

SIX SIGMA VS. TOTAL QUALITY MANAGEMENT – PRESENCE IN WORLD AND SERBIAN ECONOMY *

UDC 005.6(100+497.11)

Marija Anđelković Pešić, Vinko Lepojević, Vladimir Zlatić

University of Niš, Faculty of Economics, Serbia

marija.andjelkovic@eknfak.ni.ac.rs, vinko.lepojevic@eknfak.ni.ac.rs, vzlati@verat.net

Abstract. *The Six Sigma concept represents a step forward in the evolutionary development of the approaches for providing competitive advantage based on continuous quality improvement. In that sense, this concept is the successor of Total Quality Management, and, as each new generation surpasses its predecessor, Six Sigma goes beyond Total Quality Management. After implementation of this concept many companies around the world have achieved significant results. Guided by this fact, the aim of this paper is to show the advantages of the Six Sigma concept compared to Total Quality Management. The paper presents data which show presence of the Six Sigma concept in the world economy, but at the same time data from which one can realize the "place" of the Serbian economy compared to the world economy, when it is about implementation of this concept.*

Key Words: *Six Sigma, Total Quality Management, customers, defects, leadership, business culture.*

INTRODUCTION

The appearance of defects is possible in all the processes that take place in an enterprise. This means that defects occur during: determining the needs and demands of customers, product design and development, materials and equipment procurement, planning and preparation of production, transport of materials and unfinished products or parts of products, storage of materials and equipment, production process, storage of finished products, sales and distribution, product installation, technical assistance and maintenance and servicing. Issues that are imposed are the following: 1. Should all processes be improved at once or only some of them? 2. What should be changed in the process in order to provide positive effects on customer satisfaction?

Received April 23, 2011

* This paper represents the result of the work under the project No 179066, financed by Ministry of Science and Technological Development of Republic of Serbia

Managers must understand that quality is what customers want, not what they think customers want. Their opinion should not be restricted by the boundaries of the enterprise, but must be based on data collected from customers. The importance of exceeding customers' expectations is promoted by Norioki Kano (K. Ahoy, 2009). According to him, for providing competitiveness is usually not enough to meet the needs of customers, it is necessary to exceed their expectations or fascinate them. This is precisely the intention of the Six Sigma concept - to achieve, and continuously improve quality in order to ensure customers satisfaction and consequently customers' loyalty. Compared to the other initiatives for quality improvement, and among them especially Total Quality Management (TQM), beside other things, this concept stands out in treatment of variations and defects. All other features, which make the Six Sigma concept different from the other initiatives for quality improvement, are in the function of variations and defects management, which means prevention and elimination.

SIX SIGMA VS. TOTAL QUALITY MANAGEMENT – ESSENCE AND DIFFERENCES

Six Sigma is a business concept that is based on a disciplined improvement of quality, where the accent is on quality of process, in terms of increasing quality and reducing costs of their implementation, by reducing variation and defects. Due to the fact that it is implemented through methodology for process improvement, which assumes discipline and dependence on information, the Six Sigma concept, as well as the improvement projects that are implemented within, has a great probability for successful implementation.

Although the Six Sigma concept, in a way, is the successor of Total Quality Management, since it involves the same principles and tools, it also has features that make it different. The most important are: (Brown, 2001, 269):

- Identification, reduction and prevention of defects and variations, within the defined specifications,
- Existence of experts for the implementation of Six Sigma projects and precisely defined roles of employees,
- Promotion of the Six Sigma business culture,
- Continuous improvement of relationship with customers.

