

QUALITY MANAGEMENT	1143
PERCEPTION OF BENEFITS - GUIDELINES FOR THE APPLICATION OF ISO 9001:2015	1144
Cice Jelena, Pribičević Ivan, Kočijašević Strahinja	
PARADIGM EVOLUTION: FROM LINEARITY TO COMPLEXITY IN THE WORLD OF QUALITY MANAGEMENT	1154
Borisavljević Miloš, Nedeljković Miloš, Đurić Mladen	
SOME TERMINOLOGICAL OBSERVATIONS ON ISO 9000 STANDARD SERIES WITH SPECIAL FOCUS ON ISO 9000:2015	1160
Đordan Andrijana, Jakić Gordana, Anđelković Jelena	
QUALITY COSTS IN THE MANAGEMENT SYSTEM IN THE FIELD OF HIGHER EDUCATION	1167
Zivkovic Nedeljka	
DOCUMENTING PROCESSES: CHALLENGES FOR FIRMS OPERATING IN SERBIA	1176
Momčilović Marina, Stefanović Ivan	
QUALITY MANAGEMENT AND INFORMATION: FROM STAKEHOLDERS REPORTING TO MEDIA PIONEERING QUALITY	1183
Jakovljević Tamara, Čobrenović Ana, Ranković Biljana	
HOLISTIC APPROACH TO CONSULTING FOR QUALITY SYSTEM AND OTHER MANAGEMENT SYSTEMS	1190
Trajković Ana, Mihić Branimirka	
FMEA APPLICATION IN RISK MANAGEMENT AS RESPONSE TO THE ISO 9001:2015 REQUIREMENTS	1198
Marković Sanja, Ruso Jelena, Horvat Ana	
QUALITY OF SOCIAL RESPONSIBILITY ACTIVITIES AND STAKEHOLDERS NEEDS IN SERBIAN EDUCATIONAL INSTITUTIONS	1205
Lukić Bojana, Glogovac Maja, Živković Nedeljko	
WHO IS GOING TO BE MORE INTERESTED IN ISO 50001 CERTIFICATION?	1213
Kandić Sanja	
THE ROLE OF HIGHER EDUCATION IN BUILDING AND IMPROVING NATIONAL QUALITY INFRASTRUCTURE – THE CASE OF SERBIA	1220
Ruso Jelena, Filipović Jovan, Pejović Gordana	
THE ROLE AND THE PERCEPTION OF THE STANDARD ISO 22000	1225
Jovanović Luka, Ilić Milica, Đurić Mladen	
INNOVATIVE STRATEGIES FOR NEW COMPETENCE DEVELOPMENT – BRINGING THE REAL WORLD IN HIGHER EDUCATION	1235
Mijatovic Ivana, Damnjanovic Vesna	
SOFTWARE QUALITY ASSURANCE	1242
Marković Sara, Stojanović Katarina, Đurić Mladen	

QUALITY MANAGEMENT

PERCEPTION OF BENEFITS - GUIDELINES FOR THE APPLICATION OF ISO 9001:2015

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Abstract: ISO 9001, the world's leading quality management standard, has recently been revised. The new version follows a new, higher level structure to make it easier to use in conjunction with other management system standards. With over 1.1 million certificates issued worldwide, ISO 9001 helps organizations demonstrate to customers that they can offer products and services of consistently good quality. It also acts as a tool to streamline their processes and make them more efficient. Focus of the paper is on the technical specification ISO/TS 9002 that is currently under development to help organizations easier application of ISO 9001. Based on a research performed using simple questionnaire among various organizations in Serbia, study presents the results on the awareness of the revision of ISO 9001:2015, expected benefits of quality management system implementation as well awareness on possible need and benefits of the guidelines given in the ISO/TS 9002.

Keywords: ISO/TS 9002, ISO 9001, quality management, revision, guidelines, benefits, improvement

1. INTRODUCTION

International Organization for Standardization is an independent, non-governmental international organization with a membership of numerous national standards bodies. Through its members, it brings together experts to share knowledge and develop voluntary, consensus-based, market relevant international standards that support innovation and provide solutions to global challenges. International standards give world-class specifications for products, services and systems, to ensure quality, safety and efficiency. They are instrumental in facilitating international trade. Standards are developed by the people that need them, through a consensus process. Experts from all over the world develop the standards that are required by their sector. This means they reflect a wealth of international experience and knowledge as explained by International Organization for Standardization (2016).

Taking into account that the ISO 9001 is the internationally most popular standard for quality management systems based on ISO Survey (2014), it is crucial to pay adequate attention to recent revision of the requirements given in the standard. In addition, it can be useful to give some overview of importance of technical specification ISO/TS 9002 that is currently under development as guidance on effective implementation of ISO 9001:2015 among organizations in Serbia. Led by these drivers, survey presented in the paper is based on the following hypothesis that will be concluded in the final chapter of the paper:

- H0: Organizations in Serbia are aware of the benefits in their quality management system implemented according to the requirements of ISO 9001:2015.
- H1: Organizations in Serbia are aware of the development of the new technical specification ISO/TS 9002 and its possible practical usage.
- H2: Guidance given in the ISO/TS 9002 will be applied in organizations in Serbia to assist in the implementation of management systems based on ISO 9001:2015 requirements.

Latest available survey from the International Organization for Standardization (2014) is showing of the information that was used for the survey analysis, on the number of certificates for quality management systems according to the standard ISO 9001 issued for the organizations in Serbia, in the previous years are shown in the Table 1. Assumption is that overall number of ISO 9001 certificates exceed the numbers shown in this survey. For the purpose of this paper official available data will be used.

Table 1: Total number of ISO 9001 certificates in Serbia ISO Survey (2014)

Country	2010	2011	2012	2013	2014
Serbia	1790	3228	2750	2366	2637

In the same survey from the International Organization for Standardization (2014), considered data were related to the industrial sectors in Serbia and number of certificates in each one of them:

Table 2: Number of ISO 9001 certificates in Serbia by industrial sector ISO Survey (ISO, 2014)

Sector	Number of certificates
Agriculture, fishing and forestry	17
Mining and quarrying	20
Food products, beverage and tobacco	207
Textiles and textile products	28
Leather and leather products	4
Manufacture of wood and wood products	18
Pulp, paper and paper products	19
Publishing companies	4
Printing companies	24
Manufacture of coke & refined petroleum products	5
Nuclear fuel	0
Chemicals, chemical products and fibers	47
Pharmaceuticals	46
Rubber and plastic products	75
Non-metallic mineral products	17
Concrete, cement, lime, plaster etc.	28
Basic metal and fabricated metal products	160
Machinery and equipment	93
Electrical and optical equipment	95
Shipbuilding	1
Aerospace	1
Other transport equipment	27
Manufacturing not elsewhere classified	26
Recycling	10
Electricity supply	6
Gas supply	7
Water supply	7
Construction	276
Wholesale and retail trade, repairs of motor vehicles	298
Hotels and restaurants	36
Transport, storage and communication	72
Financial intermediation, real estate, renting	13
Information technology	42
Engineering services	160
Other Services	116
Public administration	34
Education	42
Health and social work	43
Other social services	30

2. SHORT HISTORY OF THE ISO 9000 FAMILY OF THE STANDARDS

In the early days of developing first standards to this topics, according to the presentation from the working group 23, from the committee for management systems standardization ISO/TC176 (2012), a new work item proposal for three quality assurance "requirements" standards (ISO 9001, ISO 9002, and ISO 9003) was submitted to International Organization for Standardization in 1979. International Organization for

Standardization established its first committee for management systems standardization - ISO/TC 176. While the Deming Award Prize already existed in Japan, the Malcolm Baldrige Prize was just starting in the USA and soon afterwards the EFQM Business Excellence model in Europe, so it was decided to develop an additional standard giving extended guidance on the topic of quality, referred to as ISO 9004. During the development of these initial standards, it was decided that it would be better to place all the technical terminology in a separate glossary, ISO 8402, rather than repeating it in each standard. With five standards under development, feedback was received indicating that there was a need to explain the relationship between the different standards. Consequently, work was started on ISO 9000 "Selection and Use". ISO 8402 was published in 1986, with ISO 9000, ISO 9001, ISO 9002, ISO 9003 and ISO 9004 being published in 1987. Further feedback indicated that there was a need to provide users with application guidance for implementing ISO 9001, ISO 9002 and ISO 9003. It was then agreed to re-number ISO 9000 as ISO 9000-1, and to develop ISO 9000-2 as the desired application guidelines. While the initial editions of the ISO 9001, ISO 9002 and ISO 9003 standards had a distinctly "manufacturing" feel to them, there was growing recognition of the need to improve software quality. So it was decided to create a standard specifically giving guidance on quality for software, ISO 9000-3. There was also an historic association between the fields of quality, statistics, and maintenance and reliability. This led to the development of ISO 9000-4 on Dependability Management.

By the early 1990s, TC 176 was beginning to realize that it needed to consider the future revision and development of its standards, and so it produced a critical document called "Vision 2000" setting out a proposed path forward. One feature of Vision 2000 was to emphasize the difference between the basic introductory standards in the series, as compared to the requirements standards, and then the guidance standards going beyond the basic requirements standards. More feedback from the market emphasized the need to provide guidance on quality to the Services sector, but noting the recommendations in Vision 2000, it was decided to develop this as a part to ISO 9004, rather than as a part to ISO 9000. Consequently, ISO 9004 was renumbered as ISO 9004-1, and the very successful ISO 9004-2 on services was published.

ISO 9001:1987 and later ISO 9001:1994, contained 20 sub-clauses under clause 4, each addressing a different issue about quality. Feedback from the market suggested that there was a need for more detailed guidance on some of these topics, than was being provided through the generic application guidance in ISO 9000-2.

By the late 1990s, the ISO 9000 "family" of standards had grown to some 21 different standards as well as a number of supporting guidance notes and informative brochures.

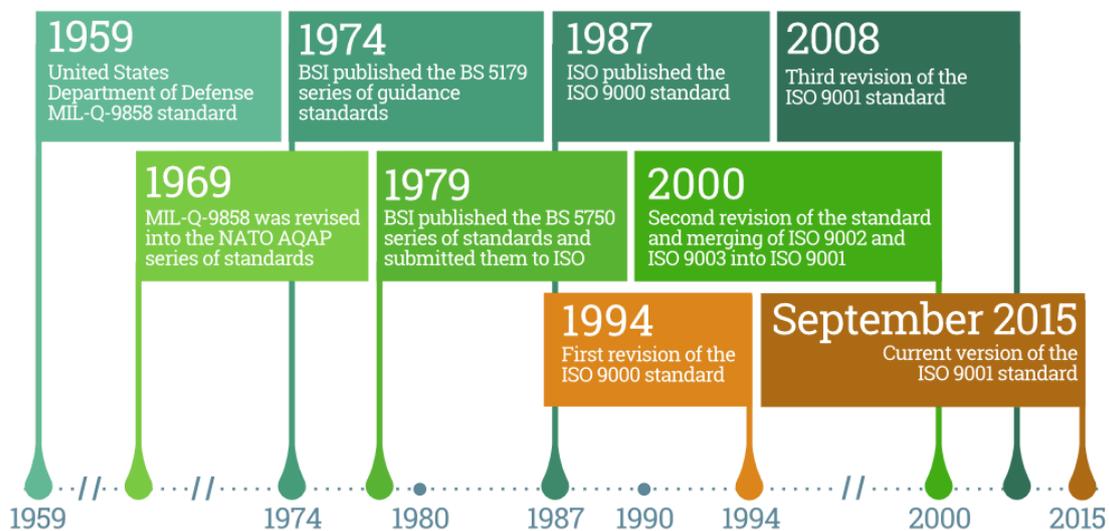


Figure 1: The history of quality management system standards by Advisera (2016)

Today, as presented by the International Organization for Standardization (2016) "The ISO 9000 family addresses various aspects of quality management and contains some of ISO's best known standards. The standards provide guidance and tools for companies and organizations who want to ensure that their products and services consistently meet customer's requirements, and that quality is consistently improved."

Standards in the ISO 9000 family include following basic set of the most important requirements or guidelines that can help various organization in not only implementing but also sustainably improving their quality management systems:

- ISO 9001:2015 - Quality management systems - Requirements.
- ISO 9000:2015 - Quality management systems - Fundamentals and vocabulary.
- *ISO/DTS 9002 - Quality management systems - Guidelines for the application of ISO 9001:2015*
- ISO 9004:2009 - Managing for the sustained success of an organization - A quality management approach
- ISO 19011:2011 - Guidelines for auditing management systems

2.1. Considerations on the revised ISO 9001:2015

ISO 9001 is the international standard that specifies requirements for a quality management system. Organizations use the standard to demonstrate the ability to consistently provide products and services that meet customer and regulatory requirements. It is the most popular standard in the ISO 9000 series and the only standard in the series to which organizations can certify. The current version of ISO 9001 was released in September 2015. The new version follows a new, higher level structure to make it easier to use in conjunction with other management system standards, with increased importance given to risk.

As explained by the American Society for Quality (2016), *“organizations of all types and sizes find that using the ISO 9001 standard helps them:*

- *Organize processes*
- *Improve the efficiency of processes*
- *Continually improve*

All organizations that use ISO 9001 are encouraged to transition to ISO 9001:2015 as soon as possible. This includes not only organizations that are certified to ISO 9001:2008, but also any organizations involved in training or certifying others.

Changes introduced in the 2015 revision are intended to ensure that ISO 9001 continues to adapt to the changing environments in which organizations operate. Some of the key updates in ISO 9001:2015 include the introduction of new terminology, restructuring some of the information, an emphasis on risk-based thinking to enhance the application of the process approach, improved applicability for services, and increased leadership requirements.

Organizations and individuals that use ISO 9001 are encouraged to transition to the 2015 revision as soon as possible. However, the International Accreditation Forum (IAF) and the ISO Committee on Conformity Assessment (CASCO) have agreed to a three-year transition period from the publication date of ISO 9001:2015.”

Strategic objectives of the performed revision of the standard ISO 9001 were:

- Taking into account of changes in quality management systems practices and technology since its last major revision that took place back in 2010,
- To provide a stable core set of requirements for the next 10 years or more,
- To ensure the reflection of changes in the increasingly complex, demanding and dynamic environments in which organizations operate and
- To ensure the facilitation of effective implementation and effective conformity assessment.

Short overview of the content in the current version of the standard ISO 9001:2015 is given as follows:

1. **Scope**
2. **Normative references**
3. **Terms and definitions**
4. **Context of the organization**
 - Understanding the organization and its context
 - Needs and expectations of interested parties
 - Scope
 - Quality management system and its processes
5. **Leadership**
 - Leadership and commitment
 - Policy
 - Roles, responsibilities and authorities
6. **Planning**
 - Actions to address risks and opportunities
 - Quality objectives and planning to achieve them
 - Planning of changes
7. **Support**
 - Resources
 - Competence
 - Awareness
 - Communication
 - Documented information
8. **Operation**
 - Operational planning and control
9. **Performance evaluation**
 - Monitoring, measurement, analysis and evaluation
 - Internal audit
 - Management review
10. **Improvement**
 - Nonconformity and corrective action
 - Continual improvement

Figure 2: ISO 9001:2015 Preview of content by ISO (2016)

In the text prepared by Lazarte (2015), acting ISO Secretary-General Kevin McKinley explains: “ISO 9001 allows organizations to adapt to a changing world. It enhances an organization’s ability to satisfy its customers and provides a coherent foundation for growth and sustained success.”

The 2015 edition features important changes, which Nigel Croft, Chair of the ISO subcommittee that developed and revised the standard, refers to as an “*evolutionary rather than a revolutionary*” process. “*We are just bringing ISO 9001 firmly into the 21st century. The earlier versions of ISO 9001 were quite prescriptive, with many requirements for documented procedures and records. In the 2000 and 2008 editions, we focused more on managing processes, and less on documentation. We have now gone a step further, and ISO 9001:2015 is even less prescriptive than its predecessor, focusing instead on performance. We have achieved this by combining the process approach with risk-based thinking, and employing the Plan-Do-Check-Act cycle at all levels in the organization. Knowing that today’s organizations will have several management standards in place, we have designed the 2015 version to be easily integrated with other management systems. The new version also provides a solid base for sector-quality standards (automotive, aerospace, medical industries, etc.), and takes into account the needs of regulators.*”

As the much anticipated standard comes into being, Kevin McKinley concludes, “*The world has changed, and this revision was needed to reflect this. Technology is driving increased expectations from customers and businesses. Barriers to trade have dropped due to lower tariffs, but also because of strategic instruments like International Standards. We are seeing a trend towards more complex global supply chains that demand integrated action. So organizations need to perform in new ways, and our quality management standards need to keep up with these expectations. I am confident that the 2015 edition of ISO 9001 can help them achieve this.*”

2.2. Purpose of the new ISO/TS 9002

Based on the International Organization for Standardization (2016) announcements technical specification ISO/TS 9002 is under development to assist users in the implementation of a quality management system based on ISO 9001:2015. It will provide guidance on the requirements in ISO 9001:2015, with a clause by clause correlation to clauses from 4 to 10 as shown in Figure 2 for ISO 9001.

Technical specification of ISO/TS 9002 (2016) will give examples of what an organization can do, but it does not add new requirements to ISO 9001:2015. The examples in technical specification are not definitive and only represent possibilities, not all of which are necessarily suitable for every organization.

ISO 9001:2015 contains requirements that can be objectively audited or assessed. ISO/TS 9002 will include examples, descriptions and options that aid both in the implementation of a quality management system and in strengthening its relation to the overall management of an organization.

While the guidelines will be consistent with the ISO 9001:2015 quality management system model, they will not be intended to provide interpretations of the requirements of ISO 9001:2015 or be used for audit or assessment purposes.

