Software Tools Complexes for Quality Management and Their Practical Applications

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1. Introduction

There are successful organizations that operate in different industries, marketplaces, and countries. Even though there differences between them, certain things are always the same: they are **ready to invest in human resources** by providing people with opportunities to acquire skills and knowledge**, implement quality tools and methods and improve business processes**.

Today, one can not achieve „world class quality" without implementation of quality tools and methods.

This paper presents most commonly used quality tools and methods for process improvements and achieving excellence. Practical implementation of those tools is shown on the examples of process improvement in state owned electric power company in Serbia - JP Elektroprivreda Srbija [2].

2. Process Model and Implementation of Quality Tools and Methods

Organisations that implement requirement of ISO 9000:2000 and models of excellence will gain greater financial benefits if they implement quality tools and methods. Implementation of quality tools and methods enables reduction of defects, improves quality and increases safety and satisfaction of employees and customers.

Process improvement asks for **Quality Tools and Methods** and knowledgeable people within the organization. Quality Tools enable:

- analysis of all inputs, while detecting and removing potential "viruses";
- improvement of activities;
- decrease of variations of Critical-to-Quality characteristics;
- are altogether aimed at improving customer satisfaction.

Quality Tools help improve process capability within a permanent cycle (on a journey towards excellence – towards Six Sigma process quality level – which means 3.4 defects per million opportunities for a defect).

Quality Tools and Methods are indispensable aspect of process improvement initiatives and bring process improvement efforts at the maximum of effectiveness.

CIM College d.o.o. has mission to help **partners improve performance of their business processes in order to make profit now and in the future**. We provide tools and methods for all companies striving to achieve world class. This is not destination. This is journey.

Our software tools can help You monitor business process stability and capability, extract vital view from trivial many, measure customer satisfaction, identify and remove systematic causes of problems, conduct FMEA and QFD analysis, perform audits, design experiments, … in effective and efficient manner. We have three international certificates for software research and development and consulting.

Main characteristics of our software are:

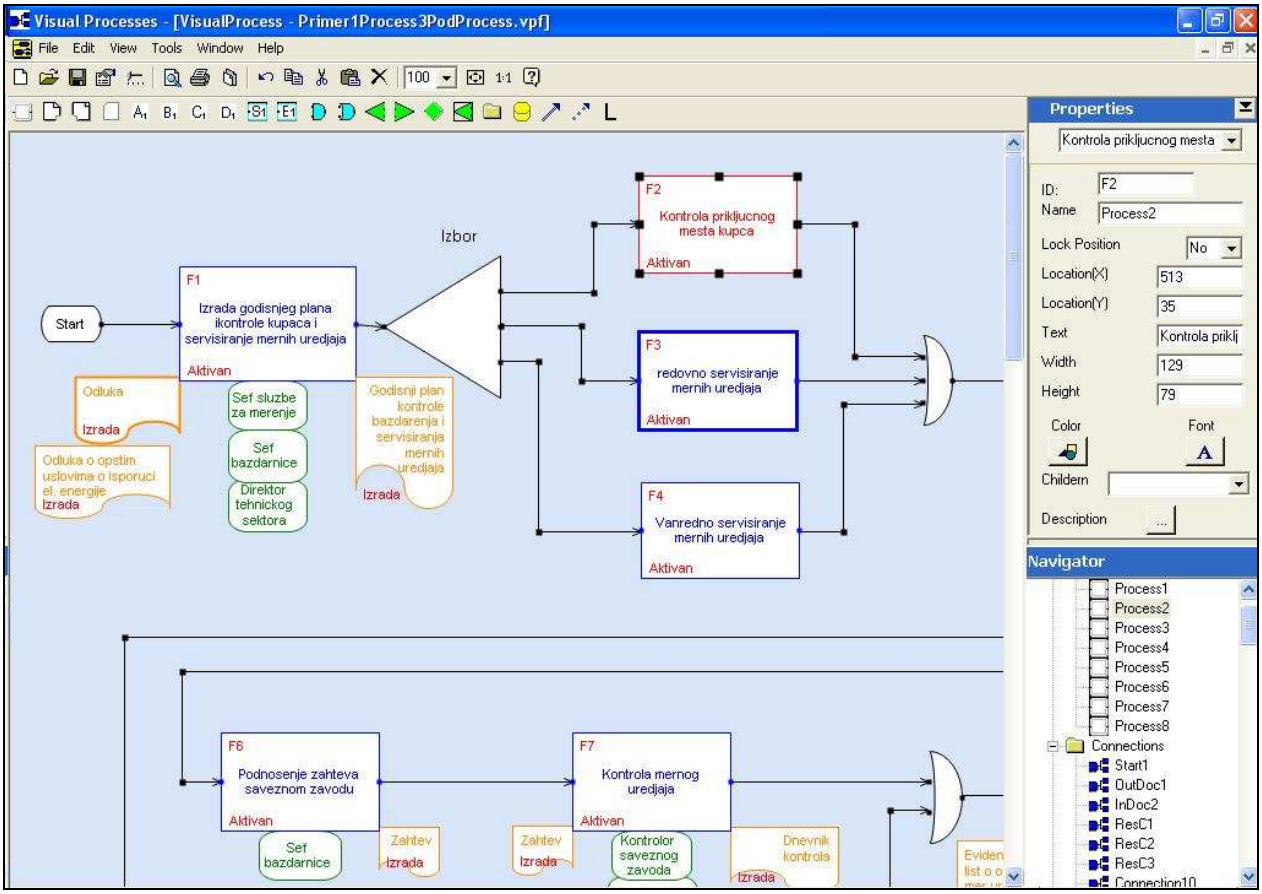
- Easy usage, installation and maintenance
- Comprehensive documentation and HELP
- Fulfilment of requirements of ISO 9000:2000, ISO 14000:2000, OHSAS 18001:1999 and GMP
- Reliability and safety according to ISO 17799
- Network ready
- Scalability
- User friendly interface
- Integration with existing information system
- Minimum hardware requirements
- Standardised functionality and user friendly interface
- Experience in implementation in organisation of various types and sizes

Our partners have at their disposal over 20 software packages. We provide software for SPC-Statistic Process Control, Pareto method, FMEA-Failure Method and Effect Analysis, QFD-Quality Function Deployment, Ishikawa method, EDM- Enterprise Document and Data Management, Quality Audit Management,....

In the global marketplace there are many software solutions that more or less satisfy customers' current needs. However, the real question is: Is the information system capable of satisfying needs of an organization in periods to come? The answer is positive **only if the information system is based on process model**, which facilitates continual process improvement and simultaneous adaptation of the information system.

CIM Integrated Systems ltd. utilizes a graphical tool ***OPISys™ Visual Processes v2.0 .NET for*** process representation. Graphical interpretation helps people understand highly complex concepts. Textual descriptions might have been more useful if processes were liner (developing sequentially, one activity after another). However, since it is rarely the case in real life, graphical interpretations are much more effective. They are the best way for documenting and transmitting process-related information, and they help people grasp more information and more process complexity.

Process management tools are reality today. People that operate processes know that it is possible to map, analyze, and improve them. Such tools found their way to excellence models as well. (e.g. *Malcolm Baldrige*, American model), and their application led to significant process improvements in many renown companies: *Motorola*, *General Electric*, *Nokia*, *Whirlpool*, *Citybank*, *Sony*, *AlliedSignal*, *University of Wisconsin*, etc. As well, application of such tools leads to enormous savings of financial and other resources. OPISys™ information systems support integration of quality tools.