Other reasons for superiority of Six Sigma compared to Total Quality Management are listed and shortly explained below (Pande, Neuman, Cavanagh 2000):

1. TQM – a lack of integration: in Total Quality Management framework, quality is not sufficiently connected with the strategy and performances; a team that is responsible for quality improvement is autonomous and separated both from the top managers, as well as from the process executives;
Six Sigma – a high level of integration: Six Sigma process management, process improvement and measurement are seen as the daily responsibility of all employees, and above all operational managers and direct executives of business processes; this concept enables that the quality and costs, as well as their relationship, become an integral part of work of each employee;
2. TQM – apathy of leadership: when it comes to quality, quality leaders are managers who are committed to quality improvement, advocate for quality improvement, and take measures to raise the quality of the business to the next, higher level;

however, if top management support is missing, and they express scepticism for the ideas of leaders, these ideas may remain exactly that, just ideas, with no possibility for implementation; in such enterprises, where top managers' support is missing, quality improvement is only temporary assignment;

Six Sigma – leadership as a predecessor: the ideas of leaders are only the prelude or introduction to quality improvement process, because Six Sigma implies that top managers must understand the necessity of change, and the necessity of quality improvement for continuity of successful business; only with the support of top managers, ideas of leaders and other employees can become a reality;

3. TQM – stabilization of quality: the objective of Total Quality Management is primarily to stabilize the level of quality, not improve it;

Six Sigma – quality improvement: the message that Six Sigma promotes includes continuous improvement of enterprise, focusing on customers, process management and process improvement;

4. TQM – unclear goal: the goal that is promoted by Total Quality Management is usually expressed as "achieving or surpassing customers' requirements"; however, as customers' requirements are subject to change, meeting customers' needs today, does not assure their satisfaction in the future;

Six Sigma – ambitious goal: Six Sigma defines a challenging, ambitious goal, which is expressed as "providing zero-defects"; this goal is very clear, since it is defined as defects rate or correctness rate, which should be around 99.99966%;

5. TQM – strong attitudes or technical fanaticism: the team charged for Total Quality Management creates a "quality policy" and takes care that business processes are realized in accordance with this policy; quality policy is defined without consulting the direct executives of the processes, but they are forced to comply it; due to that, direct executives are often alienated from the defined quality policy;

Six Sigma – the degree of rigidity depends on the circumstances: Six Sigma involves the expertise of employees for performing specific activities, particularly in terms of their adaptation to changing conditions, and not only in terms of mechanical application of technical guidelines, programs or policy; employees are given the authority to perform work in a way they think is the best, but they must always have in mind the fact that the results of their work reflect the results of the enterprise as a whole.

Previously pointed differences can be accepted to a lesser or greater extent. It seems that Total Quality Management is too strictly valued compared to Six Sigma. However, the results of enterprises that have implemented Six Sigma concept testify about its superiority. The advantages or, at least, the elements in which Six Sigma is different compared to Total Quality Management are: the attitude about defects, the relationship with customers, leadership and business culture.

THE ATTITUDE ABOUT DEFECTS

Variations are immanent to every enterprise, regardless whether it is about variations during the process or variations in process output characteristics, which occur as a result of variations during the process. Variations occur as a result of various factors, some of

them can be controlled, reduced and / or eliminated, while others are inherent to the process and cannot be eliminated. The variations that are caused by factors, which are clearly defined and which can be controlled, belong to the first group of variations. Such are variations that occur as a result of unequal or inadequate training of employees, inadequate adjustment of machines for production of a specific part of a product or for performing specific operations. Variations that are inherent to the processes cannot be avoided, and in some way represent one of the characteristics of the process. For example, variations during the process may be result of the selected type of machines for performing certain operations, and cannot be eliminated until the current machine is used.

Variations are in inverse relation with regard to quality, which means that with decreasing of variations quality increases. However, it is almost impossible to eliminate all variations from the process. It is therefore necessary to make specifications that will determine not only the target value, but also acceptable limits, or upper and lower limits of certain parameters. For this reason, it can be said that there is the difference between variations and defects, because every defect is a reflection of some variation, but each variation does not represent a defect.

Defect (or as it is usually denoted - nonconformity) is the occurrence of failure to meet the established requirements, defined by the customers', or the defined specifications, which are determined based on customers' requirements. Gathering information about the defects, the way of their expression and possible ways of their elimination or creating a database of defects, is very important for formulation of management actions. Information about the defects is of great help when it is necessary to prevent their occurrence or to eliminate them, painlessly and quickly, if they are already present.