ISO/TS 9002 (2016) will be used by different organizations and implementation can vary based on types, sizes, levels of maturity and sectors and geographic locations. Based on these facts main purpose of survey presented in this paper was to present expectations of organizations in Serbia on this matter.

3. RESULTS OF THE RESEARCH AMONG ORGANIZATIONS IN SERBIA

In order to have factual data as a basis for objective conclusions on the hypothesis, comprehensive but simple survey was performed among 101 organizations from public and private sectors in Serbia. Survey had consisted of 11 questions towards locations, size, scope and similar data about companies as well on questions related to existing quality management system, perceived benefits of revised ISO 9001:2015 and awareness of developing of the technical specification ISO/TS 9002 and related guidance on implementing ISO 9001:2015. Results of the survey are given in the following figures and tables.

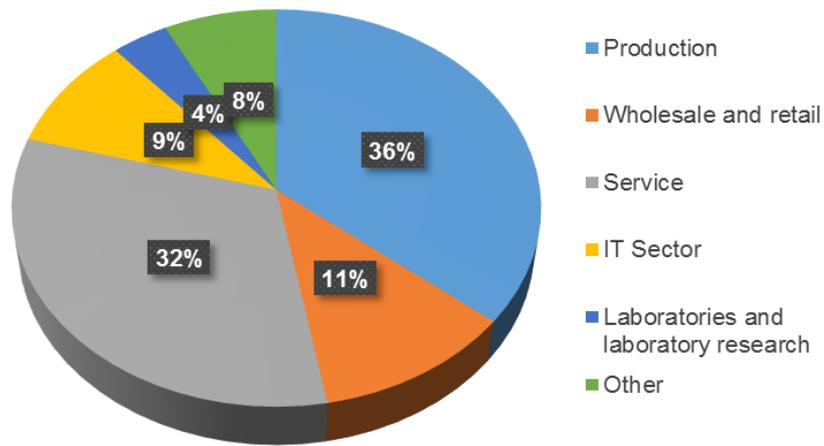


Figure 3: Industry sector of an organization

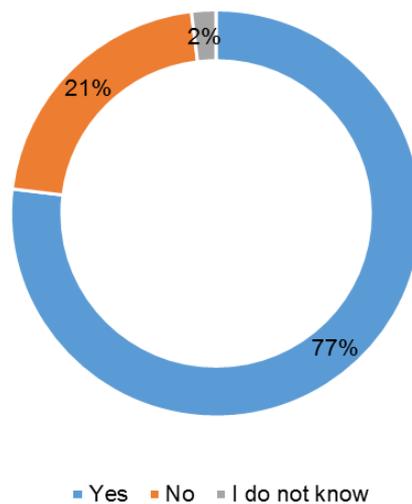


Figure 4: Did your organization implement Quality Management System - ISO 9001?

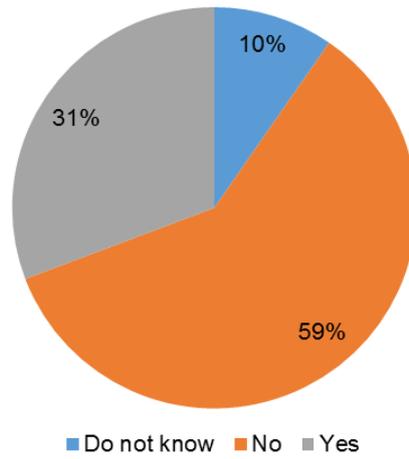


Figure 5: If your organization has been implemented a quality management system before, is it performed transition to the ISO 9001:2015?

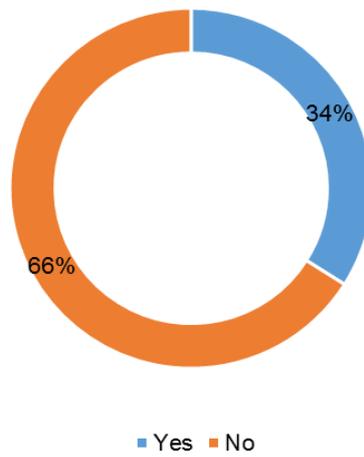


Figure 6: Do you know what technical specification ISO/TS 9002 is?

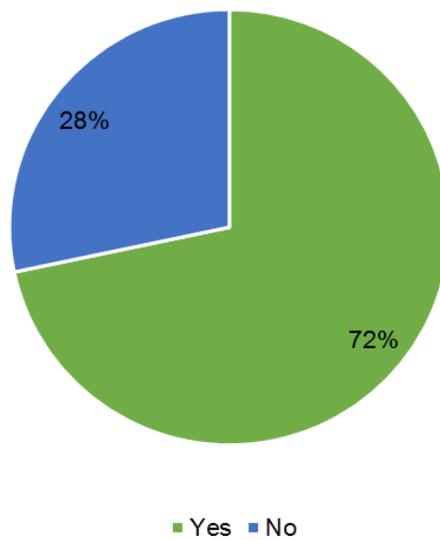


Figure 7: Do you believe that you need additional guidance on the interpretation and application of ISO 9001: 2015?

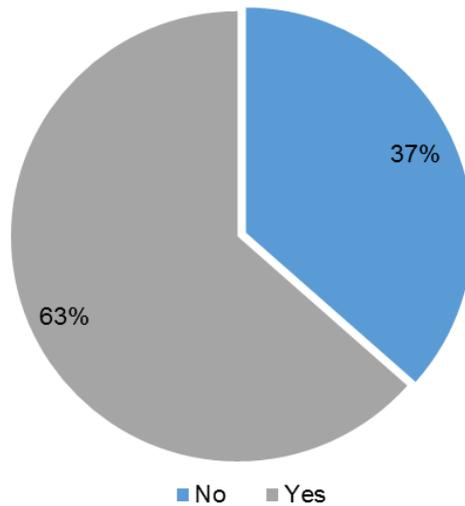


Figure 8: Do you think there is a need to adopt ISO/TS 9002 or ISO 9001:2015 is sufficient to implement the requirements for quality management system?

Conclusions of this survey are that organizations in Serbia are not familiar with existence of ISO/TS 9002 and their possibilities for better implementation of ISO 9001:2015 requirements and improving of business processes. Also, there is big demand for more assistance and information regarding interpretation of ISO 9001:2015 requirements.

The most useful information to give some additional conclusions is given in the Table 3 which consist of the answers given by the representatives from the organizations. They have been given different explanations on possible benefits from implementing revised version of the standard ISO 9001:2015 requirements:

Table 3: What are the benefits from implementing ISO 9001:2015?

Benefits (in %)	Companies ≤ 100 employees	Companies > 100 employees
Less paperwork	72	85
Winning tenders	61	78
Better risk and control management	53	60
The improvement of supply chain	39	67
Better clients' satisfaction	29	53
Easier implementing of EMS & OHS	21	47
Other	18	27

4. CONCLUSION

Considering results of the presented survey and the experts' opinion on the importance and methods of implementing concepts and principles of quality management in the various organizations, following conclusions can be related to the initial hypothesis:

- H0: Organizations in Serbia are aware of the benefits in their quality management system implemented according to the requirements of ISO 9001:2015. - C0: Most of the organizations are aware of the benefits they are pursue by effective quality management system although, on the other side, most of them still perceive the greatest benefit in two areas of easier participation on the tenders and less administrative bureaucracy related to control of paper documentation. There is still room for trying to express more benefits related to some other, more quantitative performance indicators like examples from the study on "Economic benefits of standards" explained by Gerundino, Weissinger, Grosfort and Damond (2014).
- H1: Organizations in Serbia are aware of the development of the new technical specification ISO/TS 9002 and its possible practical usage. - C1: Most of the organizations are not aware of the current development of the neither technical specification nor what it is the planned purpose of it.
- H2: Guidance given in the ISO/TS 9002 will be applied in organizations in Serbia to assist in the implementation of management systems based on ISO 9001:2015 requirements. - C2: Unless experts from the quality management system, representatives of institutes and universities as well top managers of the organizations themselves do not use maximum effort in spreading information on the importance and usefulness of the future technical specification ISO/TS 9002, there is a short chance that organizations

themselves nor different kind of consultants in this area will use ISO/TS 9002 on a big scale as a support to implementation of the ISO 9001:2015 requirements in Serbia.

Inputs for the future researching on the topics presented in the paper can indicate some of the following thesis in order to prepare beneficial results and practical guidance to the interested professionals and organizations that have implemented quality management system based on the ISO 9001 and possible guidance given in the future ISO/TS 9002:

- There is a great need of using additional methods of getting closer to current developments in the field of quality management relevant to the representatives of the organizations in Serbia based on the presented survey results from April 2016 in this paper.
- Internal and external trainings and workshops for the quality management representatives are essential for creating knowledge database that can be systematically explored in the various organizations as discussed by Schachner (2015) and emphasized by Smida (2015). It will be significant to research what level of improvement in organization can be generated through development of knowledge management system.
- If organizations on the worldwide scale and also it applies to Serbia as well, are aware of the risk based approach and using some of the simple risk assessment techniques to perceive strengths and weaknesses of their quality management system and processes they can be able to use more effective strategy and decision making models in order to maximize benefits of their management systems as also indicated by Bauer (2015) and Garscha (2015).

As changes in internal and external context of the organization are immanence to all kind of organizations it can be useful to organizations in Serbia to use more tools or guidelines, like given in the ISO/TS 9002, in order to be prepared to adequately react on time in the ever-changing conditions for existence of the successful business. Otherwise they can suffer from the shortage of information present and available but not used by the organizations as a lack of systematic approach to concepts like change management and analysis of internal and external issues using strength/weaknesses and threats/opportunities analysis or consideration of the political, economic, social and technological factors used to assess the market for a business or organizational unit as concluded by Pelzmann and Koubek (2015) as well as Pölz (2015).

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PARADIGM EVOLUTION: FROM LINEARITY TO COMPLEXITY IN THE WORLD OF QUALITY MANAGEMENT

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Abstract: *The latest management concepts, which are based on nonlinear dynamical models, differ significantly from the traditional concepts intertwined by linearity, which are created for the world that seized to exist a long time ago. Such concepts, that include adaptability, nonlinearity and holistic approach, can provide a broader picture of the organization and the space in which it exists, which is a prerequisite for the creation of more adequate quality management mechanisms and solutions. This paper presents specific concepts and phenomena that were previously observed in some natural sciences and whose applicability can be found in different processes of organizational systems. The discussion on complex adaptive systems should lead to a better understanding of the organizational processes. The reason for the inclusion of the complex adaptive systems and the complexity theory in the management and quality management approaches lies primarily in a desire to create a more resilient and more flexible organizational system that learns and evolves, which is also a requirement of the latest version of ISO 9001 standard. As is written in the new ISO 9000:2015 that „an organization’s QMS model recognizes that not all systems, processes and activities can be predetermined; therefore it needs to be flexible and adaptable within the complexities of the organizational context“, we recognize complex adaptive systems theory as an appropriate framework for making these concepts live in operational practices of organizations’ quality management systems.*

Keywords: *organization, quality management, complexity, complex adaptive systems, ISO 9000*

1. INTRODUCTION

The beginning of the XX century was marked by the development of management as a scientific discipline. Frederic Taylor, the creator of the scientific management theory, based his work on the need to increase productivity, i.e. industrial efficiency. Productivity was the most important factor of success in this era, so the entire focus was on manufacturing. The basic assumption was that only increasing the efficiency of the process would increase productivity as well. Further research of Taylor and his contemporaries came to the conclusion that the processes must be carefully designed and that the most suitable man should be selected for them. Even a linear approach like this one gave good results at that time and represented a major progress. However, nowadays it is simply impossible to manage the organization as a linear system.

Numerous management concepts that were created later have increasingly estranged from understanding the organization as a linear system. The latest concepts observe the organization as a highly nonlinear dynamic system that exists in a nonlinear, even chaotic, dynamic environment.

Variable, turbulent, often unpredictable business environment requires a greater level of adaptability from the organization. A long-time trend that shows great instability of the global world market, which is very susceptible primarily to economic and political influence, imposes organizational leaders to apply different management approaches to make their organizations more flexible. The challenges that organizations are dealing with have become more complex and traditional management approaches and the way that they are designed have not given the necessary flexibility. In an era characterized by nonlinearity and complexity, leaders primarily need to change the way they conceptualize solutions for the problems they face in managing organizations.

Today, people care about different things, they are better informed, more educated, but also better connected than in the past. Their expectations from the company, whether they take the role of customer/consumer, suppliers, investors or members of the community, are changing rapidly. Unfortunately, most companies have not evolved enough to keep up with all these changes and continue to operate by using the way of thinking and practice that was suitable for a very different world. (Mackey & Sisodia, 2013)

The system approach to management represents the basis and the starting point for analyzing the environment, changes and creating a solution for management systems. Taking into account the concepts of the systems theory, we can come to a better understanding of the problems and the mechanisms by which they can be solved.

The complexity theory as part of the systems theory provides a number of aspects through whose prism the organizational systems can be studied. The subject of studying in complexity theory is a nonlinear dynamic system, and since the organizations are nonlinear dynamic systems they fulfill this assumption. Through the prism of the complexity theory and the theory of complex adaptive systems, which are based on a systematic approach, observation and study of the management system of the organization can bring a completely new management approaches and concepts.

The basic concepts taken from the theory of complex adaptive systems and the complexity theory, which are increasingly present in the world of management, will be presented by the literature review.

2. FUNDAMENTALS OF THE COMPLEX ADAPTIVE SYSTEMS THEORY

Complex adaptive systems (CAS) are systems composed of a large number of interdependent components and agents with mutual interactions (Sammut-Bonnici, 2014; Doyle, Watz, & Portrey, 2015). Sammut-Bonnici (2014) notes that all components of CAS work as a whole and have the ability to learn through experience so they can adapt to changes that occur in the environment. Doyle, et al. (2014) observe agents as autonomous system components that are able to observe, analyze, decide and act taking into account information obtained from the environment and set goals.

Similar to the authors Domingues et al. (2015), Palmberg (2009) Bonabeau & Meyer (2001), Rouse (2008) he defines some of the main characteristics of CAS:

- They represent the non-linear dynamic systems whose behavior and actions can become chaotic or random, depending on the nature of the system.
- They are composed of independent agents (or partially dependent) whose behavior is based on the physical, psychological or social rules.
- Because the needs and desires of agents (which are stated in their rules) are not homogeneous, their goals and behavior are often in conflict. In response to these conflicts and competitiveness, agents tend to adapt the behavior of each other.
- The agents' intelligence is limited. When they experiment and gain experience, they learn and change their behavior accordingly.
- Adaptation and learning tend to be only the outcome of the organization. The patterns of behavior arise before than being designed into the system.
- There is no central point of control. The behavior of the system is usually unpredictable and uncontrollable and no one is "the boss".

The model of the complex adaptive systems, except the inputs and outputs in the form of information, substance and energy, contains a system of simple rules, which defines the rules by which the system agents respond to the impacts detected by the system, whether they come from the system or from the environment. It is important to note that feedback allows adaptive learning which has a direct effect on the evolutionary mechanism of the system. Neikam (2015) mentions the importance of designing an organizational system model according to CAS because of the benefits in the form of co-evolution, which means that the system reacts in the same way to the environment aiming to create a suitable climate.

Sammut-Bonnici (2014) suggests that it would be extremely risky to transform organizational models into those which only involve self-organization, primarily because there is a possibility of the occurrence of chaos and the inability to predict any results of the system because he is not guided, i.e. it is not directed towards a determined direction, but should transform only those processes and parts of the system, according to the CAS, which in practice appear sustainable and efficient. CAS theory contributes more holistic view of the organizational system (Dooley, 1997).

2.1. Swarm intelligence

A large number of the world's leading organization accepts new concepts of management resulting from the theory of complex adaptive systems in order to maintain a competitive advantage through innovation. One of the new concepts that is based on complexity is swarm intelligence. Many companies like "Unilever", "Southwest Airlines" and others have adopted this approach to solve some of their problems. Primarily, the

approach is based on optimization of different business operations and provides greater flexibility, robustness and self-organization (Bonabeau & Meyer, 2001).

The swarm intelligence is a specific pattern of behavior of certain chaotic systems composed of a large number of individual agents that are manifested through their association to solve the problem by putting efforts toward a common goal.

The term is taken from the natural sciences, and it is best illustrated through the natural phenomena on which they were named, whether they are swarms of bees, a school of fish or a colony of ants. There are so many scientific programs about animals which are studying only the form of their behavior in a group. A flock of killer whales who use well-coordinated tactics and clear communication to surround the seal, a herd of wolves who are trying to isolate the buffalo calves from the herd by using an excellent coordination and strategy or a colony of ants that join forces to defend their habitat from attack or self-organize the shipment of food into their colony, are some examples of united intelligence of individual agents who represent on a higher level an intelligence of the group.

3. ORGANIZATIONAL AND QUALITY MANAGEMENT SYSTEM FROM THE ASPECT OF THE COMPLEX ADAPTIVE SYSTEMS THEORY

Mechanisms of early management concepts show a high degree of linearity, but as management theory and practice evolved more and more of these concepts carried nonlinearity in them. The concepts of today such as knowledge management, but also the management of complexity, base their mechanisms on forms that are adaptive and variable in space and time.

During XX century, the development of production technology has fundamentally influenced not only the society but also the logic of business and organization. Similarly, the dominance of the development of information technology at the turn of the XXI century affects not only the way of communication between people but also the organization. These trends require organizations that can combine efficiency with flexibility and innovation. (Palmberg, 2009)

Traditional quality management systems are based on hierarchy and centralization which means that information flows are directed from top to bottom and they are precisely defined. Contrary to them, quality management based on the complexity theory enables consideration of an organization as a decentralized system where information flows in all directions and where the level of bureaucracy is on a very low level. (Olmedo, Sancho, Meteos, & Valderas, 2002). Rouse (2008) provides a comparison table (Table 1) of differently oriented organizational models, i.e. traditional and complex adaptive organizational systems.

