost simultaneously. So, today we speak about LSS methodology. Both lean and SS tools need to be used concurrently to ensure effectiveness. The integration of these two paradigms enables the attainment of common goals [18]. LSS combines the strategy and solution sets inherent in Lean with the cultural, organizational process and analytical tools of SS, resulting in better and faster response to customers with less waste. The relation between SS and other improvement initiatives seems to be synergic (Lean, ISO, etc.), but also conflictive because all these initiatives compete for the same type of internal human resource [16]. Therefore, SS and Lean cannot be used separately, but an LSS methodology must be used.

2.3 LSS in the supply chain (SC)

In today's highly competitive environment, supply chain (SC) performance is extremely vital for the survival of firms because customers judge the performance of firms based on their SC performance. Competition is no longer merely between firms but also between entire SCs. So, SC has become an important dimension to which companies must give maximum attention so as to excel in a competitive environment. The field of supply chain management (SCM) is growing day by day. According to Womack and Jones [24], Six Sigma and SCM are two pillars of business improvement.

SCM has become a key strategic factor/tool for firms to improve their performance and secure their competitiveness in a market place. In order to successfully implement SCM, all firms within a SC must reduce functional silos and adopt a process approach [13]. In recent years, SCM performance has become very vital for the survival of firms because customers judge the performance of firms based on their SC performance [15]. The unified structure of DMAIC provided in the LSS framework encourages various SC players to support the improvement process, based on the P-D-C-A cycle. Management can receive feedback from the operational level which aids in enhancing improvements within the process. From the study it is concluded that SS (DMAIC) with integration of the SIPOC model (Supplier – Input – Process – Output - Customer) has been established as winning practice in improving the manufacturing process – the key entity in the SC network. Figure 2.

The success of the framework can encourage the various stakeholders to use the presented methodology to improve and reduce losses in their processes after identifying key performance attributes related to process dimensions [15].

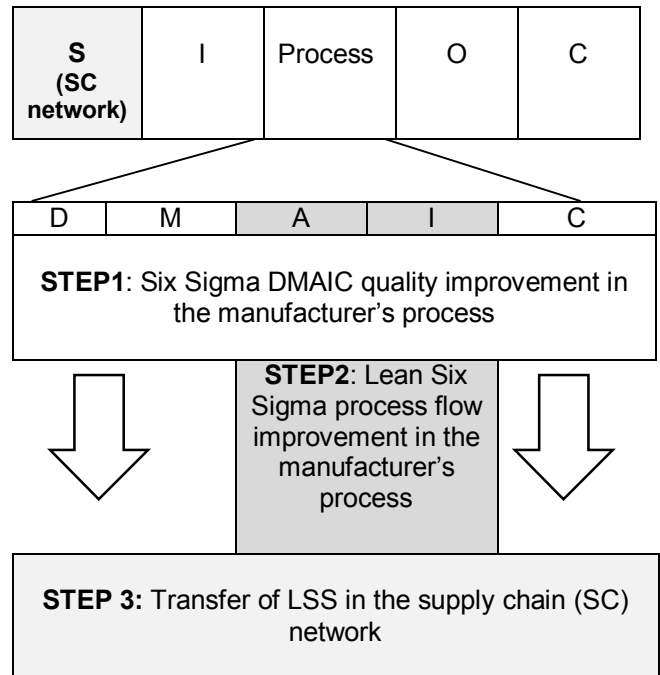


Figure 2. Lean Six Sigma DMAIC Improvement Process Road Map and activities which need to be implemented by the manufacturer and in the SC network

3. LSS RESEARCH IN SLOVENIAN AND SERBIAN MANUFACTURING COMPANIES

The main objective of this comparison study is to examine how Slovenian and Serbian manufacturing companies are implementing LSS methodology. In order to do this effectively, the general objective was further divided into a number of specific research questions as follows:

- RQ1: What are the challenges, similarities and differences between Slovenian and Serbian manufacturing companies?
- RQ2: What will be their primary focus in the future and to what extent are Slovenian and Serbian manufacturing companies prepared for the implementation of Six Sigma?
- RQ3: What are the most common barriers to Six Sigma implementation in manufacturing organisations in Slovenia and Serbia?
- RQ4: What are the detected Six Sigma project manager characteristics and trends in Six Sigma organisations in Slovenia 2012?