Implementation of quality tools and methods can lead to realization of the following results:

- significant defect reduction and process improvement which leads to savings of up to 15-40% of a company's gross income;
- readiness for a Six Sigma journey, which means production with no defects;
- information-based management, which largely facilitates managerial tasks;
- definition and standardization of all company's processes, meaning organization of the complete system;
- elimination of interfunctional barriers and speeding up of processes that take place through more than a single organizational function (department);
- cost monitoring for organizational units, processes, activities, machines, employees, etc., analysis of costs and their reduction.
- productivity increase per employee and overall organizational income increase;
- innovative business planning, realization and planning of investments;
- improvements in employee knowledge level and better utilization

of their potential;

- increase of employee satisfaction as a consequence of better work environment and possible increases in compensation;
- increased value for shareholders;
- identification and prevention of negative business trends.

2.1 Pareto Method

Pareto Method was named after Italian scientist Wilfredo Pareto. This method introduces 80/20 principle that differentiates between the «Vital few» and «Trivial many». 20% of causes provoke 80% of consequences. This allows allocation of available resources on «Vital few» elements – focusing on 20% of causes, while getting 80% of results. Pareto diagram is a set of vertical bars the height of which reflects frequency of impact. Bars are depicted in descending order, from left to right. It means that bar represented categories that are closer to the left axis are relatively more important than the ones closer to the right axis. The main aspects of 80/20 rule in the context of implementing Lean are the following:

- Identification of critical 80% within organization's businesses: markets, customers, products\services, processes, suppliers, distribution channels, etc.;
- A clear separation between what belongs to the 80% and what doesn't. Elements that produce 20% of results should be treated differently form the elements that produce 80%;
- Focus people, time, and money on anything that meets 80% of organization's needs: 80% of income, profit, market share, competitive advantages, production volume, losses, injuries, defects, etc.

Picture 6 shows main menu of software for Pareto method. User has comprehensive set of possibilities for implementation of Pareto principle: quality improvement, universal Pareto, work injuries, .

Picture 6 Main menu of Pareto method software

When user chooses option for quality improvement software tracks defects and their appearance in different locations in organisation. Software keeps track of organisation

structure, machines, products, services, … in order to detect the location of the defect. These data allow different analysis and detection of the source of error.

JP Elektroprivreda Srbije uses Pareto method to extract vital view important items on which to focus efforts for process improvement. Picture 2 shows different processes that are analysed using Pareto method..

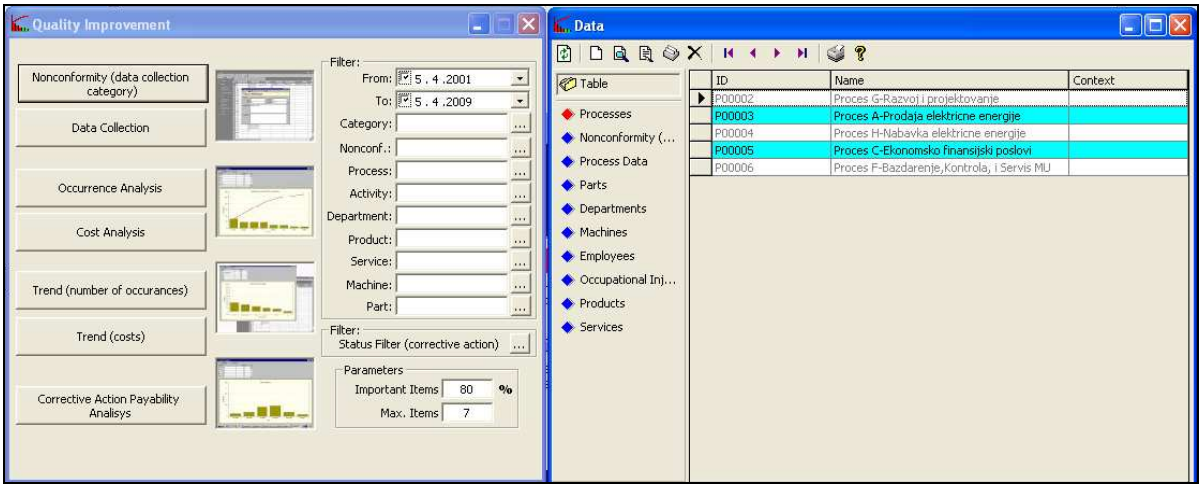
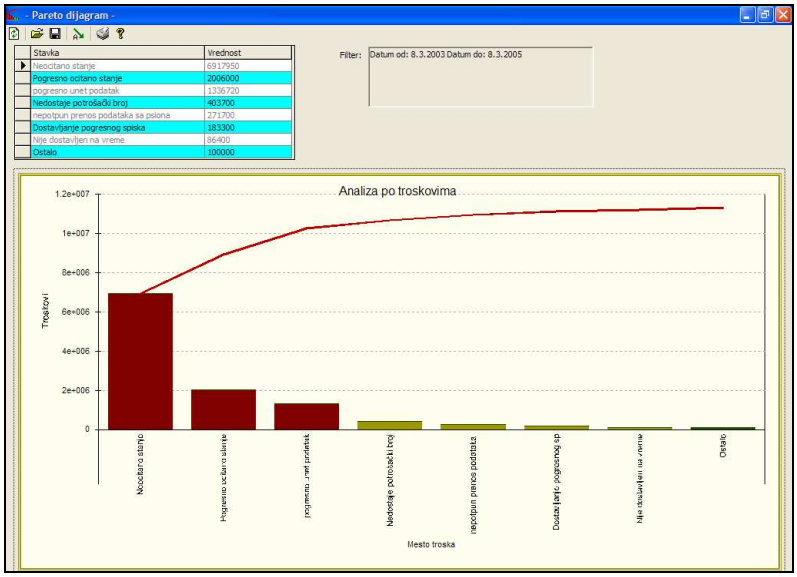