Table 1: A comparison of the characteristics of organizational systems (Rouse, 2008)

Criterion	Traditional	Complex adaptive
The role of top management	Management	Leadership
Methods	Command and control	Initiative and inhibition
Measurements	Activities	Results
Focus	Efficiency	Agility
Relations	Contractual and specified	According to personal discretion
Network	Hierarchical	Heterarchical
Design	Organizational design	Self-organization

Setting the organization in the context which implies that it is a part of an environment that actually represents the system at a higher level of decomposition and taking into account factors that may affect the system, which is one of the most important changes in new ISO 9001:2015, can contribute to more efficient management and increase resilience of an organizational system. It should be noted that the model that defines the context must be adequate to the situation. Olmedo et al. (2002) note that linear models of dynamic systems can facilitate understanding of the basis and functioning of the system but such models contain a very simplified picture of the real situation with a known and determined environment, which in reality is not the case. Also, behaviour patterns that occur are well-known so that such a model does not imply evolution, learning and adaptability.

Although the organizations as open systems are exposed to the influence of environment, also the environment is exposed to its impacts, to a greater or lesser extent. Dulanovic and Jasko (2008) note that organizations need to adapt to the environment but also depending on how much power they have, they can

adapt the environment to their needs. The progressive growth in the number of organizations has led to the increased complexity of global environment in which they exist.

It is generally accepted (Wheatley, 1993; Domingues, Sampalo, Arezes, 2015; and others) that organizations and their management systems are dynamic systems with a large number of nonlinear interactions both within its system and also with the dynamic but turbulent environment.

As for any other management system, we can say for a quality management system that „under certain circumstances, regularly behave in a predictable way. Under other conditions they exhibit a behavior in which the regularity and predictability are disappearing. Almost invisible differences in the initial conditions lead to the gradual divergence of systemic reactions compared to the normal state until the behavior of the system becomes very different (Rosenhead, 1998).“

Certain characteristics recognized by many authors (Domingues, Sampalo, Arezes, 2015; Palmberg, 2009; Bonabeau & Meyer, 2001; and others) define the organization as a complex adaptive system, and some of them are especially important from the angle of the quality management system:

- A large number of different agents, with their interactions, make the system “alive” such as employees and other stakeholders and interested parties, as well as equipment, structure, organization, etc.
- The learning, which is increasingly represented as a management concept, also appears in the ISO standards for quality management systems (ISO, 2015b), involves the generation of knowledge upon which the organizational systems form patterns of their behavior. It is certainly a very important characteristic that gives the adaptability to the system.
- The co-evolution – as already mentioned, the organization is an open system that is subject to influences, but also the environment is a subject to influences that are coming from the organization, so this feature provides a space-time dimension to the changes that occur and represent an evolutionary trait of all participating systems.
- The complexity – numerous nonlinear interactions between agents of the system from which arises indeterminate behavior patterns.
- Emergence – because of its complexity and the imposed requirements, an organization creates certain patterns and mechanisms: the ISO 9000 family should be perceived as a set of solutions aggregated from the good practice, given the management practices and technologies utilized throughout the world.
- Self-organization as a mechanism that initiates the formation of specific patterns of behavior and it contains a system of simple rules by which it functions.
- Organizational systems are assembled from parts, sectors and departments that can be changed, abolished and/or added which is usually achieved by reengineering of business processes, so the principle of modularity is contained in the assumption that organizations possess this characteristic. Modularity is very important when it comes to adaptability because it gives more flexibility.

4. LEARNING AND AUTOPOIESIS THEORY AS A POTENTIAL BASES FOR SUCCESSFUL IMPLEMENTATION OF ISO 9001:2015 IN COMPLEX ENVIRONMENTS

In terms of the new ISO 9000 series, we are guided to understand that „organizations share many characteristics with humans as a living and learning social organism. Both are adaptive and comprise interacting systems, processes and activities.” (ISO, 2015a). Also, the same document states that organizational QMS „needs to be flexible and adaptable within the complexities of the organizational context“, with the following requirements which imply that appropriate learning and knowledge management processes are vital in achieving this. We here present the autopoiesis theory as one potential way of understanding how this set of requirements may be fulfilled in a complex environment.

“The concept of ‘autopoiesis’ essentially is the system, which is organized as a network of production processes components which continue to produce components that are using their mutual interactions and transformations that continually regenerate and realize the network of processes that produces them. Components in some way constitute the system as a unit in the area, in which they (the components) exist by specifying their implementation in such a network topology.” (Varela, 1979)

In “autopoiesis” theory, the organization can be seen as a transfer or flow of knowledge whose characteristics change - new ones are created and old ones are abandoned. Knowledge is flexible, available to members of the organization and linked to the organizational history. (Von Krogh & Roos, 1995). Maturana and Varela (1987) note that this theory largely depends on the “observer”. The observer is always a man as an agent of organizational system and all cognitive processes and learning processes rely on its objectivity or subjectivity.

Individual knowledge through social communication creates the phenomenon of organization and organizational knowledge (Maula, 2006). The organization is formed through the interaction of people and their merger. One of the phenomena of „autopoiesis“ theory is structural coupling. This is actually the assumption of co-evolution, but essentially means two individual entities or entity and its environment where their mutual interactions over many repetitions create compatibility of these two systems or entities and create a unique trajectory (Maturana & Varela, 1987).

Furthermore, knowledge is, as already stated, closely related to the observation (perception) and systems that can perceive are autopoietic systems. Individuals create knowledge in an autonomous way. It is based on previous knowledge and created in co-evolution with the environment. Their knowledge depends on the interaction within the organization, while the organization operates as a specific space for “structured association” that allows individual agents to reproduce cognitive processes (Von Krogh & Roos, 1995).

From the above we can observe that organizational learning is not just an ISO 9001:2015 requirement, but also a specific mechanism through which learning and knowledge management occur and are adapted over time, while organizational systems form patterns of behavior by just using the gained knowledge.

5. CONCLUSION

Organizations are chaotic systems, as they possess certain opposing forces that are used to move the organization from a state of balance and push it into the chaos. Some forces are pushing the system to stability and order and they usually involve activities such as planning, structuring, inspection and control – all of this being very important subprocesses of the quality management, while other forces are pushing the system in the opposite direction, i.e. to instability and they include activities such as innovation, initiatives, experiments, etc. (Thietart & Forgues, 1995).

In the context of organizations and their quality management systems complexity provides a useful framework that explains how organizations behave, and how individuals and organizations interact, how to connect and survive within a larger system, i.e. environment. Furthermore, the complexity also explains why a particular influence on the processes gives unpredictable consequences and unexpected results. There is a number of intertwined links among elements within a complex system that lead to the creation of greater interdependence, which means that the changes affect the elements at all levels of the system. The changes usually occur between the elements at lower levels in parallel and then move on to the whole system (Maldonado & Gómez-Cruz, 2012).

It is important to ask the question whether it is a linear control mode suitable for the current situation and the dynamic of the environment in which organizational systems exist. Quality management system may remain without a necessary flexibility, despite the fact that it is implemented by all the details related and arising from ISO standards, national legislation, working procedures etc. These procedures are usually very complicated, sensitive to change, it takes some time to create them, but are also quite inefficient and can cause unforeseen side effects and costs. If system would work as previously discussed, minutely management would require great amount of energy and resources. Complex natural systems use self-organization that contains certain principles and thus the system operates in the desired direction (Helbing, 2009).

All of this indicates that informal systems can be more efficient and more capable of solving some problems than formal systems. The nonlinearity is very strong and emerging patterns and mechanisms lead to different dynamic of the system. In the informal system the existence of a system of simple rules or principles is very important, in order to maintain the system’s organization. Otherwise, there would be chaos and the system would be very likely to collapse.

From the perspectives of the theories elaborated in this paper, it may be concluded that quality management system acquires additional dimensions enabling it to solve main organizational issues more efficient and effective than ever before.

The goal of future researches should be to find the generic concepts that can help organizations to achieve a certain degree of agility, flexibility and efficient mechanism for the collection of knowledge on the level of organization, all of these being requirements of the new ISO 9000 series.

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SOME TERMINOLOGICAL OBSERVATIONS ON ISO 9000 STANDARD SERIES WITH SPECIAL FOCUS ON ISO 9000:2015

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Abstract: *The Institute for Standardization of Serbia (ISS), as the main national body for standardization (defined by the national Standardization Act), adopts, publishes, reviews, and withdraws Serbian standards. Promptly after the ISO 9000:2015 was published, the Institute offered its identical Serbian version entitled SPRS ISO 9000:2015 Quality Management Systems – Fundamentals and Vocabulary (SRPS ISO 9000:2015 Sistemi menadžmenta kvalitetom – Osnove i rečnik). This paper presents some observations on terminological solutions offered both by the abovementioned standard, and the ISO 9000 Standard Series as a whole. The paper identifies challenging terminological units, analyzes them and offers possible solutions, thus indicating the need for more adequate terminology management.*

Keywords: *terminology, quality management system, ISO 9000:2015, translation, standardization*

1. INTRODUCTION

The Institute for Standardization of Serbia (ISS) as an independent, non-profit entity is the legal successor of the Federal Commission for Standardization (1946-1962), the Yugoslav Institute for Standardization (1962-1978), the Federal Institute for Standardization (1978-2003), and the Institute for Standardization (2003-2006). According to the Standardization Act ("Official Gazette of the Republic of Serbia", No. 36/2009 and 46/2015) and the Decision on Amending of the Founding Act of the Institute for Standardization of Serbia ("Official Gazette of the Republic of Serbia", No. 88/2009), this Institute is the only official national standardization body in the Republic of Serbia, and a legal entity that operates in accordance with the regulations governing the legal status of the public services.

Operating as the national organization for standardization, the Institute represents and protects interests of the Republic of Serbia in the following international and European organizations for standardization (<http://www.iss.rs/>):

- International Organization for Standardization (ISO); a full member since 1950,
- International Electrotechnical Commission (IEC); a full member since 1953,
- Worldwide System for Conformity Testing and Certification of Electro technical Equipment and Components (IECEE); a full member since 1965,
- European Committee for Standardization (CEN); an affiliate member since 2008,
- European Committee for Electro technical Standardization (CENELEC); an affiliate member since 2005,
- European Telecommunications Standards Institute (ETSI); a member since 2011.

International Organization for Standardization (ISO) as an independent, non-governmental international organization including 161 national standards bodies *brings together experts to share knowledge and develop voluntary, consensus-based, market relevant International Standards that support innovation and provide solutions to global challenges* (<http://www.iso.org/iso/home.html>). The ISO Technical Committees (TCs) are in charge of preparation of international standards, while rules for the structure and drafting of International Standards are contained in ISO/IEC Directives Part 2. At least 75% of ISO members have to support an International Standard draft for it to be published.

In this paper we are specifically interested in the ISO 9000 Standard Series that can be applied to organizations of any size. This series includes some of the ISO's best known standards that address various aspects of quality management and quality assurance providing guidance and tools for companies and organizations in order to improve quality consistently and ensure that their products and services consistently meet customers' requirements.

The ISO 9000 family comprises the following standards:

- ISO 9001:2015 - sets out the requirements of a quality management system;
- ISO 9000:2015 - covers the basic concepts and language;
- ISO 9004:2009 - focuses on how to make a quality management system more efficient and effective;
- ISO 19011:2011 - sets out guidance on internal and external audits of quality management systems.

Standard ISO 9000:2015 was originally published in 1987, but has later undergone several revisions: a major one in 2000, another one in 2008, and the final one published in September 2015, immediately followed by its Serbian version. Standard SRPS ISO 9000:2015 *Quality Management Systems – Fundamentals and Vocabulary (Sistemi kvaliteta menadžmentom – Osnove i rečnik)* is a product of the CASCO Technical Committee of the ISS. The ISS also embodies a technical committee named Terminology (A037), but it mainly dedicates its activities to ISO TC 37 standards.

The purpose of this paper is to draw attention to a number of terminological issues observed in this standards series, and to particularly focus on the quality, adequacy and consistency of term use in the Serbian version of ISO 9000:2015 indicating the third chapter of this standard *Terms and Definitions* as the limelight.

2. TERM FORMATION AND EXAMPLES OF TERMINOLOGICAL INCONSISTENCY IN THE FIELD OF MANAGEMENT

Management is a specialized subject field undergoing rapid development, thus in constant flow of newly emerging terminological units, very often representing the same concept by more than one term and consequently, often causing terminological confusion. New terms in Serbian are generated from (1) adopting terms from other languages, (2) accepting internationalisms or (3) transferring words from the language for general purposes (LGP) into terms (the process known as *terminologization*). It is not infrequent that a single concept and a single foreign term in Serbian have several alternatives, originating from different linguistic processes. Despite the obvious need for an organized and unambiguous system of terms for adequate professional communication in this subject field, the reality is undoubtedly chaotic. It seems necessary to establish methods for selection of the most appropriate term alternatives, and carry out systematic process of terminology standardization in professional communication. Jakić (2014) claims that the following terminological principles are applied in the process of management terminology standardization (pp. 94-103):

- Precedence of Serbian terms over loan terms,
- Precedence of Latin and Greek terms over English, French, German, etc.,
- Adaptation of terms on all linguistic levels (phonological, morphological, syntactic),
- Precedence of shorter loan terms over longer Serbian terms.

2.1. Precedence of Serbian terms over loan terms

Loan words have an obvious dominance in the Serbian language management terminology. Having that the development of every language domain is important for the general language development we suggest the use of Serbian words whenever and wherever possible. There is no reason for avoiding a Serbian term even when it is used in parallel with an internationalism (generally Latin or Greek word): e.g. *obim* instead of *volumen*, *nespojivost* instead of *nekompatibilnost*. Even in such cases, only the basic term is to be taken, but further derivations should follow the linguistic rules of Serbian. It is necessary to work on Serbian term formation systematically and continuously in order to create useable, useful, practical and linguistically correct terminology. Table 1 provides some Serbian management terms as examples of precedence over loan terms.

Table 1: Serbian management terms and their loan equivalents

Loan term or term with a loan element	Term in Serbian
Bridžing	<i>Premošćavanje</i>
Incidenca	<i>Pojava</i>
Prevenција	<i>Sprečavanje</i>
Kompetencija	<i>Konkurencija</i>
Border line	<i>Poremećaj, granični poremećaj</i>
Flow chart	<i>Dijagram toka</i>

2.2. Precedence of Latin and Greek terms over English, French, German, etc.

Jakić (2014) indicates that unlike other loan words, Latin and Greek easily find their place in the Serbian language system (p. 96). The experience of borrowing lexical items from these two languages is centuries-long and Serbian (as many other languages all over the world) has developed certain mechanisms for adoption and adaptation of Latin and Greek lexical materials. These internationalisms have secured themselves a special position within other language systems (including Serbian), so it is not always necessary to insist on finding a proper translation of a Latin or Greek term (or a term including their elements).

Table 2: Examples of diachronic development of words with Latin or Greek root

Term	Serbian	Latin or Greek root
Company	<i>Kompanija</i>	Latin words <i>fed up</i> and <i>panis, bread</i> combined give the root of a word <i>company</i> . At a later stage it started being used in a business context.
Cash	<i>Gotovina</i>	Derived from a Latin word for “box” <i>cassa</i> . At the beginning it was used by French and denoted “moneybox”.
Consumer	<i>Potrošač</i>	Latin expression <i>consume</i> means “eat it all”. This has led to the use of the term <i>consumer</i> .
Economist	<i>Economist</i>	Comes from a Greek word <i>oikonomia</i> , which means <i>house management</i> .

2.3. Adaptation of terms on all linguistic levels (phonological, morpho-syntactic)

Adaption of terms on the phonological level is obvious in translations. Phonological form of a translation should be defined by the pronunciation in a source language, its orthography and influence of the language mediator.

2.3.1. Phonological level

Several levels of phonological adaption (transmorphemyzation) of translated management terms could be noted (Jakić, 2014):

Table 3: Adaptation of terms on phonological level

Complete transformation	Phonemes of a source language are replaced with compatible phonemes of a target language with completely the same phonological description: <ul style="list-style-type: none"> - AQAP (<i>a ku a pe</i>) (Allied Quality Assurance Publications) - AQAP (<i>ej kju ei pi</i>); - PDCA (<i>pe de ce a</i>) (Plan-Do-Check-Act) - PDCA (<i>pi di si ei</i>);
Partial transformation	Phonemes of a source language are replaced with semi-compatible phonemes of a target language: <ul style="list-style-type: none"> - brainstorming - <i>brejnstorming</i>; - benchmarking - <i>benčmarking</i>; - reengineering – <i>reinženjering</i>;
Free transformation	Phonemes of a source language find neither complete nor partial compatibility in phonemes in a target language; as a result, they are replaced in a free form. <ul style="list-style-type: none"> - E- business - <i>E- biznis</i> - Brand management - <i>Brand menadžment</i>

2.3.2. Morpho-syntactic level

The level of morpho-syntactic adaption of translated terms is measured by the difference - similarity criterion in parts of speech that the term elements in both source and target language belong to.

Table 4: Adaptation of terms on morpho-syntactic morphological level

Brain + storming	<i>Moždana + oluja</i>
Bench + marking	<i>Tezga za rad + reperi</i>
Re + engineering	<i>Ponovo + inženjering</i>
Reverse engineering	<i>Unatrag + inženjering ili inženjering unatrag</i>

Lexical and semantic adaptation of borrowed and translated terms is related to lexical synonymy, translation pairs and definition or all those translations that show interlingual semantic changes between source and target equivalents. Here are some examples of management terms and their translation equivalent forms:

Table 5: Translation equivalents

ROA (return of assets)	<i>PS (povraćaj sredstava)</i>
VAE (value added per employee)	<i>DVPZ (dodata vrednost po zaposlenom)</i>
MS (market share)	<i>UNT (udeo na tržištu)</i>

2.3.3. Precedence of shorter loan terms over longer Serbian terms

Although we think that Serbian words and expressions should get the status of a term whenever and wherever possible, for the purpose of language economy many shorter loan terms should be accepted.

