



SIX SIGMA CONCEPT

ABSTRACT:

The concept of Six Sigma is a concept of quality company management. At the same time it is a clever way of managing a company or organizational parts of the company. It was created by General Electric, in aim to satisfy the needs of the client more successfully. Companies implementing Six Sigma concept in the first place put improving the client - customer satisfaction, resulting in reduced cycle time necessary for an almost perfect product / service to be produced and delivered to client. The success of the concept of Six Sigma implementation depends on the willingness of employees to participate in the same.

Applying the concept of Six Sigma results in permanent improvements in operations, results in excellent financial and non-financial results, and improved performance of the organization. Also, the company provides uplift above average and provide the best possible solution for all stakeholders: customers, employees, owners, society, etc.

KEYWORDS:

management, leading, clients, products, operations

INTRODUCTION

Six Sigma is a smarter way of running a company or department, created by Jack Welch and Larry Bossidy, a director of General Electric's, in order to improve company's business quality in aim to satisfy the needs of the client more successfully. Six sigma puts the client on the first place by using different data available in order to achieve better results. Six Sigma action takes part in:

- improvement of customer satisfaction (customer / user services and products),
- reduction of cycle time necessary to perform a product or service,
- reduction of errors during the delivery of products or services.

With successful performance of the previously mentioned, companies achieve significant savings, retain satisfied clients, win new markets and create a good reputation and guaranteed quality of services / products.

To perform Six Sigma in the company means to achieve such progress in all parts of the process of creation or product / service, which means that the process and product are realized without any errors (defects). Also includes a full commitment to the management philosophy of perfection, focusing on the customer, improving processes and the law of value, instead of measuring sense. The aim of the concept of Six Sigma is that the whole companies adapt to the demands of clients - customers, markets and technologies, and that it can benefit all stakeholders - customers, employees and owners.

The Six Sigma concept differs from other concepts of quality management in the following:¹

- Six Sigma is focused on the client,
- Six Sigma provides a yield (return) on investment (eg, General Electric has achieved profit growth of 2 billion U.S. dollars in 1999 in comparison to 1998 - growth and profits of 2.4 billion U.S. dollars in 2000 year compared to 1999),
- Six Sigma changing mode of management.

The essence of Six Sigma is that things should not be done with hard work, but smartly. Six Sigma can be defined as:

- a) statistical measure of realization of the process or product - Sigma is a sign of the standard deviation. As is well known "standard deviation is a measure that describes the dispersion of the whole population in the same units that are specific to the data base" (M. Cvetinović).¹

Sigma measure was developed to help:²

- In the broadest sense, the measurement of customers - some customers of the company,
- a consistent way of measuring and comparing the various processes.³

The first step in calculating Sigma is to understand what the client - the customer expects. Six Sigma

¹ Cvetinović (2009 : 53)

² Different definitions of management suggests that if the processes companies can not express in numbers, this means that the company's employees do not know much about it and that this can not manage.

³ "The process is a set of interrelated or interconnected activities which converts the input elements into output elements (ISO 9000:2000). In practice, it is essential that the processes have their "owners" that clears the interrelationships, responsibilities and powers.

language requirements and customer expectations are called critics for the quality (CTQ).⁴ Six Sigma purpose is to understand and assess how the process works on all theoretically possible customer demands. So, we use a measure of sigma values so that we could examine how a process works and all phases of the production process of service / product we give a way in which it can be measured.

In the beginning, acceptable sigma levels for the company were three or four sigma (99.9937% without defects in process). Over time it became clear that the six sigma level necessary to increase the efficiency of processes and achieve excellence in delivering value to interested parties. At the same time achieving six sigma levels indicates that this is a Best in class organizations.