The research for Slovenia (2008) is based on the research [5] [6]. Based on the literature review [1] [5] and the authors' experiences, a structured questionnaire was developed. The questionnaire was e-mailed out to 100 manufacturing companies in Slovenia in April 2008. Of the 100 questionnaires mailed, a total of 21 completed questionnaires were returned within a 3-month period. This represented a response rate of 21 percent.

The research for Serbia (2010) is based on study [4] [5]. The questionnaire in Serbia was e-mailed out to 170 manufacturing companies in January 2010. A total of 60 completed questionnaires were returned in a

3-month period, representing a response rate of 35 percent [14].

3.1 Several characteristics of Slovenian and Serbian manufacturing companies in the SC

Discussion regarding Six Sigma activity and its impact on organizations in developed economies is common place. However, despite numerous papers written about SS, the challenges facing organizations in emerging economies in Central and Eastern Europe are given little attention. In an ever-increasing competitive environment, a strong focus on critical success factors (CSF) for successful SS implementation in transition countries is required.

Slovenia and Serbia are both transition economies possessing many similarities. The institutional phase of the socio-political transition has concluded but the socio-economic transition has not yet been completed.

1. The Slovenian and Serbian economies are transitional economies.
2. Manufacturing companies are strongly affiliated with the EU and global automotive industry; Slovenian and Serbian companies are often included in the SC on the bases of low costs and the manufacturing field, and less with regard to the field of new product development (NPD).
3. The global car producer Renault in Slovenia with a strong local Supply chain in Slovenia (SC).
4. The global car producer Fiat in Serbia with a strong local Supply chain in Serbia (SC).
5. The Slovenian and Serbian economies are open and globally oriented and prone to low price competition from the east, dictating process improvements, higher productivity, low costs and higher value added (VA).
6. Intense pressure for low manufacturing costs and high product quality throughout the entire SC is present [17].
7. There is increased demand for process innovations and high value added throughout the entire SC [6].

In the future, many organizations and industries, including the Slovenian and Serbian manufacturing industries, will focus more on the following projects: carrying out projects on managing globalisation, research and sustainable development projects, cost management-oriented projects, manufacturing cost management projects, innovative product development and brand management-related projects [4]. Thus, for a successful project selection and implementation good product management supported by Lean and SS and customer benefit-oriented projects is required [3] [6] [7]. Also [17] classify 8 project types in Slovenian manufacturing companies. Their results show that the most important competitive criterion in Slovenian project-oriented companies is product quality, followed by product price and customisation to customer demands [17]. These results are also quite comparable to the results of several previous researches on the field regarding the challenges of manufacturing companies in Slovenia in the past [3] [7].

4. RESULTS

Survey results from Slovenia (2008)

The majority of the companies had between 100 and 500 employees (43 percent), with 33.5 percent of the organisations having from 500 to 2000 employees and 14 percent of respondents having up to 100 employees. Only 9.5 percent of the companies had over 2000 employees. In the companies where no Six Sigma methodology had yet been implemented, participants were quality managers who work in the field of quality management in the manufacturing companies. The respondents in this study consisted of mechanical engineering (34.5 percent), automotive (23 percent), electro (9.5 percent), chemical (19 percent) and telecommunication (14 percent) companies.

Survey results from Serbia (2010)

The majority of the companies had between 100 and 500 employees (40 percent), with 30 percent of the organisations having between 500 and 2000 employees and 20% of the respondents having up to 100 employees. Only 10 percent of the companies had over 2000 employees. The participants were quality managers working in the field of quality management in the manufacturing companies. The respondents in this study consisted of mechanical engineering (39 percent), electro (23 percent), chemical (22 percent), automotive (8 percent), and telecommunication (8 percent) companies.

4.1 Comparison study: Challenges of manufacturing companies in Slovenia and Serbia (RQ1)

Analysis of the current challenges of Serbian manufacturing companies showed the biggest opportunity in the field of how to satisfy customer expectations to be the consideration of individual needs. (Figure 3)

Respondents were asked about the biggest challenges they faced in their business. A five-level Likert scale was used. (1... factor does not present any challenge for our organisation at all, 2... , 3..., 4... and 5... factor presents extremely big challenge for our organisation). The results are shown below. (Figure 3).

Survey results from Slovenia (2008)

Analysis of the current challenges of Slovenian manufacturing companies (those which use and those which do not use Six Sigma) shows a similar finding with the biggest opportunity being the consideration of individual needs for satisfying customer expectations. Figure 3.

Survey results from Serbia (2010)

None of 60 companies was actively involved in the Six Sigma programme, and there are no certified individuals in the field of Six Sigma present in those companies. This clearly shows us that Six Sigma is a new methodology in Serbian manufacturing companies.