Examples:

- The term *mobing* (mobbing) is used instead of a longer expression in Serbian *zlostavljanje na radnom mestu*;
- The term *percipirani kvalitet* (perceived quality) instead of a *korisnikovo poimanje kvaliteta*.

Filipović and Đurić (2009) tried to find a terminological solution to the translation of the expression *5W2H* (*what, why, where, when, who, how, how much*) and they proposed seven standard questions asked in the quality planning. The reasons for the possible precedence of the first (English) terminological alternative over the suggested Serbian one may be the length and language economy. Almost all scientists, both linguists and subject field experts, Bugarski, (2007), Cabré (1999), Filipović and Filipović (1997, 1998), Milić (2013), Silaški (2009, 2012), Wright and Budin (1007) and Šipka (1998), are unanimous when it comes to some basic characteristics of scientific and professional terms. With certain differences, they all agree that a term should be (1) monosemous (have only one meaning), (2) non-synonymous, and (3) as short as possible.

3. ISO 9000:2015: SPECIFIC TERMINOLOGICAL ISSUES

We observed the following three terminological issues in the ISO 9000:2015 standard, namely:

- Terminological inconsistency;
- Terminological ambiguity;
- Terminological acronyms.

3.1. Terminological inconsistency: Use of *management + noun in the instrumental case vs. management + noun in genitive case*

By analyzing Serbian terms as used in this standard, we noticed the frequent use of the instrumental case in terminological expressions after the noun management. Table 7 presents examples of the terminological construction *management + noun in the instrumental case* as identified in SPRS ISO 9000:2015, together with their English equivalents. The numbers preceding the terms are their referent numbers from the standard.

Table 6: Terminological construction *management + noun in instrumental case*

Term in Serbian (SRPS ISO 9000:2015)	Term in English (ISO 9000:2015)
3.3.4 <i>Menadžment kvalitetom</i>	3.3.4 Quality management
3.5.4 <i>Sistem menadžmenta kvalitetom</i>	3.5.4 Quality management system
3.1.2 <i>Konsultant za sistem menadžmenta kvalitetom</i>	3.1.2 Quality management system consultant
3.4.3 <i>Realizacija sistema menadžmenta kvalitetom</i>	3.4.3 Quality management system realization
3.3.9 <i>Menadžment konfiguracijom</i>	3.3.9 Configuration management
3.3.12 <i>Menadžment projektom</i>	3.3.12 Project management
3.5.7 <i>Sistem menadžmenta merenjem</i>	3.5.7 Measurement management system
3.8.11 <i>Plan menadžmenta projektom</i>	3.8.11 Project management plan

The examples above point out that ISS apparently opts for the use of instrumental case following the term *management*. Namely, Technical Committees of the ISS are *Sistemi menadžmenta zaštitom životne sredine (Environmental management)*, *Ocenjivanje usaglašenosti i menadžmenta kvalitetom (Conformity assessment and quality management)*, *Sistemi menadžmenta bezbednošću hrane (Food safety management systems)* and all of these contain the same construction: *management + noun in instrumental case*.

Unlike the translation of the original ISO standard terms done by the members of the working committee within the Institute for Standardization of Serbia, management experts that belong to Serbian academic community unmistakably insist on the use of genitive case (*management + noun in genitive case*). This is obvious in the names of courses and study departments at universities. For example, the Faculty of Organizational Sciences in Belgrade, as the institution of the supreme authority in management studies has a department named *Menadžment kvaliteta i standardizacija (Quality management and standardization)* and among numerous courses offered by the Faculty, we can find *Menadžment ljudskih resursa (Human Resource Management)*, *Menadžment tehnologije i razvoja (Technology and Development Management)*, *Menadžment inovacija (Innovation management)*, *Sistem menadžmenta kvaliteta (Management quality system)* (Jaško and Petrović, 2009). Following the given examples noticed in the Serbian academia, we can conclude that the forms of the previously listed terms from the standard should be like those given in the Table 7.

Table 7: Terminological construction *management + noun in genitive case*

Term in Serbian (SRPS ISO 9000:2015)	Term in English (ISO 9000:2015)
3.3.4 <i>Menadžment kvaliteta</i>	3.3.4 Quality management
3.5.4 <i>Sistem menadžmenta kvaliteta</i>	3.5.4 Quality management system
3.1.2 <i>Konsultant za sistem menadžmenta kvaliteta</i>	3.1.2 Quality management system consultant
3.4.3 <i>Realizacija sistema menadžmenta kvaliteta</i>	3.4.3 Quality management system realization
3.3.9 <i>Menadžment konfiguracije</i>	3.3.9 Configuration management
3.3.12 <i>Menadžment projekta</i>	3.3.12 Project management
3.8.11 <i>Plan menadžmenta projekta</i>	3.8.11 Project management plan
3.5.7 <i>Sistem menadžmenta merenja</i>	3.5.7 Measurement management system

There is an obvious lack of communication and cooperation between the Institute for Standardization of Serbia and the academic community, resulting in a discrepancy between the term variants adopted by the national standards and the national educational system. The first ones are primarily used by current management experts working in different fields. The second ones, however, are preferred by the educational system which prepares future experts and provides them with terminological knowledge. It is clear that both sides share responsibility for the state of terminology of the subject field.

3.2. Terminological Ambiguity

Jakić (2014) draws attention to the frequently occurring incorrect translation of the English terms (p.102):

- Control vs. Inspection;
- Interested parties vs. Stakeholders

3.2.1. Control vs. Inspection

The term *control* is repeatedly translated into Serbian as *kontrola* or *kontrolisanje* while the meaning of the concept that it denotes in Serbian is *upravljanje*. Even in scholarly articles on management, *quality control* is often transferred into Serbian as *kontrola kvaliteta*, but its correct translation is *upravljanje kvalitetom*. SRPS ISO 9000:2015 clearly confirms this fact, so it offers the following terms: 3.3.7 *upravljanje kvalitetom* (*quality control*) and 3.3.10 *upravljanje izmenama* (*change control*). The mentioned errors are the consequence of the negative transfer from English. Both, *kontrola* and *kontrolisanje* are two expressions for the same concept and its English equivalent is *inspection*. It is interesting that SRPS ISO 9000:2015 chooses only 3.11.7 *kontrolisanje*, even though *kontrola* is used more often in the professional communication. Since these terms are synonyms and the one out of the standard is more frequently used, perhaps its introduction into the standard should be considered.

3.2.2. Interested party and stakeholder

The terms are seen as synonyms and defined as “a person or organization that can affect, be affected by, or perceives to be affected by a decision or activity” (ISO 9000:2015). SRPS ISO 9000:2015 also equates terms *zainteresovana strana* (*interested party*) and *interesna strana* (*stakeholder*). Jakić (2014) underlines that their synonymous relationship should be reconsidered and underlines the need for correct understanding of their definitions (p.102).

3.2.3. Terminological Acronyms: QMS or SMK

Throughout the Serbian version of the standard ISO 9000:2015, the English acronym *QMS* (*Sistem menadžmenta kvaliteta*) is used. The English acronym *QMS*, though not adapted to the Serbian phonological system (i.e. it contains an element – letter Q – which is not a part of the Serbian alphabet), does accept our flective suffixes (e.g. *QMS-om*, *QMS-u*, etc.). Having that one of the main terminological principles is that a source language (English) term should be fully adapted to the linguistic system of a target (Serbian) language (explained in more detail in 2.3. above), our main concerns regarding this issue are whether:

- (a) the acronym should be phonologically adapted (through the process of transphonemization)
- (b) the acronym should be adapted on lexico-semantic level, i.e. whether it should be replaced by a Serbian alternative: *SMK* (*Sistem menadžmenta kvaliteta*) instead of *QMS*.

The same process of adaptation could be applied to the acronym *DRP* (for *Dispute Resolution Process*) used in ISO 9000:2015. This acronym is used in unadapted form in the Serbian standard to mark *Proces rešavanja spora* instead of the possible alternative (PRS).

A very common deviation from the Serbian language norm is the disregard of the Serbian word order in noun phrases. Namely, the replication of English word order in Serbian noun phrases, especially when the first element of the noun phrase is a/an (foreign) acronym: *QMS model*, *QMS standard*, *DRP isporučilac*, etc. The Serbian alternatives to these terminological phrases would be (*model QMS-a*) or (*model SMK-a*), see 3.4. above), (*standard QMS-a*) or (*standard SMK-a*), (*isporučilac DRP-a*) or (*isporučilac PRS-a*).

By following the English word order, Serbian terminological noun phrases also avoid using the flective suffixes, which does contribute to language economy, on the one hand, but also breaks the Serbian language norm, on the other hand.

4. CONCLUSION

The terminological issues addressed above raise several questions:

Namely, the first one is whether the translation of the ISO 9000 standards is adequate enough, i.e. whether the terms present in the standards can actually be regarded as the most representative ones and acceptable both from the perspective of Serbian language standard and the perspective of the subject field experts.

Secondly, there are some inconsistencies between term variants preferred by the Institute for Standardization of Serbia and the ones present and transferred into our educational system. This obviously stipulates close cooperation between the standardization institutions and relevant expert institutions (primarily educational). Before the adoption, all Serbian standards are accessible to the public and can be a

subject of public hearing. As long as a national institution specialized in terminological activities is not established, the existing relevant bodies should actively participate in this field.

In conclusion, one of the preconditions for monosemous and harmonized terminology should be good terminology management (Galinski, 1999), i.e. a systematic approach to all terminological activities, and especially to its standardization, as well as and a close cooperation between linguists, terminologists, and subject field experts.

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QUALITY COSTS IN THE MANAGEMENT SYSTEM IN THE FIELD OF HIGHER EDUCATION

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Abstract: *The topic of this paper belongs to the research field of the significance of quality costs, that is, non-economic costs, applied to institutions of higher education, and its specificity lies in differentiating and considering actual costs and lost opportunities costs, which, as a rule, are significantly higher. Measuring and identification of quality costs is a complex process because these costs are, as a rule, hidden and not represented as actual costs, rather as lost opportunities costs. The aim of this paper is to consider and interpret quality costs applied to a higher education institution, to show the need to invest resources in support costs of introducing and implementing quality systems, considering and assessing the possibilities of lowering quality costs as opportunity costs, correlated with considering lost opportunities costs, quality and total benefit, should these costs not be incurred. The identification and consideration of total quality costs and their division into categories are presented as costs actually incurred by missing to invest an asset as real costs of current operations.*

Keywords: *costs, quality, higher education, students, investments*

1. INTRODUCTION

The starting point for the quality costs is determined and generally accepted amount of costs for the implementation and application of the quality system which serves as the basis point, and is necessary for higher education institutions to be able to decide about the acceptability of the amount of initially actually incurred quality costs with consideration of the consequences presented through the measurement of the scope of potentially incurred costs due to the failure to implement the quality system. *Filipović and Đurić (2010, p. 384) point out that quality costs are defined as “costs incurred in an organization in order to secure the quality of the product”.* The optimization of quality costs in higher education institutions is based on the increase of quality costs manifested through investments into prevention, consequently leading to a decrease of costs which can occur due to failure to implement quality and the total implementation costs and application of the quality system. *Summers (2009, p.270) points out that “using quality costs, a manager can determine the usefulness of investing in a process, changing a standard operating procedure, or revising a product or service design”.* The optimization of quality costs is a process of balancing the quantity of resources used to insure the level of quality, which means to fulfill the user's request. Unlike the actually incurred costs resulting from the functioning of a higher education institution, and unavoidable in all organizations, therefore also in higher education institutions, the actual quality costs are difficult to identify and locate. The actually incurred costs resulting from the business operations activities represent the actualization of business policies set by the management of the higher education institution in the planned annual budget in terms of types of costs and their scope, adhering to the following goals:

- Preserving the financial strength through the scope of assets engaged and sources available for financing, while defining the business policy of preserving permanent payment ability, permanent financing ability, that is, investing in the development and modernization of equipment and assets for the realization of the teaching process;
- Preserving assets and increasing assets;
- Maximizing the financial result, as the highest long-term goal, and
- Permanent ability to pay salaries and encourage employees, the ability to settle liabilities to creditors on time, as well to state bodies and organizations.

Quality costs in all organizations, as well as in higher education institutions, are defined as hidden costs which wouldn't be incurred if everything were done correctly the first time, that is, if the product/services were always without errors. Objectively, this is impossible. So, quality costs or bad quality costs are actually costs of lost opportunities. All quality costs incurred occur due to incorrect process performance and are measured as costs incurred or which shall incur above the initial investment costs in the quality system being applied. Organizations measuring their costs discovered that the situation in certain institutions is such that total quality process costs can make up to 30% of total sales, which is an extremely high scope of costs. *Pyzdek and Keller (2013, p. 22) point out that “the lower cost of quality than competitors, translates to lower overall*

cost". There are situations when the costs caused by not applying the quality system are two to three times higher than the potential gain, so that the decrease of costs which are in correlation with the quality systems can influence the operational profitability and increase the profitability rate as the measure of operational yield. Hence, quality costs are costs incurred if each activity in the organization is performed correctly each and every time. Initial quality costs in higher education institutions consist of all that was invested in the implementation and application of the quality system and they are part of the primary costs, but all that was lost or can be lost due to bad quality makes for the secondary part of costs caused by failing to apply or the untimely application or implementation of quality in business processes. In higher education institutions these costs can be qualified as loss of accreditation costs, transfer of students to other faculties, inadequate choice and calibration of the teaching program, incomplete teaching performance and such. Seemingly these costs do not exist. However, the analysis of the gain lost, as a rule, in the long-term quantifies the amount of lost opportunities costs – quality costs.

2. QUALITY COSTS STRUCTURE

In the structure of total costs there is a certain amount we call primary quality costs. Those are the costs an organization incurs in order to achieve the aimed quality. Quality costs can be defined as costs incurred by activities (primary costs), costs referring to the prevention of errors (accompanying costs) and lastly, secondary costs incurred by failing to apply the quality system entirely or partially, or as a consequence of making errors arising from the non-compliance to the determined procedures and processes. The most significant characteristics of quality costs are:

- Initial or primary–accompanying quality costs;
- Secondary costs or costs arising by failing to apply or applying inadequately the quality systems; these costs are hidden as a rule;
- They are contained in the financial statements, not as separately presented items of current costs in the income statement, rather as opportunity costs of decreased utility (revenue);
- As a rule, their structure is not obviously known, but they can be identified;
- They are missed, potentially unexploited chances of possible, lost profit;
- The degree of knowledge about these costs is a measurement of the degree of awareness about the quality;
- As a rule, these costs are significant in scope. Although hidden, they must be identified by the management in order to take steps to decrease them or eliminate them through intensive monitoring of the quality application (hotspots of cost – loss incurrence);
- Due to their specific nature manifested in a hidden – opportunity effect, these costs can be latently very high and significant for survival and development.

Evans and Lindsay (2002, p. 408-412) mention that the term quality costs first appeared in the 1950s. Quality cost structure can be presented as follows:

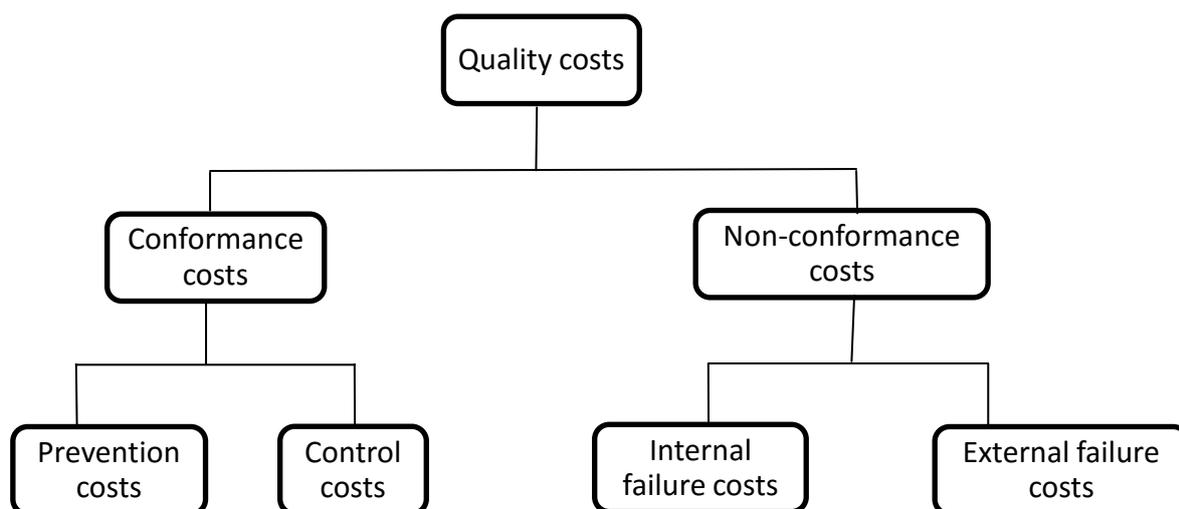


Figure 1: Outline of the quality costs

Charantimath (2011, p. 14) states that “cost of quality has two main components – cost of conformance and cost of non-conformance”. When the term cost is mentioned in this case, it refers to the failure to satisfy the user’s requests. Costs of not applying quality are, as a rule, very high and should they be incurred they are manifested and significantly influence the direct decrease of profit through revenue lost and performance lost. For this reason, top management takes all measures and activities to identify bottlenecks and reasons for hold-ups in the application of the quality systems and measures which will in the shortest period possible effectively remove the problems identified.