Characteristics of such companies are: very (highly) satisfied customers, managers are determined, motivated employees, stable growth in market share, business results that rank company in the top in the domestic and international markets, and obtain an internationally recognized awards for business excellence / perfection.

b) aim to achieve almost perfect for improving implementation - applying Six Sigma goal is to help employees and processes to achieve production of a product / service without errors. Therefore, Six Sigma sets the target where the errors in the processes and products/services almost impossible. Application of Six Sigma provides a long-term achievement of the objectives of the company, through the realization of short-term attainable short-term goals set for the quality of products / services.

c) management system that achieves long-term leadership position and perform work on the world level. The essential difference between the concept of Six Sigma and similar management concepts is that a high degree of management involvement in monitoring the results and achievements of the implementation of Six Sigma. Six sigma management system is not owned by directors or management is left to managers. Ideas, solutions, improving or introducing new processes and improvements that result in six sigma events occurring at the lowest levels of operations of the company (at the level of actors). Six Sigma companies are trying to give more responsibility to employees who work with clients.

Therefore, Six Sigma is a concept that unites the management and includes all employees. The benefit of Six Sigma is monetary and non-monetary. In the domain of non-monetary, it is important to emphasize that all employees at different levels of the company better understand its clients - customers, clearly setting processes and enhance the realization of products / services, standards implementation process and meet clients' demands are fair and significant, which leads to more efficient work of employees and a greater degree of satisfaction with completed work.

According to the above, we can conclude that the most important elements of the concept of Six Sigma:

- sincere focus on customer - buyer ,or meeting client demands,
- manage the company based on data and evidence,
- processing the product / service opportunities and permanent improvement of technology and business processes,
- proactive management and management technology and business processes,
- non-limit cooperation in the production of products / services valuable to clients,
- expressed need for perfection and failure tolerance.

It is important to emphasize that the concept of Six Sigma is not much new. The unification of these elements in the management process is new. Also, Six Sigma is a slow process because it should come up with the perfect product / service that fully meets the requirements of the client.

Successful implementation of Six Sigma concepts can achieve the following results: fulfillment of clients' requirements, achieving greater benefits for the owners of the company, reduced costs, better utilization infrastructure, stable organizational structure and staff satisfaction and successful motivation. It is very important to unite all employees in the company in order to accomplish processes, procedures and Six Sigma process implementation successfully .

WAYS TO INTRODUCE SIX SIGMA IN YOUR COMPANY

If your company decides to implement the concept of Six Sigma, it cannot be predicted what way it will have to pass. Also, companies organizations are different and these differences create variations in the application of the concept of Six Sigma.

There are three basic ways of introducing Six Sigma into the company:

1. transformation of business - means a change in the organization, organizational culture and organizational climate in the work of the company, in order to meet the needs of clients and owners in a better way. Teams created for the business transformation process should analyze the different areas of the manufacturing process of products / services and to propose solutions or advice for changes. The mentioned teams carefully examine: how the company is placing the products / services, whether the sales process are effective, what is the interest of new potential customers, what are the critical objections to existing clients, what types of product/service defects appear as common problems, what kind of information systems are needed for companies' decision-making and where can great cost savings be expected.

So, the focuses of business transformation are: customers, employees, all processes related to the implementation of products or services (including internal organization and strategic decisions) in order to increase the profits of the company. It is important

⁴ CTQ – Critical to Quality



that the needs of the market and competition are outside the scope of application of Six Sigma.

If the company decides to put the implementation of this concept of Six Sigma then all parties concerned feel a change.⁵

2. *strategic improvement* - the middle entrance, which offers the most opportunities for the company. Undertaking strategic improvements is limited to one or two key needs of the company, with teams that are focused on the great opportunities and disadvantages of the process of products / services realization. Also, project Six Sigma can be applied to a limited number of departments or sectors of the company.⁶

3. *problem solving* - is the easiest approach to the implementation of Six Sigma. This approach is intended for companies that constantly have the same problems. Various attempts at resolution have been without success. Therefore, they are trying to solve this problem by implementing Six Sigma. The concept of Six sigma analyzes problems and solutions better, based on the facts and understanding the causes and needs.