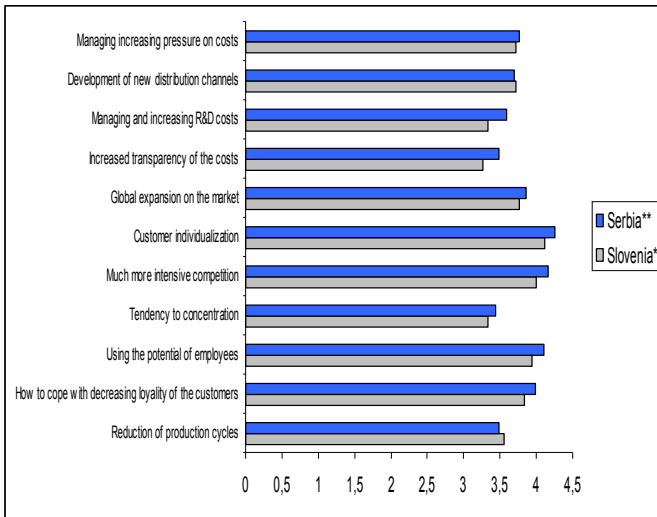


Figure 3. Challenges of Slovenian and Serbian manufacturing companies

4.2 Comparison study: Primary focus of manufacturing companies in the future in Slovenia and Serbia (RQ2)

The respondents were asked what the main focus in future would be to cope with challenges. The five-level Likert scale was used (from 1—we will not focus on this at all, to 5 - we will focus on this intensively).The results are shown below. (Figure 4)

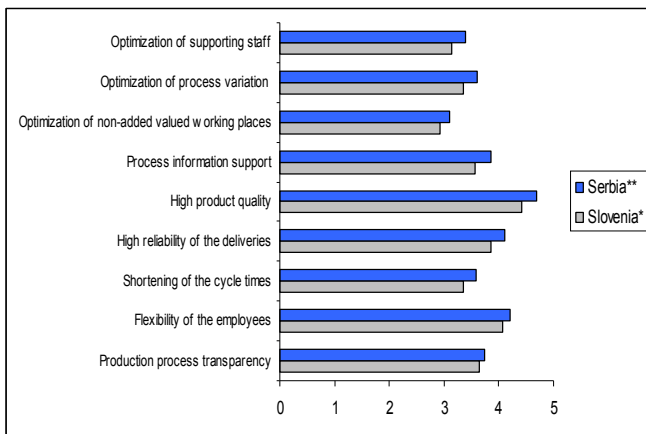


Figure 4. Primary focus of manufacturing companies in the future in Slovenia and Serbia

Survey results from Slovenia (2008)

Analysis of the current challenges of Slovenian manufacturing companies (2008), both those that use and those that do not use Six Sigma shows us that they detect the biggest opportunity in the field of how to satisfy customer expectations by considering individual needs. On the global market they face global competition and are often confronted with the challenge of how to use their employees' potential and internal knowhow, and how to empower existing knowledge to ensure further existence. Additionally, many of the other detected and expressed challenges can be more or less directly related to customers.

Survey results from Serbia (2010)

Response to these challenges shows us that many of

the Serbian manufacturing companies see an opportunity in focusing on the quality of their products (4.69 of 5), increasing the flexibility of their employees (4.21 of 5) and in the high reliability of deliveries (4.10 of 5) (Figure4).

Many of the other replies were directed at the management of all kinds of organizational processes (product development, manufacturing, delivery) and quality aspects of products and orientation towards customer needs. This presents also opportunity for Six Sigma implementation in those organisations.

4.3 Comparison study: Common barriers of LSS implementation in Slovenia and Serbia (RQ3)

The respondents were asked what the most common barriers related to the implementation of Six Sigma were. A combined open-closed type of questionnaire was used.

Survey results from Slovenia (2008)

Many of the big manufacturing companies in Slovenia are already implementing Six Sigma while many others are not. One of the questions in this study was also what the reasons were that manufacturing companies in Slovenia were not implementing Six Sigma. A questionnaire was designed and the issue researched. The most important reason was that manufacturing companies in Slovenia were satisfied with the existing quality system they had (30.77 percent), another was that top management was not interested in implementing Six Sigma (30.77 percent) while the third most common reason was the lack of human resources in the company (15.38 percent) to support the implementation. Only 7.69 percent of the companies were not familiar with Six Sigma.