2.1. Prevention costs

Prevention costs are costs of all activities undertaken in order to stop the occurrence of non-conformities. In higher education institutions prevention costs would be identified as:

- Educational services and employee education;
- Participation fees for educational seminars;
- Participation fees for professional training;
- Participation at fairs and symposiums;
- Literature and professional examination expenses;
- Other professional education expenses.

Douglas (2013, p. 33) discusses that the application of prevention costs could be unclear. These costs are desirable but they must be directed where they are most effective and can decrease other undesirable quality costs. Prevention begins with market research, that is, the understanding and complying with the users’ needs, as well as expectations. These costs are also called conformance costs in the literature. They include all techniques and measures performed in order to prevent errors. Error prevention costs are proportionate to the cost of removing errors in accordance with the rule “1:10:100”. The rule “1:10:100” basically means that the removal of errors during the planning process costs 10 times more, and the removal of errors during the realization process costs 100 times more than the prevention of errors. Applied to higher education institutions in the process of gaining accreditation it would mean that if the prevention of an error costs one monetary unit, the correction of the error during the review of accreditation documentation costs 10, and the correction after the documentation was returned by the accreditation committee costs 100 monetary units. Prevention costs are several times lower than correction costs incurred due to non-conformity. These costs can be regarded as an investment in quality.

2.2. Assessment costs

Assessment costs are the costs of measuring and rating quality conformance along with the costs of research and control. *Quality assessment costs in the words of Živković and Glogovac (2015, p. 158) are “initial assessments in relation to the quality which are not based on experience, rather on assumptions”.* They are the costs incurred in the adjustment of the degree of conformity to the quality requests, such as:

- Incoming control and testing;
- Control and testing of the process;
- Final control and testing;
- Monitoring service quality;
- Maintenance of research equipment and software;
- Control and testing of material and services and
- Valuation of inventory.

Filipović, Đurić and Teodorović (2008, p. 1) point out that „the education is a specific, but also a classic service activity”. One of the most important differences between education and production (and other service activities) is that here we find an intensive and permanent interactive role between the user and the provider of the service. In higher education institutions these costs may be identified in the field of testing the achieved level of quality of service provided to the students.

Within them the following can be identified:

- Testing and monitoring the curriculum;
- Monitoring the work of all departments (student administration, accounting...)
- Monitoring the work and work quality of teachers;
- Testing by applying a trial classification exam;
- Surveying the students.

2.3. Costs of non-conformities

Costs caused by errors are referred to as non-conformities costs in literature. These costs include all direct and indirect costs in relation to the correction of errors of any type, wherever they occurred. The mentioned errors include all accidental and system errors occurring in organizations. The majority of costs for the correction of errors directly depend on the location and scope of their influence on the application of quality, after their identification. The later the error is detected, the higher the costs. Non-conformance costs occur when the quality system is not applied and due to the unsuitability of the quality system. In higher education institutions these costs are identified when students are lost, that is, when they transfer to other faculties due to their dissatisfaction; they can also be based on the loss of accreditation due to non-compliance with certain requirements such as the number of teachers necessary for a quality performance of classes and exercises in relation to the number of students, existence of adequate space for the delivery of classes (necessary number of classrooms, laboratories and lecture halls). Depending on where the non-conformance is identified, that is, within the organization itself or externally, we differentiate between internally detected and externally detected non-conformities.

2.3.1 Costs of internal non-conformities

Costs of internal non-conformities or internal errors comprise those costs that have not fulfilled users' requests and have been detected within the organization itself. These costs include:

- Write-offs, badly provided services;
- Reprocessing, that is, the need to provide the service again;
- Costs of lower level quality ;
- Reexamination.

Applied to higher education institutions these non-conformities costs refer to cases when, for example, during the exam registration in the current examination period, the wrong exam was registered for a student by the administrative worker in the student administration, or during the change of the study program, a student was enrolled to a wrong study program due to an error of the administrative worker. *Ušćumlić and Lukić (2008, p. 214) state that internal costs of failures are redundant, that is, they do not lead to the increase of the value of output, and they contain: costs of corrective actions or measures, costs of re-inspecting and re-examining, costs of repeat work and such.*

2.3.2 Costs of external non-conformities

Costs of external non-conformities occur when a product or a service reaches the user, that is they leave the organization, and they do not conform to the user's request. These costs include:

- Costs incurred from processing appeals and objections;
- Costs incurred by processing and conducting a litigation;
- Costs of recalls and liabilities;
- Corrective actions;
- Costs of realized warranties;
- Liability costs;
- Examining objections.

During the reporting of non-conformities it is necessary to define the cause of error and to make a decision about the application of measures to remove the identified non-conformities. External costs of non-conformities decrease the profitability of the organization. External failure costs take up a considerable share of total costs. This can be presented in the following way using an example of investments in prevention in a higher education institution:

Table 1: Review of quality costs based on investments (in 000 of dinars)

Investments	I period	II period	III period
Net monetary investments	50.000.000	80.000.000	120.000.000
Effect of investments	90.000.000	130.000.000	150.000.000

*period of one accreditation or 5 years

As in all organizations, in higher education institutions investments are necessary in order to deliver education of "the best quality product" and the most significant resource of a higher education institution

efficiently in accordance with the set quality standards. Consequences of not caring about the application of the quality system and managing quality costs are, as a rule, unrecoverable, considering that their occurrence is measured with the opportunity loss of expected gain. They are presented as:

- Loss of accreditation;
- Transfer of students to other higher education institutions;
- Bad reputation and a decrease of the enrollment interest of prospective students ;
- Poor rating, etc.

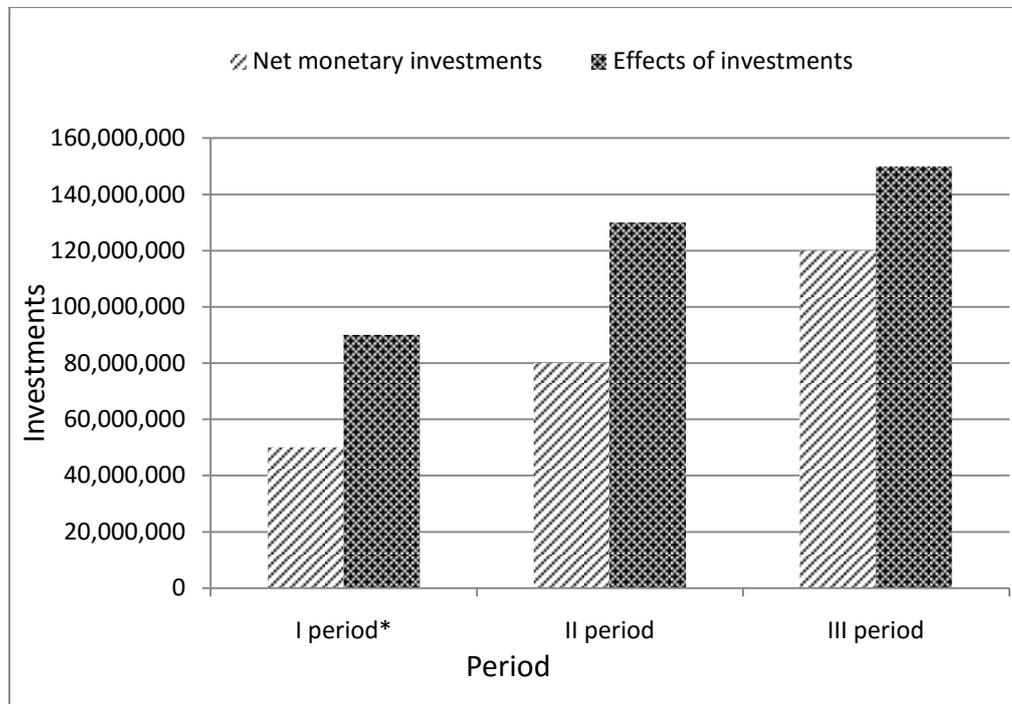


Figure 2: Graphical view of quality costs (in 000 of dinars)

The table and graphical view clearly show that the investment in costs, that is, net monetary investments, produces the effects of those investments. The breakdown of investment costs would be as follows:

- Investments in IT support,
- Investments in software (software adjustments),
- Investments in furnishing,
- Investments in human resources (teaching and non-teaching employees).

3. AIMS OF QUALITY COST ASSESSMENTS

Drury (2015, p. 48) points out that the present business conditions where the only thing that is constant is change, there is a general agreement in business practice that costs, quality, time and innovation are key variables to achieve user satisfaction. Striving to develop a concept of managing quality costs, as comprehensible as possible, has resulted in the creation of numerous concepts aimed at decreasing both quality costs and total costs.

Juran and Gryna (1999, p. 20) emphasize that all organizations assess quality costs for several reasons.

- Quantifying the size of the quality problem expressed through the measurement of money – improving communication between middle and senior management. At some organizations the need to improve the communication between the levels of management is so present that it has become the main topic of the case studies about bad quality. When preparing case studies, assessment of quality costs is significant for two reasons: first, quality costs have shown to be much higher than managers and management assumed, and second, while the allocation of quality costs confirms some known problems, it reveals other problematic areas previously unknown.
- Major opportunities to decrease costs could be recognized. Bad quality costs do not exist as a homogenous mass. In reality they consist of a whole of specific segments, each of which can be identified, as well as their cause. When assessing bad quality costs the most important thing is to recognize segments directly causing bad quality.
- Opportunities can be recognized for decreasing user dissatisfaction and dangers related to the realization of products or services. Some bad quality costs are the result of management omissions.

Viewing and assessing the costs can help recognize vital areas of high costs. With total view of all business success markers of an organization there is a realization not only about the quality costs, but also about total costs in an organization. Quality costs assessment in higher education institutions is identified through managing and monitoring quality costs of all business processes, monitoring the work of all departments (student administration as an important process with a direct relation to the users - students), then the accounting department as the financial department performing indirect work with students though analytical monitoring of settling student obligations, while Departments assume a special place, and in accordance with the study programs, they professionally coordinate and monitor the delivery of classes, at the same time analyzing all quality segments and processes of monitoring the functioning of the teaching process, the basis of higher education work.

4. COMPARING QUALITY COSTS WITH BUSINESS MARKERS

Understanding the total amount of costs is made easier by comparing total quality costs with other markers presented to management. Markers with the highest influence on higher management are:

- Quality costs as realization percentage (revenue),
- Quality costs compared to net gain,
- Quality costs as a share in total realization costs,
- Influence of quality costs on the cost-effectiveness threshold (yield).

If we take the example of an organization such as a higher education institution, primary quality costs measured according to their size in relation to revenue, yields or their share in total costs aren't a true measurement of quality costs, because we have determined that quality costs represent opportunity costs of missed uses and as such can be extremely high and are not measurable and comparable with costs, revenues, gain, etc. of a certain period.

5. QUALITY COST ANALYSIS

Analyzing interrelations of quality costs leads to different understandings. Studies in many organizations about quality control show that omission costs surpass assessment costs. If management becomes aware that prevention costs are extremely low, this would alarmingly mean that non-conformance and omission costs will be high. In order to achieve a significant decrease of quality costs, one must take control of the assessment costs. An increase in prevention costs can bring gain to the later decrease of costs. *Filipović and Đurić (2010, p. 409) point out that, "if it turns out that the highest percentage of costs belongs to non-conformance, then the management is spending money on the wrong things"*. This mostly refers to production organizations, but below is an attempt to apply it to a service organization. A higher education service institution functioning on a state level wants to improve the quality of services to its users – students through both teaching and non-teaching processes. Top management of the higher education institution is familiar with the work and functioning of other faculties and colleges and has come to the knowledge that it could decrease non-conformance costs. Gathering data on an annual level in the cost analysis per categories is presented in the following table:

Table 2: View of quality cost control analysis per category

Purpose of quality expenses	Annual costs (in m.u.)	Quality cost category
Errors in printing forms – for keeping students register	11	Internal non-conformance
Training costs	40	Prevention
Complaints – student's exams were not registered due to a clerk's error	8	External non-conformance
Testing regularity of classes	70	Assessment–testing

After identifying individual costs and determining to which category they belong, a sum and percentage review was made and is presented in the following table:

Table 3: Quality cost analysis per category

Quality cost category	Amount (inm. u.)	Percentage in the total
Total prevention costs	40	31%
Total assessment costs	70	54%
Total costs of internal non-conformance	11	9%
Total costs of external non-conformance	8	6%
Total	129	100%

Based on the data presented in the table, one can draw the conclusion that it would be advisable for top management of the higher education institution to spend more money on investments in prevention in order for quality costs of the control and examination to decrease. Costs of internal and external non-conformities are low which is certainly a good result; it would be even better if the costs of prevention which amount to 31% were much higher on account of assessment costs. If we assume that an inadequately prepared teaching process and insufficient, that is, inadequate number of teaching staff necessary to deliver classes, in accordance with the Bologna convention in higher education institutions (HEI) which fails its accreditation in one out of five parts of up until now accredited teaching processes (study programs), quality costs will influence the decrease of the direct revenue of HEI in the next five years in the level of enrollment fees of self-financed students increased for the accompanying studying revenue (exam registration, semester registration, etc.) in the amount of 90.000 RSD annually for approximately 150 students. Aside from the direct loss of the period, indirect loss will be identified as the loss of the period due to the withdrawal of prospective students from studying at the higher education institution due to bad acquisition image entirely determined by the loss of one study program. That loss is assessed to about 80 students annually.

Loss without one program accredited:

I year:	$150+80=230 \times 90.000=$	20.700.000 RSD
II year:	$150+80+105$ (70% transfer from first of 150 students) = $305 \times 90=$	30.150.000 RSD
III year:	$150 + 80 + 75$ (50% transfer from II into third year) = $305 \times 90=$	27.450.000 RSD
IV year:	$150 + 80 + 75=$	27.450.000 RSD
V year:	$150 + 80= 230 \times 90.000$ RSD = 20.700.000 + loss of the next three years until the enrollment ($9.450.000+6.750.000+6.750.000$) =	43.650.000 RSD
TOTAL:		149.400.000 RSD

Projection of HEI revenue without the loss of accreditation for one study program:

I year:	1.200 students (5 departments – study programs $\times 90.000$) =	108.000.000 RSD
II year:	$1.200 + 840$ (70% from 1.200) = $2.040 \times 90.000=$	183.600.000 RSD
III year:	$1.200 + 600$ (50% from 1.200) = $1.800 \times 90.000=$	162.000.000 RSD
IV year:	$1.200 + 600 = 1.800 \times 90.000=$	162.000.000 RSD
V year:	$1.200 \times 90.000=$	108.000.000 RSD
TOTAL:		723.600.000 RSD

Table 4: Review of revenue decrease

Year	Total revenue (without loss of the accreditation)	Revenue (without accreditation of one program)	Difference – revenue
I	108.000.000	20.700.000	87.300.000
II	183.600.000	30.150.000	153.450.000
III	162.000.000	27.450.000	134.550.000
IV	162.000.000	27.450.000	134.550.000
V	108.000.000	43.650.000	64.350.000
TOTAL:	723.600.000	149.400.000	574.200.000

Graphically it can be presented in the following way:

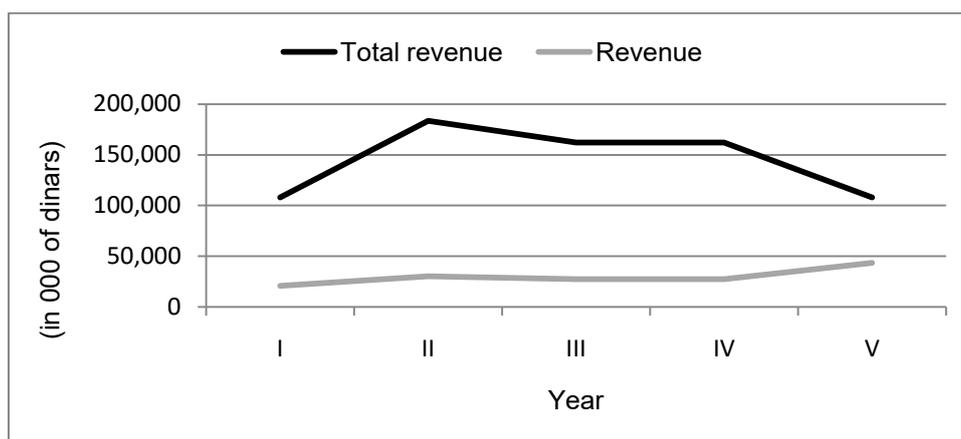


Figure 3: Graphical review of revenue decrease

The example shows that quality costs manifested as opportunity costs of revenue decrease due to insufficient application of the quality system significantly influence the decrease of revenue from HEI during the accreditation period (five years). Their average share in revenue decrease in the observed period is 21% or on an average RSD 29.880.000.

6. QUALITY COSTS DECREASE

Total quality costs can be significantly decreased with reallocation. Ušćumlić and Lukić (2016, p. 143) point out that "the higher level of quality decreases total costs". The increase of prevention and control costs influences the decrease of costs of both internal and external non-conformities. Costs in relation to bad quality are present both because of occasional and permanent problems with quality. Constant improvement (called Kaizen by the Japanese) is necessary, as well as constant efforts in order to improve all processes within organizations. *Goetsch and Davis (2016, p. 19) indicate that "reducing the costs associated with poor quality is mandatory for companies that hope to complete in the marketplace. Reducing such costs is one of the principal drivers behind the total quality concept of continual improvement".* Financial markers and financial measurements are usually critical because they sum the economic influence of different physical activities in a manner understandable to managers, although the way of financial presentation might not correspond to the actual flow of economic events. On the other hand, financial accounting requires exclusively financial markers. Quality costs consist of financial costs during the process of introducing and monitoring quality systems. While the quality functions, those costs are correlated with other costs and revenue as measurements of success during the work of the period. However, missing the application of quality entails missing the primary cost of applying, controlling and monitoring in the current period which will be presented as a significant cost in the future periods, and not as current costs, rather as the opportunity costs of lost opportunities – unrealized gain, volume of business, references etc.; these costs are immeasurably higher and difficult to recover. When it comes to quality costs it is very difficult to find the right mix of financial and non-financial measurements to satisfy expected financial revenue and reconcile requests and effects of business decision makers. Lowest quality costs are those that maximally invest in quality.