This approach is good for companies that want to experience the benefits of implementing the concept of the Six Sigma without major changes in the organization. This approach or entrance, the Six Sigma, is useful because it focuses on the essential problems and faces with their cause, uses data and analysis rather than feelings.

It is important that any approach to the implementation of the concept of the Six Sigma has both good and bad sides. Success primarily depends on the implementation of the will and readiness of employees to take a very active part in the same. Depending on which way the company decides to implement the Six Sigma, the impact of Six Sigma on the employed in the company will also be important.

NEW ROLE OF MANAGEMENT AND EMPLOYEES

Since the company's management decided with what approach would it implement the concept of Six Sigma, the business is handed over to a group of business leaders, members of teams, team leaders and agents. Some employees will get the function called by belts from the martial arts skills, such as a black belt, green belt and master black belts. Other team members will have similar names.

Black belt Six Sigma represents the most important role of managers in the implementation of the concept of the Six Sigma. Owner of black belt is committed to improving the possibilities of change and their introduction in order to achieve better results. He must be a leader, inspirator, delegate,

manager, coach and nurse to colleagues, and an expert in the tools to recognize the problems and improve or create processes and products / services.

Six sigma black belt managers usually work with a team that is dedicated to a particular project. Without a strong and tireless person with a black belt, six sigma teams are usually unsuccessful. They are usually chosen from the ranks of middle management or are already top managers, and they lead these teams to an average of two years, and in this period of time they carry out four to eight projects.

Master Black Belt Six Sigma is a manager or consultant, he mentors managers with a black belt working on different projects. In most cases the master is a true expert in analytical tools of Six Sigma, and often the starting point in technology or science, or is recognized in the profession that deals with the work⁷ In some cases, master black belt plays a mediator role in the organization change, or becomes a permanent coach for those who are preparing for black belt or can be involved in special Six Sigma projects. It is important, master black belt plays a key role in the pace of change, reduces costs and improves customer satisfaction.

Green belt Six Sigma manager is a person who is still operative participate in the process of realization of products / services and a member of the team or team leader. His/her role is to bring new ideas into the daily work of the company. Champion and / or sponsor is director, senior manager or a member of the executive board of the company, which begins and supports (sponsors) someone with a black belt or some other team. It is very important to have champions or sponsors. This role sends a message: Champion is a respectable person, who takes upon himself the responsibility of the project. The role of champion is:

- To ensure that projects remains in the form of company goals, and if not, to change direction,
- To present the progress of each project team to other members of the Board,
- To acquire the necessary resources, such as time, money and other help for the team,
- To report on controls of the "toll booths",
- To negotiate in conflicts with other Six Sigma projects.

It is important that the champion is usually at least experienced with the concept of the Six Sigma and is usually the weakest link in the execution of Six Sigma tasks, especially in the early stages. The leader of the implementation is the person who manages the entire

⁵ Companies that have decided to implement Six Sigma approach to business transformation are: General Electric, Starwood Hotels, Bombardier, and 3M.

⁶ Companies that have decided to implement Six Sigma approach to strategic improvement are: Johnson&Johnson, Sears, American Express i Sun Microsystems.

⁷ Six sigma instruments are: exchange of ideas, affinity diagram, voting, the tree structure, process diagram, process map diagrams and the causes and consequences (fish skeleton). Instruments for collecting data are interviews, operational definitions, the voice of customers and tables. The instruments of analysis process and the data were: analysis of the process, valuable and worthless additional analysis and charts. Instruments for statistical analysis are: tested for statistical significance, correlation and regression, and design of the experiment. Instruments for the implementation and management process are: process control methods, analysis of potential problems and failure analysis and impact analysis investors, the powerful field diagram, documentation processes, and balanced accounts and processes.

implementation of setting Six Sigma ideas. He/she is usually from the ranks of senior management of the company and directly contacts the executive committee and chairman of the company. Comes from the area of organizational areas of the company or has experience in business management and administration. As a black belt Six sigma managers, leaders of the implementation have a time-limited mandate. The ultimate goal of leaders is to introduce the implementation of Six Sigma thinking, tools and practices through the whole company, to achieve profits and benefits to clients - customers.