Figure 2: Implementation of Pareto method in JP Elektroprivreda Srbije

Pareto method is also used for identification of the most significant process in the company. Process *Sale and collection of payment of electric power* is identified as the most significant one.

After the identification of the most significant process team starts to look for opportunities for improvement. Improvement simply means: „ **Find errors and defects and eliminate root causes**.“ Team goes through process map in order to identify defects by simply asking question: „ **What defects can occur in this activity**?“ Those data allow team to define defect according to number of their appearances.



Picture 4: Pareto diagram according to the costs of the defects

It is more important for one company to know what defects cost the most, rather than to know what defects occur the most times. That is why companies introduce the cost of each defect and picture 4 represents Pareto diagram according to the costs of the defects.

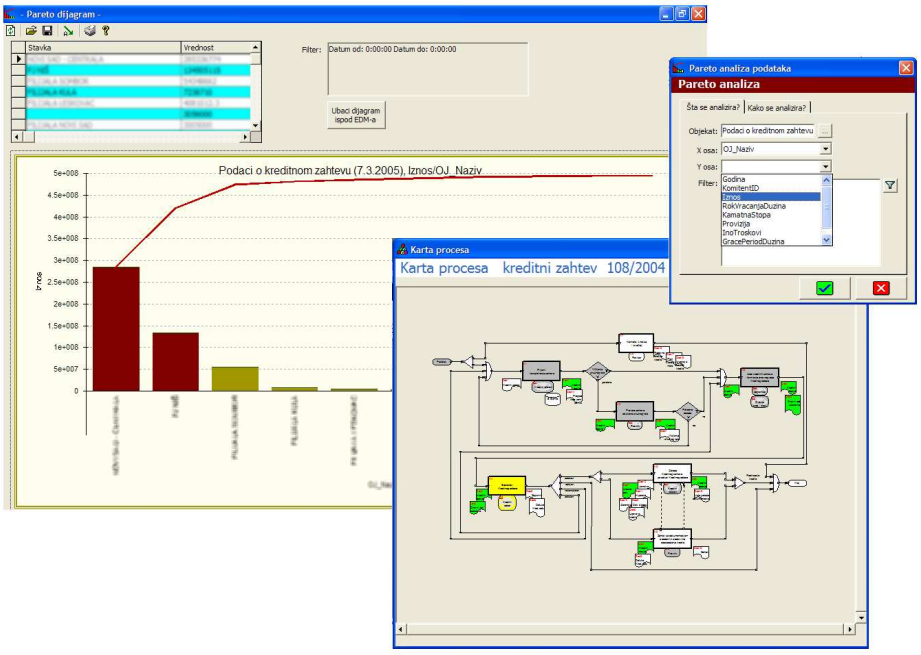
Analyses show that defect «*neočitano stanje*» costs company the most. Defect «*pogrešno očitano stanje*», which was on the third place according to the number of appearances has reached the second place according to the costs.