Although generally associated with the manufacturing process, defects can occur before, during or after manufacturing process (Popovic, 1992). For example, defects before manufacturing process may be the wrong size of purchased parts (components) of products, inadequate material, incomplete constructional documentation, inadequate preparation of production, machines etc. During the manufacturing process defects arise as a result of inadequate technological process or incompetence of employees who are directly engaged in the manufacturing process. In case that during manufacturing process happens the machine malfunction, cracking of material due to inadequate hardness and tear due to inadequate thickness of the material, these defects are the result of poor work done before the production process and should be considered as defects before manufacturing process (since they are caused by activities that precede the manufacturing process). Considering that services, which occur after manufacturing process, are very important for customers' satisfaction, enterprises must be careful and prevent product damage during transport, the lack of warranty, untimely delivery of products and so on.

If defect is not prevented or is not discovered on time at some point, in one phase or activity of a process, it will spread through all subsequent stages of the value chain and will cause further increase of enterprise's costs. Considering previously mentioned fact it can be said that the greater the possibility for costs savings will exist if the defects are earlier detected and / or prevented. Thus, the absence of timely detection of defects leads to a progressive increase in costs. The following table (Table 1), through the hypothetical example, shows how detection of defects in the later stages of the specific process causes significantly higher costs. The example considers the process of delivering products to customers, preceded by the procurement of components from suppliers and their processing.

Table 1. The progression of costs due to untimely discovering of defects

The moments of defects' detection	Additional costs
Supplier delivers a component of desired quality level	0 €
The defect is discovered when the component is delivered by supplier	0,3 €
The defect is discovered after the first operation on the component	3 €
The defect is discovered after the last operation on the product	30 €
The defect is discovered after the delivery to the customer	300 €

However, it is wrong to make judgments about the success of an enterprise based on defects, or depending on whether the defects occur to a greater or lesser number. Namely, it is possible that the number of defects has been decreasing, not due to higher level of quality process realization, but because decreasing the level of activities (Figure 1).

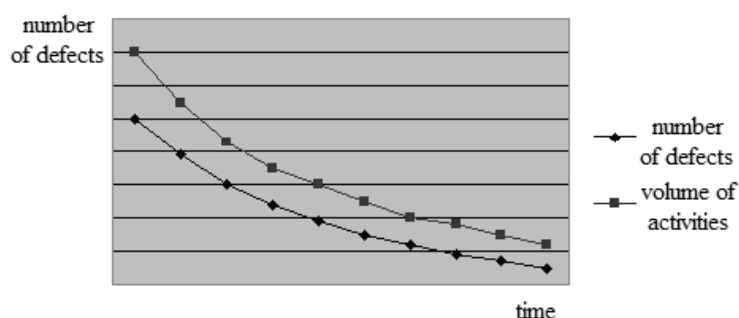


Fig. 1. Decreasing number of defects in unsuccessful enterprise
(According to: Deming, 1996, 11)

This means that it is almost certain that the number of defects in an enterprise will be reduced with decreasing level of activities performed in it. Therefore, the pursuit of the enterprise may not be simple elimination of defects or ensuring zero-defects, but eliminating defects with growth of volume of activities (Figure 2).

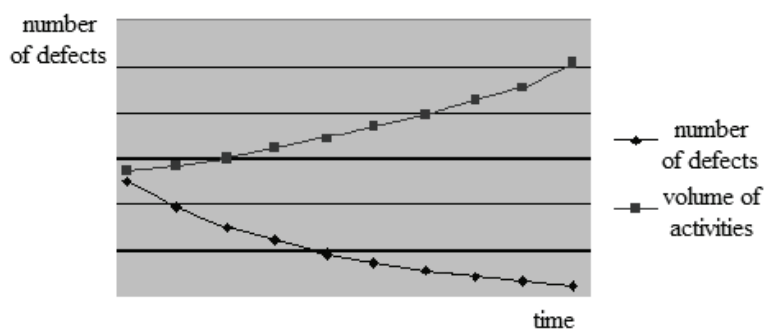


Fig. 2. Decreasing number of defects in successful enterprise
(According to: Deming, 1996, 13)

The information on defects, namely the number, type and causes of defects, is very important, but not enough to gain a true picture of quality of doing business. However, it is necessary to point out another context when the information about defects is not enough. Namely, it is possible that each part of a complex product is produced without defects, but that assembly of these parts does not function in a planned way or according to specifications. Therefore, even though parts are not defective, if they do not work together as a system, zero-defect in production of parts does not mean much - the parts are not defective, but their circuit (finished product) is.