Survey results from Serbia (2010)

Many of the manufacturing companies in Serbia are not implementing Six Sigma. One of the questions in this study was why manufacturing companies in Serbia did not implement Six Sigma. The most important reason was that manufacturing companies in Serbia were satisfaction with the existing quality system they had (32 percent); followed by company management's belief that Six Sigma was not a customer requirement (20 percent) and the lack of human resources in the company (15 percent) to support implementation. Only 11 percents of the companies were not familiar with Six Sigma.

4.4 Comparison study: Six sigma project manager characteristics in LSS organisations and detected trends in Slovenia (2008-2012) (RQ4)

This research was in 2012 performed just in Slovenia. A lack of manufacturing companies in Serbia which are using Six sigma methodology and thus related number of Six sigma certified experts in Serbia is very limited. So, this comparison research in Slovenia (2008-2012) can be used to help Serbian managers how to select and educate Six

sigma managers. Selection of proper Six sigma managers and their education can significantly affect the success of further Six sigma implementation in Serbian manufacturing companies.

Research in Slovenia (2008-2012)

In the first part of the questionnaire, analysis helped us to better understand the findings of the study. Several crucial aspects have been analysed, such as the number of employees in the organisation, the position occupied by the respondents, the areas of industries, the status of Six Sigma implementation, number of years of presence of Six Sigma in the company and number of concluded Six Sigma projects within the organisation.

The questionnaire was e-mailed out to 100 production companies in Slovenia in April 2008. Of the 100 questionnaires mailed, a total of 21 completed questionnaires were returned during a 3-month period. This represented a response rate of 21 percent which is similar to other research worldwide using this tool (survey).

A survey was implemented in April 2012 on the field and 33 completed questionnaires were obtained. The companies participating in the study carried out in 2008 consisted of mechanical engineering (34.5 percent), automotive (23 percent), electro (9.5 percent), chemical (19 percent) and telecommunication (14 percent) companies. The companies participating in the 2012 study comprised mechanical engineering (73 percent), automotive (24 percent) and chemical (3 percent) companies. The authors strongly believe that this figure might change with increased sample size.

The following table (refer to Table 1) shows the mean responses of top 12 essential characteristics for Six Sigma project managers. The results of the comparison study show several differences in the perceived characteristics of Six Sigma project managers, such as: the item "change agent" was found to be a much less important characteristic for a Six Sigma project manager in the 2012 study than in the study of 2008. This can be explained by the fact that, after the 2008 crisis the main impulse for change was external crisis, rather than an internal cause. On the other hand, some items such as: "being innovative", "defending customer interests" and "risk taker" became much more desired personal characteristics of Six Sigma project managers in 2012 compared to 2008. This can be explained by the fact that companies had 4 years more experiences with Six Sigma by 2012. So the companies possessed different priorities and different projects in 2012 than in 2008. Many projects in 2008 and at the beginning of Six Sigma implementation were focused on quick wins and easy earnings [3]. During the 2008-2012 period the structure of Six Sigma projects has changed as have the priorities, and can consequently be linked to the personal characteristics of Six Sigma project managers identified in 2012.

Table 1. Results of the comparison study of Six Sigma project manager characteristics

Characteristics	2008	2012	St.dev. 2012	Higher in 2012	Lower in 2012
Mean value (1...5)					
Change agent	4.92 (1)	4.21	0.74		-0.71
Results oriented	4.64 (2)	4.24	0.83		-0.4
Motivated to lead	4.50 (3)	4.42 (1-2)	0.75		-0.08
Effective communicator	4.42 (4)	4.39 (3)	0.75		-0.03
Positive thinker	4.35 (5)	4.36 (5)	0.78	+0.01	
Networking ability	4.35	4.36 (4)	0.70	+0.01	
Respect for others	4.28	4.27	0.76		-0.01
Problem solving ability	4.21	4.30	0.77	+0.09	
Team builder	4.14	4.21	0.86	+0.07	
Innovative	4.14	4.42 (1-2)	0.75	+0.28	
Defends customer interests	3.570	4.03	0.88	+0.46	
Risk taker	3.07	3.82	1.01	+0.75	