The first three defects consist vital few defects (20%) which constitute 80% of costs. Through elimination of these defects 80% of costs that are result of defects in the process will be eliminated. In the next step of process improvement team used Ishikawa diagram in order to identify root causes of the problem and define corrective actions which will lead to significant process improvement.

CIM College d.o.o. has also successfully implemented Pareto method for improvement of loan processing in one of the top 10 banks in Serbia. We have used DMAIC methodology for achieving Six Sigma quality level. Process is fully automated using OPISys™ - Object Process Integration System platform developed by CIM College d.o.o.

Software allows «work-flow» of documents and continual monitoring of all process activities. Pareto method gives management more than 15 different reports among others 20% of branches that gave 80% loans to the clients, 20% of process activities that consume 80% of the time etc.

Picture 5 represents Pareto analysis and process map from OPISys information support for loan processing.



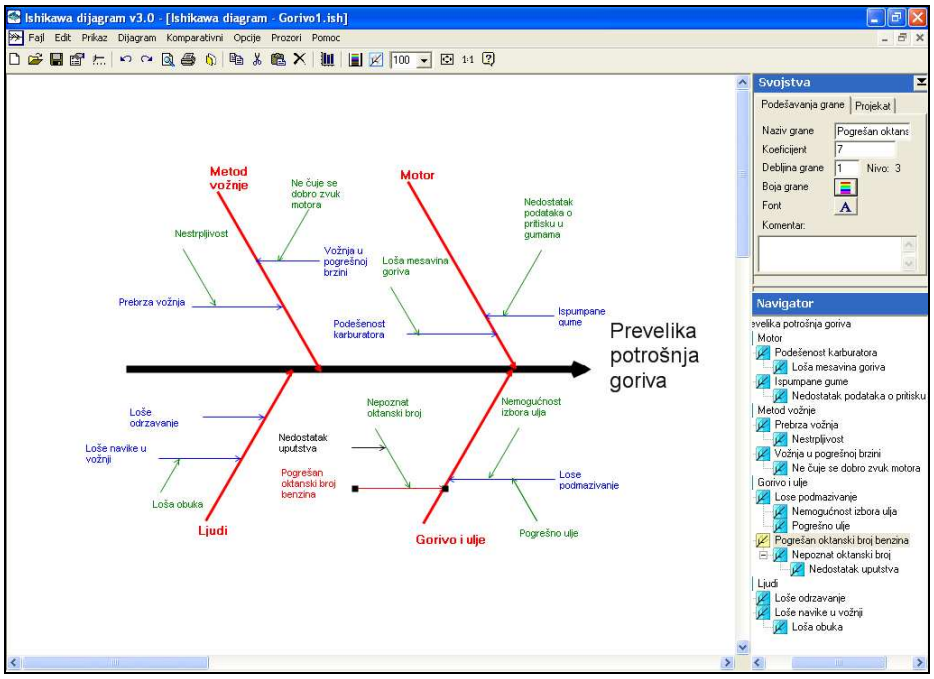
Picture 5: Pareto analysis and process map for process of loan processing

2.2 Ishikawa Method

Ishikawa method is a tool that supports identification, sorting, and display of potential causes of a certain problem, quality characteristic, aspect, or hazard. A diagram graphically depicts relation between the consequence and all the factors that have an impact on it. The purpose of Ishikawa method is to systemize knowledge. By exploring significant impacts on a certain consequence, one collects and polishes knowledge about it, which facilitates the analysis. Ishikawa diagram is alternatively called Fishbone diagram and Cause-and-Effect diagram. When utilized together with other Quality Tools, Ishikawa method achieves the most powerful results. The method is particularly effective when implemented together with the Affinity diagram, Brainstorming, Pareto method, and SPC.