Based on many years of experience Edwards Deming has formulated the principle called 85/15, which means that 85% of problems in an enterprise are the result of problems in the system or the process, and that only 15% of the problems result from mistakes of employees, as individuals (George, Rowlands, Kastle 2004). It can be concluded that managers are the ones that resist the implementation of Six Sigma concept, because they are accustomed, when they encounter a problem, to ask the question: Who is responsible? They, therefore, consider easier solution to find employees who will be blamed for the resulting problem, but to look for errors in the system or process.

In contrast to this behaviour of managers, the Six Sigma concept advocates an approach which implies that one should find fault in the process or system. For example, when the result of a particular employee is not satisfactory, managers must not simply punish the employee, but must try to find the real causes (root causes) of the problem. This may be poor communication with employees who perform activities that precede or follow the activities of the particular employee or poor communication with managers, lack of information or lack or insufficient training of employee etc. By analyzing the possible causes of problems one can detect quite different reasons for employees' mistakes than those managers initially have assumed.

In recent years of his work, Deming has reformulated 85/15 principle, recognizing that he was wrong. However, he formulated a new principle, which is called 96/4. With this new principle, he corrected his previously exposed attitude and said that 96% of the problems are result of a system or process, and that only 4% of the problems are result of errors of employees as individuals. Deming's aim was to point to the fact that the business improvement can be provided by changing the way the work has been done. This is why Six Sigma focuses on process improvement. Similar to Deming, Hitoshi Kume says that an essential source of errors is incomplete knowledge or imperfect performance of tasks (Soin, 1992, 137). He adds that these sources of errors cannot be completely eliminated, but can be reduced, through continuous improvement of business processes.

THE RELATIONSHIP WITH CUSTOMERS

In order to provide the best possible competitive position, enterprises are often focused on competition, instead of customers. Such enterprises often lose their customers, even though, according to their benchmarking reports, they perform better than competitors. By focusing on competition, and not on customers, enterprises usually lose very valuable resource or at least, they do not use it economically. If an enterprise loses the ability to "listen" customers and continues to "chase" the competitors, it will certainly face additional costs related to attracting customers. In this way the enterprise occupied

with competition rather than cooperation with customers, instead of cost reduction due to cooperation, has to deal with the increase in costs due to fighting with the competition.

Changing the attitude about customers in particular may be caused by the fact that out of 27 unsatisfied customers, on average, only one will complain, and that even 91% of unsatisfied ones will never buy products of the specific enterprise (Soin, 1992, 12). Table 2 shows how customers are treated in the enterprises that have implemented Six Sigma concept. This way is considered the only acceptable way for the twenty-first century.

Table 2. Customers in the Six Sigma concept

The enterprise that has or wishes to gain the epithet "Six Sigma" must promote the following way of thinking:	correct	incorrect
The customers depend on the enterprise		√
The customers are the most significant enterprise's resource	√	
The enterprise does the honour to the customers by producing specific products		√
The customers give life to the enterprise	√	
The customers are not important for the enterprise		√
The enterprise depends on customers	√	
The customers do the honour to the enterprise by buying its products	√	
The customers are the essential element of the enterprise, and not the outsiders	√	
The only thing the enterprises sees in the customers is money		√
The customers are human beings with feelings and wishes and have to be treated with respect	√	
The customers are persons whose wishes and expectations the enterprise has to fulfil	√	