Six Sigma provides employees involved in the project, challenges and benefits, such as experience, meeting new colleagues, excitement and education.

DMAIC - THE MEANS ARE SIX SIGMA

The most important link in the implementation of Six Sigma are teams for improvement, problem solving and creation process. Teams are formed to solve organizational problems and use opportunities. The leaders of the teams managers are black or green belt. Teams consist of three up to ten members, who were operationally involved in a process that is the subject of the project. This indicates that the team is different. In the process of forming this team, it is important to have a process or model that is common to all in order the project to be implemented. DMAIC is a flexible process that enables the implementation of Six Sigma projects, which means: define, measure, analyze, improve and control.⁸

DMAIC team has its own life cycle, which consists of the following phases:

- Determination and selection of the project - it is important to choose the important and achievable projects that provide benefit and the company and the client.
- Forming a team - the election of members and team leaders is very important. If any of the employees elected a member of the team, it means that it is conscientious person who has the power and the will contribute to the progress of the company.
- Setting the Charter - is an important document that provides a written guide to the problem or project. The Charter is the reason why the project is important, the goal, the basic plan, limits, roles and responsibilities. Also, it is important to emphasize that the Charter changes during the project.
- On going of team - the joint work on the project, this is usually four weeks.
- Implementation of the DMAIC and implementation of solutions - Teams are required to implement their own solutions and to teach groups of the company which will continue to take into account the success of improving the process. Teams are required to project plans, organize training and define procedures for their solutions. Also, they are responsible to providing them their operational

functioning - and the accompanying results over a specified time.

- Submit a solution - When the solution is given to groups of companies that will use it, these teams do not work anymore.

The Company will have the following benefits using the DMAIC model for solving the problems: quantification and measurement of problems, focusing on the customer, verification of the cause, quitting the old habits, risk management, measurement of income and maintenance changes.

Steps in the DMAIC model are:

- defining the problem - the question is what will be the goal of the project be and what is that the client wants (CTQ).⁹ This is the biggest problem for the team. The team meets with a number of open questions such as: What do they work? Why solve this problem? Who is the client - the buyer? What are the requirements of the customer - buyer? How to run the process now? What benefit would all interested parties have with the correction process or the product?

When you answer these questions, DMAIC Charter can be found. The basic elements of the Charter are: business reason or purpose, the statement of capabilities and objectives, constraints and assumptions, the limits of the project, team members and roles, the initial plan. The most important task of team is to recognize who the client - the buyer is: internal or external.

Then follows the perception of what the customer wants. This task includes the voice of the customer - the customer (VOC).¹⁰ Very often clients do not know what they want or have a problem to express what they want. However, they know very well to explain what they do not want and the team must listen carefully to the voice of the client - the customer and translate the client's language-specification to the language of the company.

Teams should use during project implementation only the tools that will help them. Also, they should place and lead the process simply. And if the selected instrument does not give the expected results, the team should try another instrument that can help.

We conclude that the definition of the problem consists of three steps: selection of the client request to be solved, creating project Charter and security processes (recommendation is the simplest one).

- Measurement - has two main tasks:
 - a. to collect data to check and quantify the problem or opportunity,
 - b. to test facts and figures that provide information about the cause of the problem.

Therefore, the measurement allows quantification of production or the consequences (the final result of a process), process (stages that can be monitored and

⁹ CTQ – Critical to Quality

¹⁰ VoC – Voice of the Customer

⁸ DMAIC – Define, Measure, Analyze, Improve, Control



measured) and investments (resources that are invested in the process of change that would produce the product / service). Practical team must identify who is the ultimate goal (output) measurement, to develop a plan to collect data (what is measurable) and the establishment of the basic route of the process (how to measure them).