During implementation of requirements ISO 14001:2004 in JP Elektroprivreda Srbije we have identified aspects and their impacts on the environment. One of the identified aspects was heavy fuel consumption. Team has implemented Ishikawa method and identified root causes of the problem.

Picture 6 represents Ishikawa diagram which was result of the team session. Some of the identified root causes include bad maintenance, wrong oil, bad driver habits, etc. Through defining and conducting of corrective actions root causes were removed and problem eliminated.



Picture 6 Ishikawa diagram for heavy fuel consumption

2.3 SPC – Statistical Process Control

Statistical Process Control is a tool that enables monitoring and elimination of variations. An axiom that persists over time says: there are no two identical things. Acknowledging variation is not sufficient. Variation needs to be decreased and eliminated. Statistical Process Control tool serves that purpose. Processes are dynamic and they alter over time. Process parameters need to be monitored in order to be able to take appropriate actions to

prevent unwanted alterations. Positive changes need to be clarified and standardized as well. Utilization of control charts allows efficient process monitoring. When a control chart signalizes that changes occurred in the process, one can take rapid and efficient actions to isolate causes by acting on them. In the first phase of process improvement, SPC is used to bring the process to a stable state – under control. Once the process is stable, SPC can enable its sustainability and increase its capability. Reaching «world class» process quality level asks for planned and continuous effort in all subsequent improvement cycles.

Statistic process control is used for monitoring of aspects that have impact on the environment in one town in Serbia, as well as for identification of hazards that can influence health of citizens.

Municipal authorities are obliged to conduct noise control. Maximum allowed level is 65 dB in the main town roads. Let us assume that the town is conducting measurement of noise level during the period of heaviest traffic – from 7 to 10 am and from 14 to 17 pm. SPC software processes those data and displays them in form of control chart.

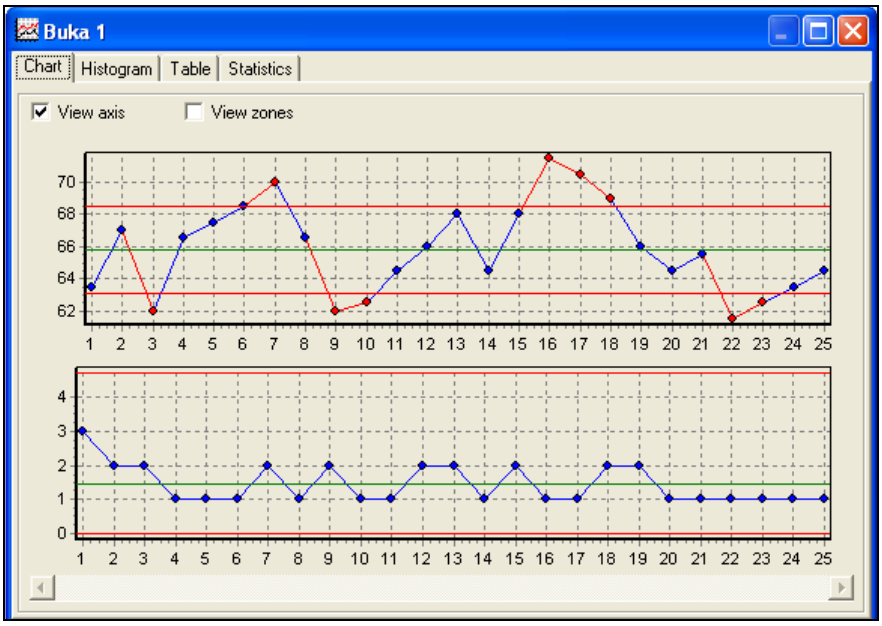


Figure 7: Control chart for noise in the city

Control chart shows that the characteristic is not stable and that there are special causes of variation. During period of measurement of the noise, for example every 10 minutes when the traffic is the heaviest, traffic jams occur and the noise level exceeds allowed maximum. When cars start to move the noise level is reduced.