The point of cooperation with customers is identification of the features that are the most important for the customers, because it is neither necessary nor possible, to provide improvements at the same time in all areas of business, rather it is advisable to first focus on requirements that customers rated as the critical for assuring the quality of product. Gradual implementation of Six Sigma refers to processes in the enterprise, as well. Namely, it is unrealistic to expect that Six Sigma projects for improvement of all processes can implement at the same time. In addition, given that the implementation of the Six Sigma concept and appropriate projects demands time, but money, as well, it is not efficient to provide at the same time Six Sigma level of quality for each process in the enterprise, because not all processes are equally important. For example, the process of applying for annual vacation of employees is far less important for the quality of products or processes, compared to the process of delivering products to the customers. This means that the enterprise has to introduce improvements in areas critical for fulfilling its mission and for strategy implementation. Critical areas and key processes are identified based on the elements that customers have been defined as critical for providing product quality. Therefore, the first step towards achieving business excellence assumes clearly defining customers' requirements. Within the Six Sigma concept, these requirements are called "critical elements of quality".

LEADERSHIP AND TEAM REALIZATION OF TASKS

Leadership should not be characteristic of certain positions in enterprise, but the activity inherent and present at all hierarchical levels. In modern business environment, the task of leaders is to create conditions for continuous business improvement and performance enhancement. When the real resources, including employees, equipment, processes and tools, are in the right place at the right time, when there is an unobstructed flow of information and when employees are motivated to continuously learn and improve the ways of performing activities, the task of leaders can be considered successfully executed (Devane, 2004, 86-91).

Improvement projects under the Six Sigma concept have been implemented by the team leaders, made up of managers and employees on executives' positions. The goal of the team is set in collaboration with the supervising manager, and it is often said that one must "negotiate" with the manager before the "official" goal of every team is defined. This is because the objectives arising out of each other, starting with the strategy, of from the top of the enterprises, till the executive levels. In this way it is ensured that the goals of all teams in the enterprise are directed towards achievement of objectives of the enterprise as a whole. Without such an approach poor interpretation of the strategy may appear, as well as, disregard for some important elements during defining the goals of the teams. The Six Sigma concept is characterized by the existence of specific leadership roles, which include some training and acquiring a certificate, but, more importantly, experience, knowledge and skills in project management, process management, statistics, and human resources.

No matter at what hierarchical level are employed, leaders must always bear in mind the survival and development of the enterprise as a whole, and in that sense must advocate improvement of process for which they are responsible. In addition, successful leaders have been characterized by the perception of needs and demands of customers. Above all leaders must accept demands of external customers, but also the internal, as direct beneficiaries of outputs of processes that are the responsibility of the leaders. In this sense, every decision must be made considering its impact on customers.

Leaders must realize the significance of giving authority to employees. However, they have to focus on so-called "intelligent empowerment". In this regard, and according to the advocacy of teamwork, making a particular decision is left to, not individuals, but teams. In this way, teamwork and team responsibility are encouraged. To make sure that the leaders of the teams, to whom responsibility has been distributed, behave in a way that will lead to achievement of enterprise goals, they must be constantly reminded of the principles and values which they have to stick to in decision-making process.

If the enterprise advocates a continuous learning by the employees, then leaders must act in this regard and must show by personal example that one should always strive for further improvement. This means that the task of leaders is "to teach others to learn". In this sense, leaders must guide the efforts of employees to collect and interpret data, in order to obtain useful information, because it is not enough just to collect data, but also to use them for making certain conclusions, especially within the DMAIC methodology. It should be noted that the DMAIC methodology involves systematic application of tools for quality improvement, through five-phase process, which includes the following: define the key processes based on customers' requirements (which they noted as critical), measure

the performances of key processes, analyse the results of measurement, make decision about the way of process improvement, implement the solution and control the implementation of the improvement.

The leaders, however, are only people who, like all employees, have their own fears and doubts. In order to get closer to the other employees, they must demonstrate that they are not omniscient and omnipotent, especially when it comes to the future. In this way, they show that it is human to make mistakes, but to admit them, as well, and finally, to correct them or try to decrease them in future as much as possible. In recognition of mistakes, leaders must be cautious, because employees may realize that their job is to make mistakes. However, the message should be that their job is to work with as few mistakes as possible and to try to recognize the causes and correct them.