- Analysis - used to be identified, confirmed (validation) and quantify the problem. The operative team includes details of the process, improving their understanding of the processes and problems and identifies the problem. Some common categories are the cause of the problem: methods, equipment, materials, measurement and results measurement, natural disasters and employees.
- Improvement - when identified the problem, the team finds a solution. This phase includes the identification of solutions, testing the implementation of identified solutions and consideration what the costs and the expected benefits of implementing each of the proposed solutions are, in order to choose the best and most practical solution. Having decided for the appropriate solution, the team also tests it in order to see which problems may occur in the further implementation.

After successful completion of testing, the solution is handed over to a group in company that participates in the execution process. Also, the monitoring phase of implemented solutions continues in order to promptly respond in the future, or to keep the quality of products / services at a satisfactory level for the client.

- Control - a step that prevents the return of the old process, which involves implementation of control mechanisms, preparation of documentation for the project taking over and the closure of the project. Operationally that means: establishing a monitoring process of the implemented project, preparing plans for possible solutions to problems that may occur, successful "sales" presentation to employees that the project will use in their daily work, ensuring management support for project implementation (all employees) and the smooth flow of information of consequences and investment to the management.

Recognizing the above, we can add that the teams work by GRPI model,¹¹ which includes:

- ❖ Objectives - purpose of forming the team and the expected results, defining project activities, identification of clients' needs, goals and delivered results (what is expected of the team),
- ❖ Roles - what role and responsibility the team has; what kind of authority and autonomy team members possess,
- ❖ Processes - which are the critical success factors, how the plans and activities of the company are set

up, what are the control mechanisms and how to perform the measurement within the company,

- ❖ Interpersonal relationships in the team - involve the appropriate operational arrangements (formal) between the team and employees of the company, as well as informal relations that exist between them. The energy that exists among the members is essential and should be constructive and positive, so that the results are better.

Finally, we can conclude that the project Six SIGMA must be flexible and that the success of the implementation of Six Sigma project is in the hands of employees who will use this new process in their daily work.

CONCLUSION

Companies applying Six Sigma concepts in the first place put improving satisfaction of client - customer, which results in reduced cycle time necessary for an almost perfect product / service to be produced and delivered to the client.

The main factors of success of applying the concept of Six sigma are: leadership commitment, full commitment of the leaders of the Six sigma team, strategy integration with top management, business process frameworks, intelligent network of customers and markets, the real savings, income and profits, motivation and stimulus for all employees, infrastructure programs, corporate culture, etc.

The success of the concept of Six Sigma implementation depends on the willingness of employees to participate themselves in the same. Therefore, you should: learn the goals of Six Sigma (see "big picture"), prepare for chaos, start work in the context of the entire production process of products / services, take the opportunity to learn new features, avoid paranoia, expect changes and challenges, accept responsibility for their learning, be patient and not to surrender, and be willing to travel without end.

REFERENCES

- [1.] Cvetinović, M., *Managerial economics*, University Singidunum, Belgrade, 2009
- [2.] Pande, P., Holpp, L., *What is six sigma?*, Mate, Zagreb, 2006
- [3.] *Process and Productivity Management, TOP Bleck Belt Six Sigma*, IBB, 2005
- [4.] *Productivity and Cost Management, Six Sigma Green Belt Training*, IBB, 2003

AUTHORS & AFFILIATION

- ^{1.} Lidija BARIKTAROVIĆ,
- ^{2.} Dejan JEČMENICA

^{1. 2.} VIENNA INSURANCE GROUP, WIENER STÄDTISCHE OSIGURANIE A.D.O. BEOGRAD, SERBIA

¹¹ GRPI - Goals, Roles, Processes, Interpersonal