7. CONCLUSION

Specificity of quality costs research applied to higher education institution as a service organization makes them objectively hard to divide between internal and external non-conformities because the largest part of quality costs in service organizations is related to the work of employees and the level of quality system application on that organizational level, so that internal non-conformance immediately becomes external in relations with the users – students. They are investment costs applied to the quality system. As to whether their amount is objective, the answer lies in the analysis of quality functioning. Costs of quality omission are not operational costs presented as direct costs in the income statement. This type of costs is presented as opportunity costs of missing on a chance of achieving revenue or some other type of benefit in the long-term period. Due to this, their amount is disproportionately high and significant. The paper pointed to the significance of quality costs or costs due to bad quality manifested in unrecoverable consequences such as loss of accreditation, if we take the example of a higher education institution which doesn't have space equipped to perform classes or has insufficient expert and competent teaching staff teaching and holding

classes. Then the cost of opportunities lost refers to the next five years, until the new accreditation, and the consequences are considerably higher, which is the measurement of the value of lost quality application costs. A complete overview and understanding of the bad quality costs is important and if every product (printing books and forms) or service were perfect, than these costs would be eliminated.

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DOCUMENTING PROCESSES: CHALLENGES FOR FIRMS OPERATING IN SERBIA

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Abstract: *In general, managers in firms operating in Serbia do not have a proper knowledge on how processes ought to be documented in order to achieve high level of process standardization and, as a result, to create opportunities for increasing process performance. With this fact in mind, the authors of this paper set out to show the importance of this problem, hoping to raise awareness about the overwhelming space for significant improvement of business results in this area. For this purpose, insights on challenges facing three firms operating within different industries in Serbia are presented. Each of them, dealing with its own problems of document management system and process management, bears some sort of resemblance with the other two when it comes to challenges of documenting processes. The paper ends with practical guidelines for managers on how to properly document the processes within their firms in order to achieve benefits of process standardization and performance improvement.*

Keywords: *document, process, standardization, performance, firm*

1. INTRODUCTION

Establishing highly efficient processes within a firm and making them run smoothly is not an easy task to master, but this has become a necessary condition for all firms trying to prosper in contemporary business environment. In order to achieve high degree of process efficiency, firms must carry out their operations in a consistent manner, which is achieved through process standardization.

Standardization may be seen as the degree to which work rules, policies and operating procedures are formalized and followed (Jang and Lee, 1998), while standard represents an approved specification of a limited set of solutions to actual or potential matching problem or a time-wise frozen end product of a standardization effort (Vries 1999). When process is standardized, variations in performing tasks within it are reduced to a minimum, i.e. each task performed by a different employee gives the same results. Standardizing a process requires process participants first to gain sufficient understanding of the process, and only then to start developing accompanying documentation that will describe the process in sufficient level of details.

Therefore, in order to achieve high level of process standardization and, as a result, to create opportunities for increasing process performance, firms must get to know and document all of their processes in a proper way (cf. Teece, 1998). It is well known that use of process documents can improve the output consistency, efficiency, and learning rate of a given process (Edelson & Bennett, 1998; Monden, 1983; Suzaki, 1993). While on the one hand standardizing business process variants across their functional and geographical structures is very attractive for organizations for a number of reasons, on the other hand, over standardizing business processes might actually decrease the aimed advantages and prevent meeting local requirements with the rolled out standardized processes (Mustermann, 1976).

Despite its great importance for contributing to firm competitiveness, there is an evident lack of papers on standardizing and documenting processes (cf. Ungan, 2006a). Therefore, this paper is a small attempt to fill this void.

The paper starts with theoretical background explaining contemporary issues in documenting processes within firms. It continues with illustrating the challenges of documenting processes at three firms in Serbia operating in different industries. Finally, recommendations for practitioners working in Serbia are provided along with some concluding notes.

2. THEORETICAL BACKGROUND

The origin of documenting processes can be traced back to Frederick Winslow Taylor and his concept of scientific management (Taylor, 1911/1998). Taylor believed that workers were incapable of designing efficient processes, hence the need of management to develop documents describing how the work is to be done. The objective of documents under Taylorism was to have industrial engineers determine 'scientifically' the 'optimal' way to perform a given process.

The way in which process documents are developed and used today has changed radically. Best practice of process document development, in contrast to Taylorism, calls for the active involvement of workers in development and refinement of these documents (Adler, 1993a, 1993b, 1996, 1999; Edelson & Bennett, 1998; Monden, 1983; Suzaki, 1993). The objective of process documents today is to ensure that all workers are performing tasks in the same way, which is a necessary condition to achieve an adequate level of coordination between workers in order to obtain consistent output from the process. On the other hand, solid process documentation may help newcomers to adjust rapidly to the manner in which they are expected to work and perform. When all workers perform their tasks consistently, it becomes possible to run controlled experiments to test the impact of changing various process parameters. When a process change is shown to improve process performance, process documents are updated and workers are trained according to new documents (De Treville, Antonakis and Edelson, 2005).

Process documents gained great popularity among contemporary firms since they represent practical tools for understanding, analyzing, improving and standardizing processes (Ungan, 2006b). In order to develop high quality process documents, it is necessary for a firm to take several steps: (1) identify all processes within a firm, (2) optimize processes, (3) establish document hierarchy and define precise criteria for different document types, and (4) documenting processes.

Having all processes identified means becoming familiar with all the processes being run within a firm by making a list of them. The result is a process register (or catalogue) usually listing main process categories, which are being decomposed to groups, then processes and finally activities. Identified processes are usually classified using one of the mostly used and accepted process classifications, such as the one developed by Michael Porter (Porter, 1985) or by Jay Galbraith (Galbraith, 1998). The aim of developing a process register is to have an overview of all processes within a firm, identifying their scope and the manner in which they interconnect in order to create value for the customer, and knowing who is responsible for each process (identifying process owners).

After the process register is developed, the next step is to develop criteria for the sequence in which processes will be optimized. Process optimization starts with process mapping (developing process maps), then moves to stating the goals of optimization (achieving the same performance as competitors, minimizing costs, minimizing errors, etc.), continues with identifying process measures, performing benchmarking, analyzing AS-IS process, developing optimized (TO-BE) process, and finally ends with implementing optimized solution. Process optimization always results in process effectiveness and/or efficiency increase.

Optimized process needs to be standardized in order to be communicated effectively to all employees within a firm, but to do so, a firm has to have a document hierarchy in place. Establishing document hierarchy is a quintessential step in any firm, not only because of the need to document processes, but because it is necessary to prescribe the norms, values and rules that will govern a firm. Document hierarchy depends on firm's needs, but usually involves documents such as: policies, procedures, work instructions and records. Figure 1 illustrates usual document hierarchy in a firm.

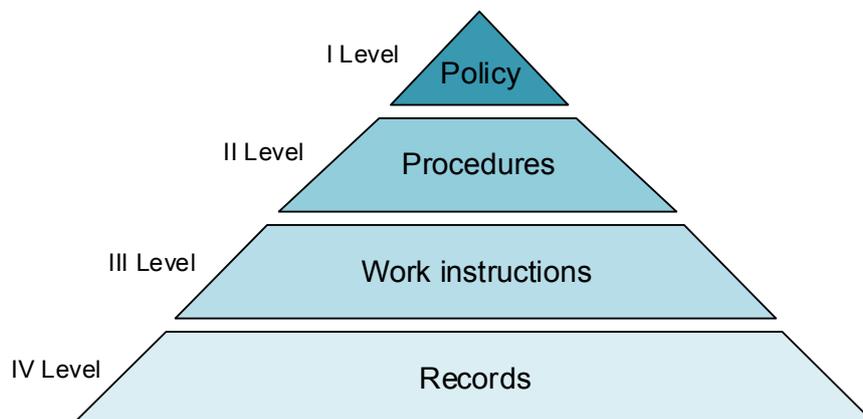


Figure 1: Usual document hierarchy in a firm

No matter what types of documents are defined within the hierarchy, each document type must have clearly defined criteria distinguishing it from the other document types. In other words, for each document type it must be defined what it is used for, what it describes, how it is connected to other document types, etc.

The final step in developing process documents is documenting the process according to the established rules (it is necessary to prescribe how the process is being documented). Very important aspect of documenting a process is to determine the level of detail in which the process will be described. Some authors indicate that process documents should not be very complicated and long, because such documents are difficult to comprehend and use (Babicz, 2000). On the contrary, Symons and Jacobs (1997) state that processes must be documented in sufficient level of detail to allow for substantial improvements. Another approach is taken by Ungan (2006b) who claims that level of detail in documentation depends on its purpose.

Next sections of this paper show how problem of documenting processes is being handled by three firms operating in Serbia. Their experience combined with theoretical background from this section will provide some insight for developing guidelines that will be helpful to other firms in Serbia struggling to gain competitive advantage through process standardization and process performance increase.

3. DOCUMENTING PROCESSES IN FIRMS OPERATING IN SERBIA

The following sections provide an illustration on the manner in which documenting processes is being done at three firms in Serbia operating in different industries: oil and gas, finance, and IT. Each of these firms is dealing with its own problems of process documenting, but the challenges they are facing bear some sort of resemblance.

3.1. Oil Company

The first firm described from the aspect of experience with documenting its processes is in oil and gas industry and will be referred to as the Oil Company. Oil Company is one of the biggest vertically integrated oil and gas firms in Southeast Europe. It was established in 1940s and since then it has gone through several periods of profound ownership and organizational restructurings, resulting in significant growth and business development. Nowadays its main activities are: (1) production of renewable energy, (2) exploration and production of oil and gas, (3) crude refining, and (4) sales and distribution of broad range of petroleum product. Oil Company operates in several countries in Southeast Europe and counts around 10,000 employees.

Due to the firm's size and complexity, one of its major challenges is to have all processes documented and standardized in a proper manner. Oil Company is coping with this difficult task by having established document hierarchy and precise criteria for different document types, continuously developing its process register, and trying to cover all the processes with sufficient amount of documents.

Oil Company has a very detailed business process register that is subjected to frequent updates. This document lists all processes being performed within the firm and its subsidiaries. It defines process hierarchy consisting of five levels:

1. Process category – the highest level in process hierarchy indicating basic business areas and grouping them into those creating value, the ones providing support and those that manage the business;
2. Process group – a set of interconnected processes within one business area;
3. Process – a set of interconnected and interacting activities that transform inputs into outputs;
4. Sub-process – a part of process composed of interrelated activities;
5. Activity – a unit of work composed of interconnected operations.

Business process register also indicates business owners on the first three levels of hierarchy: process category, process group and process.

Oil Company has developed its document hierarchy based on quality management system requirements. This hierarchy consists of three levels (depicted in Figure 2):

1. **Level I** includes the documents containing the main rules that apply to the whole firm, defined by management. These documents do not describe processes, but provide main guidelines and directions for action;
2. **Level II** refers to the documents describing process flow;
3. **Level III** comprises of documents describing parts of processes in a detailed way.

Since there are a lot of different document types in document hierarchy, each document type has a concise and clearly defined purpose, scope and criteria for its development.

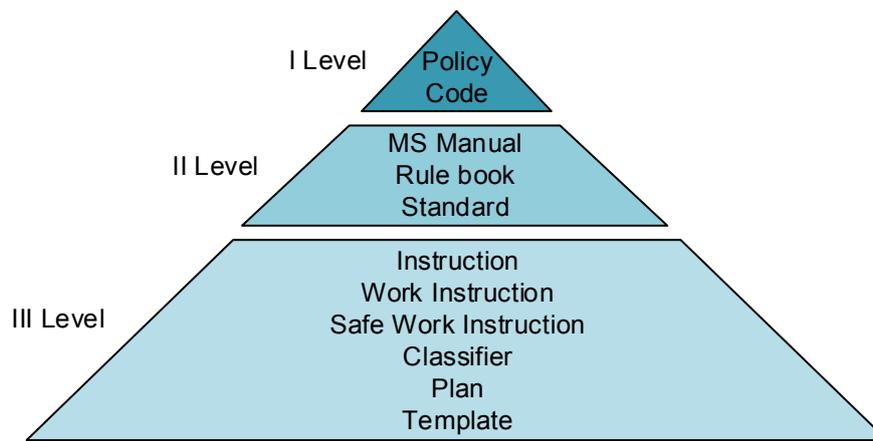


Figure 2: Document hierarchy levels in the Oil Company

When it comes to documenting processes, there are some formal rules that should govern the manner in which documents are developed, but this is not always the case in real life. For example, there is a rule that establishes relations between document hierarchy and business process register in a way that the first level of document hierarchy (policies and codes) concerns process categories, the second level (manuals, rulebooks and procedures) describes process groups and processes, while the third level (instructions, work instructions, classifiers, etc.) is connected to sub-processes and activities. Another rule proclaims that it is not allowed to have any repetition or collision within or between documents. There is also a rule concerning the number of procedures: one process must be described only with one procedure.

As already mentioned, these rules are not always being followed. As a result, some processes are not described in an adequate manner. For example, within Refinery process category, there is a process group entitled Petroleum Product Refining. One of the processes within this group is Raw Material Processing. This process is described by two procedures that have some overlapping – it is immediately clear that two aforementioned rules are broken in this case: the process is not described with one procedure and there is a repetition of text. Another example illustrates the case of insufficiently documented process: within Procurement process category, there is a process group entitled Procurement Planning that is defragmented into two processes – Procurement Plan Development and Inventory Management. Inventory Management is not documented properly – there is only one work instruction describing one activity in this process, while other activities are not described at all.

Even though Oil Company has made some significant steps on a journey toward documenting and standardizing processes, it still has a long way to go in order to develop a proper system with clear rules that will be obeyed by everyone in the firm.

3.2. Bank

The second firm experiencing significant challenges in the area of process documenting is operating in the finance industry and will be referred to as the Bank. Bank is one of the oldest banks in Serbia with a 145-year long tradition. It represents one of the most recognized local brands in the country. From 2006 the Bank is a member of one of the leading international banking groups. Today, it is among top ten largest banks in Serbia by asset size. With the fifth largest network in Serbia and almost a million clients, Bank covers the entire territory of the country.

During the last several years, Bank has developed a process register with process hierarchy consisting of three levels:

1. Process area – the highest level in process hierarchy indicating basic business areas, i.e., management processes, enabling processes, main processes and support processes;
2. Process category – a set of interconnected processes within one business area;
3. Process – a set of interconnected activities that transform inputs into outputs.

On the other hand, document hierarchy has never been established. There are a lot of different types of documents such as: policies, rulebooks, procedures, methodologies, instructions, work instructions, manuals, etc. Since the relations between these documents do not exist and rules for making them are not clear (except for procedures), it is very difficult to manage documents on a large scale. Due to this fact,

numerous problems arise when it comes to documenting a process, even though rules for documenting processes do exist. For example, Cash Management process is covered by 14 procedures and 1 rulebook with a lot of overlapping, but still one portion of this process has remained undocumented. After completing analysis of this process by the internal team consisting of process experts, it was decided to develop 2 procedures and two instructions that will cover the entire process in a satisfactory manner.

Based on everything said about the Bank, it is clear that it has just embarked at the beginning of a journey toward process documenting and that it will most certainly face numerous challenges along the way.

3.3. IT Service Provider

The third firm described in this paper operates in IT industry and will be referred to as the IT Service Provider. IT Service Provider is a recognized firm in global payment solutions established in 1998. It processes more than a billion dollars in transactions each year and is one of the largest third-party payment processors. IT Service Provider maintains a comprehensive set of proprietary backend and web-based administration systems to effectively process transactions for a wide variety of markets and help provide businesses the tools and practices necessary to successfully operate. In 2002, IT Service Provider decided to start supporting processing needs of European online merchants. It expanded its business to provide a processing solution to European-based businesses that wish to offer Visa as a payment option.

IT Service Provider has not yet finished its process register due to the fact that not all processes are identified. This is the result of focusing only on processes that have been selected as priorities for documenting. All the processes that have been identified were mapped with some of them even being automated using some cutting edge software solutions.

Regarding the process hierarchy levels, all identified processes belong to a particular category, which means there are two levels of hierarchy: categories, as basic business areas, and processes within these categories.

IT Service Provider does not have a document hierarchy established, even though it has several types of documents (procedures, work instructions, etc.), but with there are no relations between them. Criteria for different document types are not precisely defined and rules for documenting processes are not established. For example, a process is documented only if process owner realizes that process he/she is responsible for will be more efficient if documented. Process owner then chooses how he/she wants to document the process, create the document and share it with all process participants. If he/she wants to define all activities and responsibilities within the process, process maps are being developed. Alternatively, word documents and wiki pages are used to describe processes in more detailed way or to define main rules in some business area.

The problem IT Service Provider is facing at this moment is that there are still some unidentified processes, while some other processes are insufficiently covered by documents. For example, Human Resources is identified as process category. Within this category, process entitled Hiring, Transferring and Termination of Employees is documented and even automated. On the other hand, Payroll process, which is also located in this category, remains undocumented and even unidentified.

Therefore, the main challenge for the IT Service Provider is to complete identification of its processes and develop a business process register. After this is done, process mapping and documenting needs to take place for all the processes not being identified at this moment.