Mark Twain said: "Be aware of men who try to laugh off and underestimate your ambitions. These are small people; you keep up to great people so that you can become a great man" (Dusharme, 2006). Leaders just have to be "great", open for suggestions, criticisms and proposals (even from subordinates) and always be ready for cooperation and exchange of information. This is the only proper receipt if leaders want to assure that employees would be willing to follow them and ready to fight for their ideas.

BUSINESS CULTURE

Although erasing of the borders between the teams is recommended, in a certain sense, borders must exist. In fact, the borders are erased when it comes to cooperation and exchange of information and ideas, but they have to exist when it comes to responsibility and competence of the teams in terms of making certain decisions and performing certain tasks. To provide this and to create conditions for developing Six Sigma business culture it is necessary to introduce employees with the following:

- The purpose of the enterprise,
- Their importance for realization of the tasks and reaching the vision,
- The importance of customers and the importance of respecting their wishes and demands for achieving the objectives and vision of the enterprise,
- The importance of quality performing of each and every activity,
- The importance of providing continuous improvement in business,
- The importance of free presentations of ideas for the improvements,
- The importance of employees' training and education to improve their results.

Business culture has an important role in the Six Sigma concept implementation. It allows employees to experience the changes as everyday events and constantly seek for better ways to perform the activities entrusted to them. The Six Sigma business culture is based on the following postulates (George, 2002, 17):

- Starting point of all decisions is value created for customers,
- Goal of each decision is to improve financial indicators,
- Full commitment of all managers and employees is necessary,
- The Six Sigma infrastructure enables the successful implementation of any decision.

Active management of the business culture is very important. As John Lupinski, quality manager at Motorola, pointed out "where strategy and culture come into conflict,

culture always wins; devoting adequate attention to the business culture, although it apparently does not seem to be true, finally provides the increase in dividends, as well as the increase of the rate of successfully implemented changes" (Devane, 2004, 84).

THE PRESENCE OF THE SIX SIGMA CONCEPT IN THE WORLD ECONOMY AND IN SERBIA

As it is shown, the Six Sigma concept, as the successor of Total Quality Management, has certain advantages. These advantages contribute that the philosophy and methodology of the Six Sigma concept spreads, both within the enterprise (usually from the production as functional area in which implementation of this concept starts), and between the enterprises (from the manufacturer to the suppliers or between partners). According to one of the researches related to quality management, conducted in 2002, the Six Sigma concept has been implemented in 12% of surveyed enterprises (Bhote, 2002). Up to 75% of those enterprises that have implemented the Six Sigma concept emphasized its great importance and contribution to improvement of quality of their business. Later research, conducted in 2007 (www.qualitydigest.com) shows that the number of enterprises that apply the Six Sigma principles and methodology is significantly increased (58.7% of the surveyed enterprises).

Recent research suggests that the advantages of the Six Sigma concept compared to Total Quality Management are realized by the surveyed enterprises, because the number of those who based their business on the principles of the Six Sigma concept retains a positive tendency. Specifically, the research shows that the Six Sigma concept is represented in 85% of enterprises (www.qualitydigest.com). It is important to note that formal implementation of the Six Sigma concept is not present in all 85% of all enterprises. This is because some enterprises base their business on principles of the Six Sigma concept and use its methodology in choosing and implementing projects for improvement, but do not have a formal structure of employees, who would be involved in implementation of those projects. This is usual for small and medium size enterprises (SMEs), since usually, due to financial conditions, the formal implementation of the Six Sigma concept is not available for them. As it is noted, the formal implementation of the Six Sigma concept includes training and certification of certain number of employees, which, according to the level of training they have attended and finished, receive some of the following titles: Master Black Belt, Black Belt, Green Belt, Yellow Belt, etc.