5. DISCUSSION

Slovenian manufacturing organizations are implementing Six Sigma methodology because of customer requirements related to product quality. The higher the priority to customer focus, the more likely organizations will be oriented towards Six Sigma implementation. Top management commitment is a crucial factor for Six Sigma implementation in Slovenian manufacturing organizations. The higher the top management commitment and support is, the more successful Six Sigma implementation within the organization will be. This can be related to the early stage of Six Sigma implementation in Slovenian organizations, where analysis shows that 49 per cent of the organizations have used Six Sigma for up to 1 year while 87 per cent have used Six Sigma from 1 to 3 years. In this early stage of implementation, it is reasonable that initial projects – usually pilot projects will be oriented at customer benefits, strategy and finance for such projects are usually used to demonstrate the best effects for a later stage or further projects. In addition, the companies are much more oriented at quick wins with a high probability of success. From previous research, we can conclude that at this moment, there are no companies in Serbia (or few companies) which rely on Six Sigma methodology, and not enough staff present in companies with adequate training and certification to apply the methodology. Using Six Sigma, companies achieved the business goals and improvements that have already been mentioned. For example, Six Sigma methodology is successfully applied in a significant number of Slovenian companies which have executed a large number of different projects in last few years.

The 2012 Slovenian study illustrates the role and essential attributes of Six Sigma project managers in Slovenian manufacturing organisations and provides us with a comparison to 2008. The authors have attempted to compare the essential attributes of Six Sigma project managers proposed by many practitioners and academics who have carried out research in the field. Since Slovenian and Serbian economy are very similar, and because Six sigma initiative in Slovenia has longer tradition in Slovenia than in Serbia, experiences from Slovenian on the field of selection of proper Six sigma managers and their education can be used also in Serbia and increase the success of Six sigma implementation in Serbian manufacturing companies.

The top five essential characteristics for Six Sigma organisations in 2012 include: (1-2) innovative and motivated to lead, (3) effective communicator, (4) having networking ability, and (5) being a positive thinker. In 2008 the top characteristics were (1) a change agent and (2) results oriented. Six Sigma projects in Slovenia 2008 were more oriented at quick wins with a high probability of success. Today, in 2012 with 4 years of additional Six Sigma experience in Slovenia projects are much riskier and more customer oriented, reflecting today's economic situation. The authors strongly believe that this figure may change with an increased sample size or broader scope of companies included in this research. Future studies will be focused on comparison studies with other similar economies to Slovenia's and Serbia's.

6. CONCLUSION

Based on the large number of similarities between Serbia and Slovenia, implementation of Six Sigma in Serbian companies will be very important and should be given priority. The application of the methodology in Serbian companies will become inevitable in the coming years and will present one of the solutions for improving business results and competitiveness. Although companies in Serbia have implemented systems of standardization and product and process quality control, increased implementation of Six Sigma tools and techniques is expected. The growing need for employee training and certification in this area as a means of implementing crucial and sustainable changes must also be taken into account. Experiences from Slovenia 2008-2012 can be further used directly also in Serbia which is more and more adopting lean and Six sigma methodologies, especially in manufacturing companies. The study is limited by the number of organizations in the research samples for Slovenia and Serbia and by the limited number of industrial organizations in those countries. The results may be generalized for similar transition economies. The time dimension of the study could be eliminated by implementing the study in both countries at the same time. The authors also believe that a larger research sample could affect the results of this study. The authors will take the results of this study into account with regard to continued research and further periodical comparison studies.

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Lean Six Sigma u slovenačkim i srpskim proizvodnim preduzećima

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Primljen (09.07.2014) Recenziran (05.09.2014); Prihvaćen (13.10.2014)

Rezime

Predmetni rad se bavi metodama Six Sigma i Lean u slovenačkim i srpskim proizvodnim preduzećima. Na početku rada su predstavljene metode Six Sigma, Lean i lanci snabdevanja u proizvodnom okruženju. Predstavljene su rezultati komparativne analize stanja upotrebe metoda Lean Six Sigma u Sloveniji (2008, 2012) i Srbiji (2010). Istražena je upotreba Lean Six Sigma metoda u slovenačkim proizvodnim kompanijama i predstavljeno je poređenje sa Lean Six Sigma iskustvima u Srbiji. Rezultati poređenja ukazuju na mnoge sličnosti. Nošenje sa sve većom konkurencijom, individualizacijom proizvoda i njihovim kvalitetom su najveći izazovi proizvodnih preduzeća u Sloveniji i Srbiji. Menadžeri u Sloveniji i Srbiji su često zadovoljni postojećim sistemima kvaliteta u preduzećima, kupci ne zahtevaju primenu Lean Six Sigma metode, a premalo je i resursa (prvenstveno ljudskih) za njenu implementaciju i zato se ona ne upotrebljava.

Ključne reči: Six Sigma, Lean, proizvodnja, snabdevanje, lanac, supply chain, Slovenija, Srbija