3.4. Comparative Analysis of Three Firms

Previous sections provide an insight into the challenges three firms operating in Serbia are facing when it comes to documenting their processes. After presenting each of these cases, it is interesting to make a comparison between them. Table 1 illustrates three firms compared on several parameters regarding documenting processes.

Analyzing all three firms at a glance in comparative fashion shows that Oil Company has gone the longest way toward process documenting, while the Bank is lagging and IT Service Provider is left behind due to the fact it does not satisfy any of the parameters provided. In reality, IT Service Provider, even though it still does not have its process register and document hierarchy developed, has gone the farthest way. All processes identified until now have gone through a very detailed mapping, optimization and automation using sophisticated software solutions.

Table 1: Comparative analysis of three firms operating in Serbia on documenting its processes

	Oil Company	Bank	IT Service Provider
Having all processes identified	X	X	
Document hierarchy established	X		
Precise criteria for different document types	X		
Rules for documenting processes established	X	X	
Rules for documenting processes obeyed		X	
Processes adequately documented			

After seeing problems all three firms are facing, it may be concluded that neither one of them is on a high level of documenting its processes, but every one of them is putting significant effort to reach that end.

3. RECOMMENDATIONS FOR PRACTITIONERS IN SERBIA

Documenting processes in a proper manner and enforcing employees to act according to the formal documents will most likely lead to standardized processes. Once this is achieved, processes are stabilized and predictable in terms of process performance. Due to the high frequency of repeating their tasks while working on some activities within a process, employees will be able to incrementally improve the manner in which they perform, resulting in increasing the overall process performance.

Several guidelines are helpful for practitioners in Serbia to reach this end. These guidelines should be understood as sequential steps that are required to be taken in order to start improving process performance on a continuous basis:

1. It is imperative for management to recognize the importance a proper process documentation plays in terms of understanding the process flow and its underlying logic, as well as why is that so important for competitive advantage of firm.
2. Management must start raising awareness among all employees throughout a firm about the need for proper process documentation and standardized processes.
3. Document hierarchy and process register should be developed and confirmed by all major stakeholders.
4. Process mapping needs to take place process by process according to the previously established priorities. This should be done with process participants who need to confirm that processes are correctly depicted with diagrams.
5. For each process mapped, process measures need to be developed and process measurement should take place.
6. AS-IS process analysis and TO-BE process development are the following steps, after which TO-BE solution needs to be implemented.
7. TO-BE process implementation should be accompanied with development of process documentation in order to effectively communicate the process flow to all stakeholders, especially to employees in charge for that process.
8. After the optimized process starts running and learning curve takes place, it is necessary to capture (document) any improvement that might come up along the way, as well as to systematically investigate and seize opportunities for further optimization.

Managing processes in this manner will most definitely yield significant results in terms of process effectiveness and/or efficiency increase. Even more, it will foster the development of a culture of continuous improvement that is more than needed to become an integral part of every firm trying to prosper in the competitive market.

4. CONCLUSION

Survival and thriving in contemporary business environment requires that firms manage their processes effectively. To do that, they need to become familiar with their end-to-end processes in sufficient level of details by documenting them in an appropriate manner.

Proper documentation requires that processes be presented in the simplest manner to make them easy to understand. Often, using a graphical flow chart can suffice to relay all the relevant information quickly and easily. The less complicated the process documentation, the easier it will be to ensure that all employees can deliver repeatable, quality outcomes for the processes.

Authors hope that this paper will contribute in filling the void that currently exists in the literature concerning the manner in which processes are being documented. On the other hand, we are also hoping that it will help raising the awareness of managers working in Serbia about the impact that proper process documentation may have on increasing process performance and making better business results. We claim that thorough understanding of the process flows within firm, as well as their underlying logic, may be of great significance for managers in times when they are making decisions that will impact the competitiveness of their firms in the evermore demanding marketplace.

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QUALITY MANAGEMENT AND INFORMATION: FROM STAKEHOLDERS REPORTING TO MEDIA PIONEERING QUALITY

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Abstract: *This paper deals with the structure of the Media Center for Quality, also with the needs of all target groups and the public and analysis of them, in order to create specific offers of the center, along with the implementation of the quality management system in its work. It discusses the potential strategy to create a focal point for dissemination for information with regard to quality. The paper is also addressed to the directions of development of the Media Center for Quality that are specifically engaged with quality management approach, research and the provision of different services in the field of quality, but also deals with the existing trends and needs of the local market.*

Keywords: *quality management system, quality media center, stakeholders reporting*

1. INTRODUCTION

Firstly, it is necessary to say something about the field of interest of this work, and that is quality. If we look closer to the development of quality and quality movement in general, we can conclude that the fundamental needs for the emergence of quality on global market and society can be generated from the development of quality movement. The Movement for Quality traced its way back in medieval Europe, where the craftsmen were organized in unions, so called guilds, in the late 13th century. Quality management in the guilds took up a very important place. It created check-ups, controls and certain forms of audit, performed by craftsmen, to ensure compliance with quality specifications (Filipovic J., Djuric M., 2008)..

The quality system is defined as "a set of interrelated or interacting elements which is using a variety of resources to achieve objectives related to quality." These objectives are focused on fulfilling and overcoming user's requirements (Filipovic J., Djuric M., 2010).

Examples of international practice show that the issue of quality and business excellence can not be reduced only to the implementation of standards, but also to a comprehensive organizational reports of the business and working methods (Weissingeer R., 2014). In order to fully meet the requirements of all stakeholders and interested parties, organizations must provide a valid, up to date information of the business methods. It can no longer be only the financial statements, but information that provide insight on procurement, manufacturing, suppliers, vendors, working conditions, social responsibility and other activities of interest to stakeholders. (Idowu S. O., Louche C., 2011)

Worldwide, and especially in Serbia and the region, there is no existing consensus of opinion when it comes to corporate reporting and quality. The practice is tantamount to parts of PR campaigns and the work of advertising agencies.

Strategic communications will become a key factor for all organizations - whether it is a public, private sector and civil society. Communication can play an important role in removing misconceptions, resolve conflicts and bring together the common sides to improve the world in which we live. (Aras G., Crowther D, 2009)

2. GLOBAL TRENDS IN QUALITY REPORTING

The global market has been allocated to several organizations that deal with quality, quality research and quality reporting. Some of them are:

- International Organization for Standardization (ISO),

- Global Reporting Initiative (GRI),
- UN Global Compact (GC),
- Organization for Economic Cooperation and Development (OECD),
- Global voice of quality (ASQ) (the American Society for quality),
- International integrated reporting Council (IIRC) and others.

ASQ business model could be one of the key models for establishing a strategy for the development of the Media Center for Quality in Serbia. ASQ is organized primarily as a global network, which provides information on the quality, certification, training, seminars, conferences, meetings, literature, and above all it provides training, performs certification of quality managers, organizes scientific meetings and conferences for its members and provides a unique database which is formed during many years of research, and a database of professional literature and other information in the sphere of quality. (Campanella J, 1999)

2.1. IIRC solutions

International Integrated Reporting Council has developed a model of integrated reporting "IR" as a process that is based on integrated thinking which results as an integrated periodic report on the organization's created value in terms of the communication aspect of creating value. (Integrated reporting, 2011)

The integrated report represents a summary of ways of leading the communication strategy, management, organization's performance and its objectives in the context of its external environment, to the creation of value in the short, medium and long term.

Business and investors need IR, enterprises need a reporting environment suitable for understanding and articulation of its strategy which helps with keeping the performance internally and attracting financial capital for investment. Investors need to understand how the strategy creates value over time.

Integrated reporting is the market's response to nowadays challenges in corporate reporting. Businesses and investors from more than 25 countries are the pioneers in the work of the IIRC (International Integrated Reporting Council) and they have contributed to the development of an international integrated reporting framework.

IIRC has attracted the world's leaders and has included integrated reporting in their business network. Those are the companies such as Unilever, HSBC, Deutsche Bank, Hyundai, Microsoft, PepsiCo, National Australia Bank, Tata Steel and over a hundred more.

2.2. Global Reporting Initiative and IR

Along with the development and implementation of standards, there was the practice of reporting companies on the way of doing business, as a norm of quality. GRI (Global Reporting Initiative) introduced the practice of making recommendations and guidelines for the preparation of such statements, which are necessary to achieve business excellence, and which later are stabilized as a practice on the International level.

Companies should include in their reporting practices in the real world and real time. Very few companies have voluntarily signed up for a transparent way of doing business, although some have taken the initial steps. Transparency in corporate reporting is easy to describe, and implement it in practice is the hard part. All actors want information of high quality, delivered on time, in a form they can use them. They also want information that will give them a complete picture of the performance and to be updated as often as necessary. (Samuel A., Robert G, 2002)

Successful companies will have an integrated strategy for achieving financial results in the future, in order to create lasting value for themselves and for all stakeholders of society. The integrated report should be the result of an integrated strategy and integrated reporting process.

3. MEDIA CENTER FOR QUALITY AND GENERATING TRENDS

Media Center for Quality should represent an upgrade of its kind of organization. It will not only create a network of corporations, institutions, other stakeholders and interested parties concerning quality, databases and working method reports, but it should be able to arrange consultations and trainings by the listed world centers and create sustainable connections with them. It should also be the initiator of conferences, dialogues, seminars and other business events and provide adequate information, conclusions and reports

from such events, making them available to the wider community, and in order to business and social progress. The Center should basically gather the information about quality, standardization, implementation of standards, certification, control, and then to connect the public, institutions for standardization and consulting agencies primarily with companies and their stakeholders and all other potential users of such information and services. The information that it receives from its members and program participants should be selected and appropriately presented to the public and to other media centers. Within the Media Center for Quality, users will be able to obtain information on global trends in the field of quality, training, seminars, summits, literature, and the local market.

This center should give an important role to scientific research, as a part of its main activities. For the research process and professional consulting, as well as for organization of lectures, panel discussions, dialogues and conferences, Media Center for Quality may primarily hire professors and associates of the Faculty of Organizational Sciences, also students who can gain a practical experience by participating in the work of the Center.

The profitability of the center can be achieved by membership and by package of services that the center may provide in accordance with the status of the members.

Furthermore, one of the innovative solutions is also the establishment of the Center's video channel with uploaded lectures which may be included in the service package. The lectures would be run by experts, and would be about certain topics, conclusions of conferences, and specific meetings.

Media Center may represent their clients and large corporations which have no conditions or staff for performing tasks of corporate reporting and communication with stakeholders, society or state.

In Serbia and the region, there is no organization type similar to Media Center for Quality, so its establishment under the auspices of the Faculty of Organizational Sciences, can very quickly gain key role in the field of quality in our region, thanks to human resources, knowledge, contacts and reputation as a competitive advantage in relation to other institutions and centers.

In regard to global business trends, as well as regulations of the European Union which require the implementation of quality standards in the business, the need for real, proven information on the quality, finding new solutions through research and reporting in this area will eventually get significantly better. For any successful business it is important to be a step ahead, and the Media Center for Quality has such a starting point.

3.1. Case Study – NIS, as a guideline for Media Center for Quality

When we talk about the market of the Republic of Serbia, considering quality and business excellence, the work of one of the largest and most successful companies - Oil Industry of Serbia (Naftna Industrija Srbije), can be considered as a case study.

The company follows global trends in the sphere of quality and it can be considered to be the leader in the region when the application of standards and reporting are concerned. NIS applied global trends primarily through transparency of its operations and business.

We can see that they prepared their annual reports on the work of the company, as well as reports on sustainable development in according to the guidelines of the GRI (Global Reporting Initiative), and also that the implementation of quality standards can be observed through the organization of their business and the availability of other types of documents, such as company profile.

NIS applied the Indicators of GRI agencies for the creation of the report, and audit was conducted by KPMG. Model of the NIS company can also be applied as an indicator of market needs, but also as a guideline for the offer of Media Center for Quality.

Profile	DESCRIPTION
3.3	Reporting cycle
3.4	Contact for questions about the report and its content
3.5	Methodology of preparing the report and a procedure for determining the content
3.6	Boundary of the report
3.7	Limitations in scope and boundaries of the report
3.8	Basis for reporting on joint ventures
3.9	Techniques of data measuring and basic calculations for the estimation
3.10	Explain existing corrections of data from the previous report
3.11	Significant changes comparing to previous reporting periods
3.12	GRI indicators
3.13	Audit (revision) report

Figure 1: GRI reporting indicators of the NIS company

Therefore, this is the company that has introduced quality standards, follows the trends of global organizations when reporting and its control is concerned, continuously strives to improve performance through review and training, takes care of the community and works in a transparent manner.

It can be considered as some kind of a model for quality, so when it comes to services that Media Center for Quality provides, directions for quality to be drawn in dealing with this type of companies are:

- Monitoring and present global trends in the field of quality to customers in Serbia and the region, as well as creating a link between these organizations and companies in Serbia;
- Analysis of user requirements, coordination and consultation with a certified and professional staff of the Media Center for Quality;
- Training and advising about the implementation of standards, certification and reporting;
- Control, review and improvement;
- Connecting community groups, organizations, institutions (companies, governments, NGOs, experts, consulting companies, institutes, media centres);
- Distribution of information from the client to its stakeholders;
- Presentation of trends, research results and reports of companies, as well as their connecting to other target audiences and media centers;
- Organizing dialogues, conferences and seminars and presenting new solutions;
- Publication, reporting and transfer of trends in the field of quality at the local level.

3.2. The mission of the Media Center for Quality

The mission of the Media Center for Quality is creation of social solutions when it comes to the field of quality, through development of an organization that continually reviews its options, following global trends of quality and passing them on the local market. As already mentioned more complex systems, this organization should belong to a kind of network that will provide quality services information to certain users by linking and grouping them by their interests, providing the necessary information in the sphere of quality in an appropriate manner and by creating databases and the ability to further research.

3.3. Objective

The objective of the Media Center for Quality is a successful notification of targeted public about the quality, organization of scientific meetings and an increase of the number of reports, implemented standards and certified workers in the field of quality.

3.4. Creating a strategy of the Media Center for Quality

The key of the strategy of development of the Media Center is to identify market needs, as well as the continuous improvement of the organization itself in accordance with those needs. As in the theory of

complexity, in this case the most important thing is to set up a clearly defined line or points of support depending on which the structure itself and the offer of organization will continue to change along with market trends and social conditions. (Johnson, G.; Scholes, K., 1988)
 Finally, that points of support are knowledge, networks, learning, feedback of national and transactional and cooperation.

3.5. Strategic Analysis

In order to better formulation of development strategy for Media Center for Quality, we should explain all the factors that affect it.

A careful plan or method designed to achieve the goals of the organization, is often called strategy. It means doing the right things at the right time in order to ensure success in the future. From the perspective of the leaders in the company this means focusing on the future survival and success of the company. Traditional concepts assume that adequate strategies will be generated according to the systematic analysis and assessment of the current situation. These methods can then be implemented in order to take the company on the road of successful future. Johnson and Scholes present a basic model for the development of strategy. Getting an overview of the options and choosing the right strategy is based on the strategic analysis.

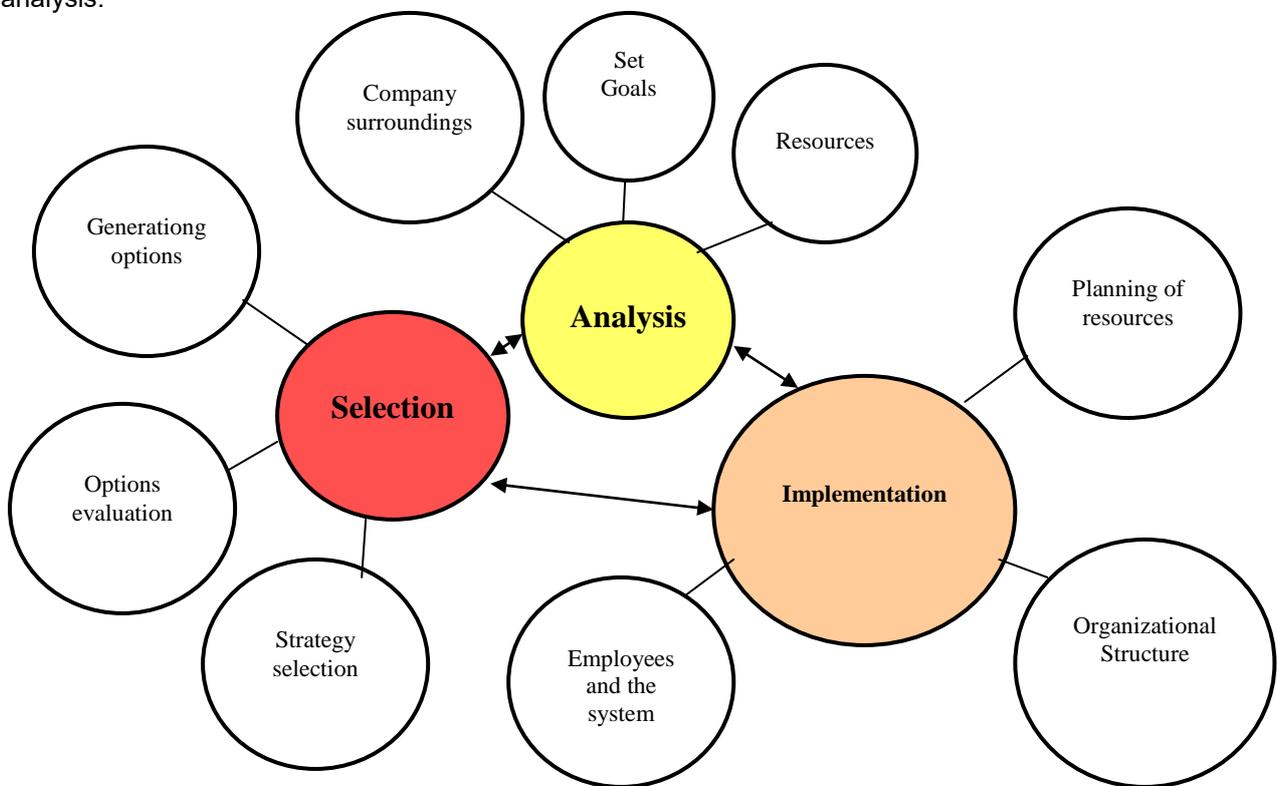


Figure 2: A copy of the Corporate Strategy: It is not this easy: Corporate Strategy (Johnson 1988.)