A significant indicator of the growing presence of the Six Sigma concept is its expansion within the enterprise, in terms of functional areas in which improvement projects are implemented, based on the Six Sigma methodology. The fact that implementation of the improvement projects usually begins in production is expected, because the production is area where defects are the most easily identified. Over time, through involvement of growing number of managers and other employees in the Six Sigma concept implementation, improvement projects occur in other functional areas, such as administration, engineering, procurement, marketing, transport and delivery (Smith, Blakeslee 2002).

Based on the previously mentioned, one can conclude that managers of the enterprises in the world economy have realized the importance the Six Sigma concept, and its advantages compared to Total Quality Management. Given the need, or rather, the necessity of inclusion of Serbia into the European and global economic trends, the experiences of the enterprises from developed countries can be very useful. If one takes into account the

positive long-term trend of number of enterprises that have implemented the Six Sigma concept around the world, it should be expected that this trend is present in Serbia as well. However, research conducted 2007 (Andjelkovic Pesic, 2008) shows that very few enterprises in Serbia have implemented Six Sigma (two enterprises in the sample out of 60), and Total Quality Management (19 enterprises). It should be noted that both enterprises that apply the principles and methodology of the Six Sigma concept belong to the category of large enterprises.

Application of both of these concepts (Total Quality Management and Six Sigma) can be observed in relation to the origin of the majority of capital in order to check whether the origin of capital affects the presence of these concepts. In this way, in fact, it is possible to check if the above mentioned concepts are more present in the enterprises whose majority of capital is foreign, or whether the inflow of foreign capital has contributed to the transfer of principles and methodology applied in the enterprises in developed countries as well. This can be checked by using the χ^2 test (Table 3). In this case, the null hypothesis can be formulated as: "there is no correlation between the origin of the majority of capital and application of Total Quality Management and Six Sigma", and an alternative as: "there is correlation between the origin of the majority of capital and application of Total Quality Management and Six Sigma".

Table 3. Determining the connection between origin of majority of capital and implementation of Total Quality Management and Six Sigma

		Implementation of the concepts		sum
		The number of enterprises that have implemented the concepts	The number of enterprises that have not implemented the concepts	
majority capital	domestic	(a) 19	(b) 29	(a+b) 48
	foreign	(c) 11	(d) 1	(c+d) 12
sum		(a+c) 30	(b+d) 30	(n) 60

The exact probability of the null hypothesis is compared to the risk of error 0.01. Fisher's exact probability test of the null hypothesis shows that the probability is 0.0628. Therefore the null hypothesis is not rejected, which means that there is no correlation between the origin of capital and the implementation of Total Quality Management and Six Sigma. This indicates that despite the "influx" of foreign capital implementation of the concepts that are represented in the most European and global enterprises have not come alive in Serbia.

Today, several years after the research has been conducted in our country, however, there are more examples of enterprises that have implemented the Six Sigma concept. Beside in the enterprises, this concept has been implemented in a non-profit organizations and institutions, such as the Clinical Centre "Dr Dragisa Misovic" in Belgrade. This project for the improvement of the processes in microbiological laboratory at the Clinical Centre "Dr Dragisa Misovic" is based on the principles of the Six Sigma concept and the appropriate methodology. The aim of the project is to automate, accelerate and raise the quality of delivery of health services to the patients (www.cimcollege.rs).

CONCLUSION

Defects are usually explained as measurable characteristics of the process or process output that do not suit the needs of the customers' or the standard or specification. The Six Sigma concept differs from the Total Quality Management precisely when it comes about the attitude on defects and variations. Bearing in mind the features of the Six Sigma concept, and comparing it to Total Quality Management, it can be said that it is more comprehensive and more appropriate for modern environment. For successful implementation of this concept, managers must have a clear vision and must present it to all employees how it could become their vision, too. Also, the enterprise must strive to attract and hire the best people in a given field. In addition, it is desirable to define clearly the values and principles (business culture), because they have to connect employees at all levels. This means that all employees need to respect the other employees, regardless of whether they are in inferior or superior relationships. It is important to develop leadership, because managers are usually good at coping with a complex, but stable phenomena, while the role of leaders is prominent in the field of innovation. Therefore, it is necessary to develop a commitment to change among the employees. Leadership is important also because leaders have to create a productive environment, by helping employees to understand the importance of their work and to direct their behaviour towards the goals of the enterprise.