2.5 QFD – Quality Function Deployment

Quality Function Deployment is a tool for transferring «Voice of Customer» into process parameters, using 4 «Houses of Quality». Based on the predefined customer requirements, QFD establishes product/service parameters that are critical for the fulfilment of these requirements. Moreover, it identifies critical spots on the product/service as well as in its development/realization process that are related to identified parameters. At the end, it

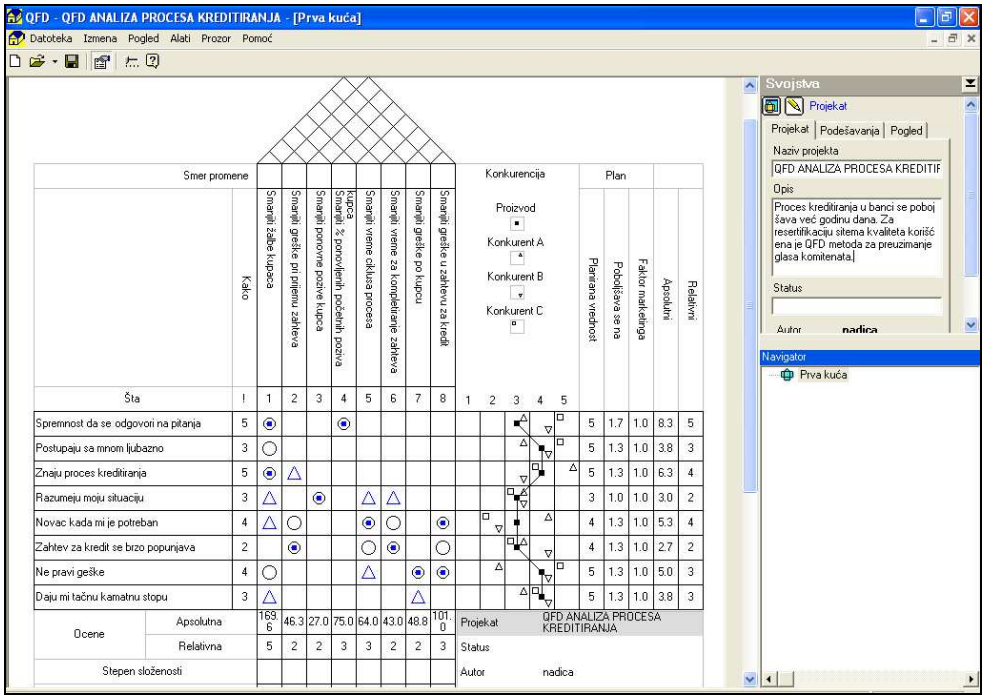
suggests procedures for realizing improvements on identified critical spots. The more people from the organization work on improvement, the better product/service design/redesign can potentially be achieved. Utilization of QFD leads to establishment of a product/service quality level that meets customer needs and requirements as well as the following:

50% decrease in costs;

33% decrease in development time;

200% increase in productivity.

One of top 10 banks in Serbia is working on achieving Six Sigma quality level. General manager has appointed team for improvement of loan processing. Team has developed QFD for process improvement using CIM College d.o.o. software.



Picture 9: QFD for loan processing

3. Conclusion

Japanese companies have used quality tools and methods since 1950s. Japan economy is on of the most successful in the world an create internationally recognisable brands.

Quality tools and methods create a good enough terrain for their continuous improvement and reaching the world class level. They make every-day job practices easier and decreases (and with time eliminates) the possibility of appearance of defects.

That is the only way for companies to survive and be successful on the market.

Literature

[1] Michael George, *Lean Six Sigma for Services*, McGraw-Hill, 2003.

[2] Vojislav Stoiljković i drugi autori, Integrisani sistemi menadžmenta, CIM College d.o.o., Niš, 2006.