Thus, although the essence of both approaches is that improvements must not be haphazard, but systematic and well thought out, and then successfully implemented in order to provide effects, these concepts have some differences. Moreover, all differences go in favour of the Six Sigma concept, and this is confirmed by its increasing presence in the global economy. Latest survey results show that enterprises in Serbia understand the importance of the implementation of this concept for competitiveness improvement (indicated by increased demand for consulting services in this area).

REFERENCES

1. Ahoy, K. (2009) *Customer-Driven Operations Management – Aligning Business Processes and Quality Tools to Create Operational Effectiveness in Your Company*. New York: McGraw Hill
2. Anđelković Pešić, M. (2008) *Analiza dometa koncepta Six Sigma na rast konkurentnosti preduzeća* (doktorska disertacija). Beograd: Ekonomski fakultet.
3. Bhote, K.R. (2002) *The Ultimate Six Sigma - Beyond Quality Excellence to Total Business Excellence*. New York: AMACOM.
4. Brown, S., Blackmon, K., Cousins, P., Maylor, H. (2001) *Operations Management – Policy, Practice and Performance Improvement*. London: Butterworth Heinemann.
5. Deming, E. (1996) *Out of the crisis*. Belgrade: PS Grmeč
6. Devane, T. (2004) *Integrating Lean Six Sigma and High-Performance Organizations*. New York: John Wiley & Sons.
7. Dusharme, D. (2006) Six Sigma Survey: Big success... What About Other 98 Percent, *Quality Digest*. www.qualitydigest.com (11.08.2008.)
8. George, M. (2002) *Lean Six Sigma: Combining Six Sigma Quality with Lean Speed*. New York: McGraw-Hill.
9. George, M., Rowlands, D., Kastle, B. (2004) *What Is Lean Six Sigma?*. New York: McGraw-Hill.
10. Pande, P., Neuman, R., Cavanagh, R. (2000) *The Six Sigma Way*. New York: McGraw-Hill.
11. Popović, B. (1992) *Obezbeđenje kvaliteta proizvoda*. Beograd: IP Nauka.
12. Smith, D., Blakeslee, J. (2002) *Strategic Six Sigma*. New York: John Wiley & Sons.
13. Soin, S. S. (2002) *Total Quality Essentials: Using Quality Tools and Systems to Improve and Manage Your Business*. New York: McGraw-Hill.

14. CIM Group, www.cimcollege.rs (23.04.2011.)
15. Quality Digest, www.qualitydigest.com/content/magazine (04.11.2010.).

SIX SIGMA VS UPRAVLJANJE UKUPNIM KVALITETOM – PRISUSTVO U SVETSKOJ PRIVREDI I PRIVREDI SRBIJE

Marija Anđelković Pešić, Vinko Lepojević, Vladimir Zlatić

Koncept Six Sigma predstavlja korak napred u evolutivnom razvoju pristupa za obezbeđenje konkurentske prednosti po osnovu kontinuiranog unapređenja kvaliteta. U tom smislu, ovaj koncept jeste naslednik Upravljanja ukupnim kvalitetom, te kao svaka nova generacija prevazilazi svoje prethodnike. Nakon implementacije ovog koncepta mnoga preduzeća širom sveta ostvarila su značajne poslovne rezultate. Polazeći od te činjenice, cilj ovog rada jeste da ukaže na prednosti koncepta Six Sigma u odnosu na Upravljanje ukupnim kvalitetom. U radu su prezentovani podaci koji pokazuju zastupljenost koncepta Six Sigma u svetskoj privredi, ali u isto vreme i podaci na osnovu kojih se može videti "mesto" privrede Srbije u odnosu na svetsku privredu, kada je reč o implementaciji ovog koncepta.

Ključne reči: *Six Sigma, upravljanje ukupnim kvalitetom, potrošači, defekti, liderstvo, poslovna kultura.*