To formulate a strategy for the development of the Media Center for Quality, it is necessary to go through the process of analyzing the factors that affects its analysis, selection and implementation. Recognizing the indicators for analysis, selection and implementation is different on each case:

- Analysis - Indicators are recognized through the company surroundings analysis, set goals and resources;
- Selection - Indicators can be recognized by generating options and selection of strategic decisions;
- Implementation - Indicators are recognized through employees and the system, organizational structure and planning of resources.

4. CONCLUSION

On the one hand, regarding to its organizational structure, Media Center for Quality should make a network of social subjects, inform them in the right time, and also should provide them the access to the services related to quality. On the other hand, it should make available the information related to quality and enable

their further distribution and channeling to the requirements of other users by following the movement of information society and work of other media centers, and by the use of certain media.

Based on the analysis of the global trends of Quality, local case study, all the analysis needed for formulating Media Center for Quality's strategy of development according to prior check and knowledge of rational planning through the corporate, global, business and functional strategy, it has come to the conclusion that the strategy can be created through several key points, such as: knowledge, network, learning, national and transactional feedback, and cooperation.

According to trends that indicate complexity, synergy and cooperation, points of support are the foundation of the structure and operation of the Media Center for Quality, leaving the opportunity for development which follows new market and social trends.

Besides transferring knowledge, information and networking, the Media Center needs to enable a proper analysis of requirements for each client and their further coordination to other clients and stakeholders.

Competitiveness is achieved by competence of human resources, the reputation of the founder institution, the existing infrastructural, technological and communication resources, but also by possession of databases, knowledge, contacts and experience in the field of quality, certification and standardization. Profitability can be acquired by making an appropriate package of services and products for customers and members, also by the status of members of the Media Center for Quality publishing, and by distribution of information and knowledge through certain media. (Tapiero S. C., 1996).

Some companies apply social and environmental reporting for 15 years, but for many others it is still new. Most companies - mostly large enterprises - present these information in the form of a report. Over time, these reports have become more extensive and more detailed with a wider range of measures of social and environmental performance included. Therefore, most organizations have reached this stage of maturity. The problem today is that there are no standards that indicate what should be reported, so the organizations still report on various matters, thereby impeding comparability. Therefore, it is probably true that this is a crucial phase of development for most organizations. (Aras G., Crowther D, 2009)

Without coordination with other companies and stakeholders, the impact of their operations may be limited. Partnerships with governments, international organizations, non-governmental organizations and other enterprises can greatly help to maximize the potentials of the company.

Formation of the Media Center precisely represents the necessary type of social solution that has to connect users, manage their requirements, analyze their needs and continue the distribution of knowledge and information gathered during the work.

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HOLISTIC APPROACH TO CONSULTING FOR QUALITY SYSTEM AND OTHER MANAGEMENT SYSTEMS

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Abstract: *Since the popularization of application of international standards, consulting plays an important role in the implementation of quality systems and other management systems. The beauty of consulting is that in its framework, it allows creativity and offers opportunities for innovation. This paper suggests three dimensions of consulting that can help in achieving success in the implementation of management systems, while presented model suggests a holistic approach. For the purpose of thorough explanation of certain claims, the examples from practice are offered that show that masterpiece actually consists of fine details. If by reading this article, consultants or those who are about to become consultants, acquire an idea how to help an organization in the implementation of the management system, then the goal of this work is fully achieved.*

Keywords: *consulting, quality, standard, management systems, holistic approach*

1. INTRODUCTION

For many years, consulting work in the field of management systems, stands as the main link between standards in the international arena and business systems that operate in free markets. Although the responsibility for the implementation of management systems lies with the organizations, it is consulting that has significant influence on whether the system will be adequate for the particular organization.



Figure 1: Consulting as a link between international standards and business entities

As almost all areas are regulated by an international standard, so the consulting has received its frameworks in the standard EN 16114: 2011 - Consulting Services in management. The International Organization for Standardization (ISO) is currently developing a standard ISO 20700 - Guidelines for the provision of consulting services in management.

However, as it is stated by Mr. Jeremy Webster from the Committee on Professional Standards (BSI) standard EN 16114: 2011 deliberately foresees only inputs and outputs in the process of consulting leaving it to consultants to apply different methods of work with clients. This has encouraged innovation and diversity that consultants must apply in their work. As the framework of providing services in consulting has already been clearly defined, skills to provide consulting services are reflected in the commitment to each organization separately.

Insight into the statistical data on the number of certified organizations and standards that have been implemented in those organizations unfortunately does not tell anything of the quality of these systems and the improvements that they bring, primarily to their business system and then to the development on the local, regional or global level. Although the standards are the framework within which we must operate in order to meet the requirements, there is always the opportunity for experts

who work on the implementation of these systems to make their unique "stamp". Within professional circles it is well known that a management system must rely on System and Process approach. However, in order for the consultant to be on his way to be proud of his work, he should apply Holistic approach.

Seldom is an organization really identical to another one, so it goes without saying that the consulting should be tailored to the differences. Any management system must be implemented so that it is perfectly suited to the organization and not to be "a tight shoe." Often, in practice, we see systems that focus on documentation and form and the proof during a certification audit can only be seen on paper by repeating platitudes composed of technical terms of each individual management system. What is the added value of such management systems on an everyday level, it is hard to assume and measure.

2. 3D MODEL – HOLISTIC APPROACH TO CONSULTING

Consulting is a profession universally accepted and well entrenched throughout the business world. Whether it is providing objective analysis, supplying a specific expertise, managing a project, or simply adding extra manpower, consultants can add value (Pliner N., Thrall J., Boland G. and Palumbo D., 2004). In order to achieve the best results and meet the goal of implementation in each segment, it is necessary to approach completely, i.e. holistically. Knowing that any form is geometrically best represented in the three-dimensional coordinate system, and that this is the only way to examine its real dimensions, we will apply the same analogy to consulting services aimed at the creation of a particular organization in accordance with the requirements of the quality management system, environmental management, occupational health and safety, information security and others Figure 2.

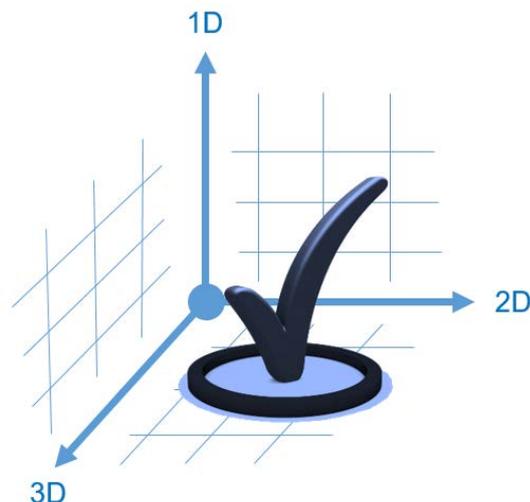


Figure 2: Dimensions of holistic approach to consulting

2.1. The first dimension – organization (1D)

- Size of the organization
- Method of organizing
- Type of business activity
- Financial and infrastructural capacities.

The volume of documentation to be expected depends largely on the **size of the organization**. However, conclusions should not be made ad hoc. Usually when we hear that the organization has a large number of workers or more locations, it can be assumed that it is a complex and demanding organization. Although in most cases, a more extensive work on the implementation of the system may be expected, sometimes this is not the case. Attention should be paid to the number of

employees in certain workplaces, processes should be identified and the mode of communication should be determined.

For example: production organization which has 400 workers and complicated process model cannot have the same volume of documentation as a distribution organization that also has 400 workers. Distributor organization has mostly employed the drivers who do the delivery and this is the most important process for them. On the other hand, in the manufacturing organization, arranging of production requires much more attention and precision, and the connection with other processes is multiple

The previous example touches **the type of the activity**, which also greatly affects how the requirements of the standard will be met. In this case there is also a link with the third dimension of the model, which, among other things, provides legislation that sometimes significantly differs for various activities. Those who provide consulting services should take into account that the process of standards implementation will run faster and easier if the consultant who personally lacks technical knowledge of the industry, hire a person who will act in the capacity of expert advisor.

The method of organizing, regardless of the management system, affects the allocation of responsibilities, powers, speed and effectiveness of internal communication. There are many forms of organizing but everybody has an obligation to describe them in detail through the organizational charts and job systematization. Consulting must begin by learning the methods of organizing.

For example: Statistically the most common is a functional method of organizing, however there are organizations that have chosen project method of organizing. If one looks at just this aspect of an organization, it is clear that the management system itself will vary. While the first organization must clearly identify all the functions because their job descriptions are separated, the second organization focuses on projects.

Very often, the measures that can realistically be implemented by the organization depend on **financial capacities**. This is especially true for the infrastructure for which it is usually necessary to engage significant financial resources. Some activities, such as food production, for example, have specific requirements when it comes to infrastructure. A consultant does not need to know exactly how much funding the organization has but it is necessary to gain insight into their capabilities and show understanding when proposing solutions that involve spending money. In this way, besides providing the best solution for the organization, consultants will also show their commitment to the organization and gain its trust.

2.2 The second dimension – human resources (2D)

It is not enough to understand a business, one should understand people as well. Although this often ends up with defining the organizational structure, division of responsibilities and determining the number of staff, consultants should pay more attention to employees. After all, they are the ones who will implement and improve the management system. In this regard, it is necessary to pay attention to:

- The educational structure
- The age structure and personal constraints
- The way of thinking
- The cultural framework.

Each consultant must be prepared to recognize the way of thinking of people working with him on implementation in order to get the right answers to the questions. It should be noted that the extent to which the consultant will motivate top management to participate fully in the implementation process also depends on this. In the case that the consultant speaks a language they do not understand, management will quickly pass their participation in the implementation process onto other employees.

If the organization has a large number of engineers or lawyers, the approach must be adapted to their way of thinking. Different professions have different views on the same issues. Sometimes the success of the implementation of the management system depends on that, so it is important to have insight into the **educational structure** of employees.

Besides educational structure, age structure is also important since sometimes solutions that are to be used depend on it too. This implies that the habits of experienced people are probably already formed and it is better to use solutions that they are used to as this will ensure efficiency and effectiveness in the implementation of quality systems. This applies particularly to information technologies the changes of which are more easily followed by younger generations who are susceptible to significant changes.

Also, the argument is that manufacturing SMEs have not considered socio-emotional and intellectual factors and ethics values within a quality culture, that is part of an integrative model of QMS to improve the aptitude and attitude of people who represent the most important value faced to any other asset in the business, and can carry an innovation process and value-added products and service to get customer and stakeholder satisfaction (Hernández, González and Aquiahuatl, 2011).

All of us in some way participate in the struggle neither to let **personal constraints** to reflect on the job nor the employee to be treated differently because of that, but in certain situations it is important to choose a solution that will fit into personal limitations. It is therefore very important to have that type of information as well. How ignorance of this aspect in employees can directly influence the implementation and sustainability of the system, can be seen from the following example:

For example: The obligation of any organization that is engaged in the production of food is to provide separate kits for the maintenance of hygiene in industrial and sanitary facilities. One of the common ways to solve this is to purchase kits of different colors. The organization has implemented this method, done risk analysis, defined work procedures, formed the records, provided kits, however it was found after two months that one of the hygienist is color-blind and very often mixes kits. The hygienist in question considered that this is the rule and did not question the decision of management and no one asked if such separation of cleaning kits suited her. Such a mistake at first glance may seem trivial, but it can unfortunately lead to disastrous consequences in case of contamination of food by bacteria of fecal origin.

The business world usually takes into account the organizational culture and works on its construction, however, when it is necessary to introduce certain changes, the general cultural context must also be taken into account. The beauty of the management systems is that they are designed to fit into any country, however consulting must have more knowledge of the cultural environment into which the management system has to be implemented. This applies to both communication with people and the solutions that are an integral part of the management system. It must be borne in mind that sometimes people are very sensitive to disrespect to their cultural values and that can be one of the main obstacles in the implementation process.

2.3. The third dimension - socio-legal framework (3D)

Through the first two dimensions the internal environment and the characteristics were considered, however the third dimension that is focused on the external environment is required for a more complete insight. Some elements of the environment are:

- Legislation
- Interested parties (social framework)
- Customary law.

It is well known that legislation is the basis for all management systems. Virtually all solutions of management system must be in accordance with the legislation. In addition to standards obliging organizations to undertake regular monitoring and implementation of legislation, it is important that consultants have precise knowledge of legislation. They are required to have the skill of interpretation of the law, on which sometimes depends whether the organization can adequately coordinate the requirements of the standards and requirements of the law.

In order for an organization to conduct business seriously, it must identify its **interested parties** and regulate its proceedings in accordance with them. Consulting should also seriously consider the interested parties because a number of activities that are part of the management system may depend on them.

For example: According to the claim of standards, a consultant has predicted that suppliers should be identified and evaluated, but has not conducted a detailed study of the structure of suppliers. Without

this information, procurement procedures were established, which projected that foreign suppliers should be contacted every Friday, with the obligation to confirm the deliveries for the beginning of next week. The idea of this solution was to organize “Just in time” supply and to reduce storage costs. However, as soon as the first week of the application of the procedure, it was found that 30% of suppliers come from the Arab region and it was not possible to apply the approach because Friday is their day off.

The importance of customary law may sound redundant when considering the approach to consulting. However, in all communities, there are traditions deeply rooted in the behavior and although not part of the legal and legislative norms, they often carry the same weight. They should be taken into account both in the part that relates to the communication between the consultant and representative of the organization and in the creation of solutions as part of the management system.

3. POTENTIAL PROBLEMS IN CONSULTING

In every profession, although it sometimes indicates problems, experience actually represents a source of valuable information which identifies room for improvement and raise the knowledge and skills to a higher level. Therefore, it is necessary to recognize the potential problems that may arise in the consulting business because it is the only way to prevent their actual occurrence.

Some of the problems could be:

- **Routine** - mapping systems from an organization of the same type of business activities. - In practice organizations that have the same business activity, sometimes have only that in common, the same activity. The process model may be different, the method of organizing also, as well as many other elements that are of great importance for the design and implementation of a management system.
- **Establishment of documentation without taking into account the level of knowledge of those who will actually use those documents.** – Grudzień Ł., Hamrol A. (2016) discuss the main function of information found in process documents is to provide knowledge regarding how to executing a process and to standardize this process by providing a specific path of execution. However, it is not easy to determine a standard level of quality of process information optimal from the viewpoint of the owner and the process executor. After the consultant leaves, documentation that remains has to be an essential tool in the everyday work of the organization. If what it says is clear only to the consultant, it is not a system that will bring the improvement to the organization.

For example, if people with disabilities are hired for simple operational tasks, what should the instructions be like? Will the paper full of words be more useful than pictogram with simple sentences? Probably not.

- **Meeting the form and not the substance** - every document of the quality management system or any other management system must have a defined shape, however it must seriously deal with the substance. If the document does not give precise answers who needs to do what, when and where, it usually deals more with the form rather than substance. This potential problem particularly applies to procedures.
- **Developing a system for external auditors** – To cut corners – All experienced consultants and their systems were subject to certification audit and as professionals they record remarks of external auditors. Since the auditors have the freedom to interpret the extent to which a requirement is met, consultants may unconsciously think not about how to really help the organization but to go through the audit without any complaints. To a consultant the client should always come first. His task when it comes to the external check is to defend a system that he designed specifically for that client.
- **Too little time to get to know the organization and establish the initial balance** - Market needs - Although in practice sometimes to customers a motive for entering into the process of implementation of an international standard is not primarily the improvement of its operations, but only the requirements of the market, the consultant still must provide sufficient time to get to know the organization itself.
- **Lack of creativity** - Whether consultants will literally apply all the requirements of the standard, or they will have an innovative look at them always depends on their interpretations of standards, personal styles and experiences. Regrettably, completely uninteresting documents and solutions that add no value to management system may be encountered in practice. One should bear in mind that clients must recognize themselves in the

documentation. It is not good if it takes only one look on the documents to recognize the consultant who worked on the implementation of the system.

- **Inadequate volume of documentation** - generally accepted claim that **"what is not written, has never even occurred"** may be supplemented by the following statement, **"but also if something was written down does not necessarily mean it happened."** Sometimes the wish of the consultant to create the best documented system may lead into oversized records which are a burden for workers who have multiple tasks. Often in practice we find that the records are filled mechanically at the end of the day, sometimes without checking the actual situation. It is desirable that the consultant steps out of the generally accepted "fill in the chart" system. It is always good to ask whether this volume of documentation will provide the realistic data.

Also, according to Mingaleva Z. (2013) "consulting is carried out in the field of activity in which the ethical code is simply necessary. The basic ethical standard for the adviser means not to abuse the trust of the client. Only trusting the adviser the director can tell him about the problems in business and will allow him to use confidential information of the enterprise and will follow the recommendations".

4. IMPACT OF CONSULTING ON BUSINESS SYSTEM

Greiner and Metzger (1983) define management consulting services as "an advisory service contracted for and provided to organizations by specially trained and qualified persons who assist, in an objective and independent manner, the client organization to identify management problems, analyze such problems, and help, when requested, in the implementation of solutions" (p. 7).

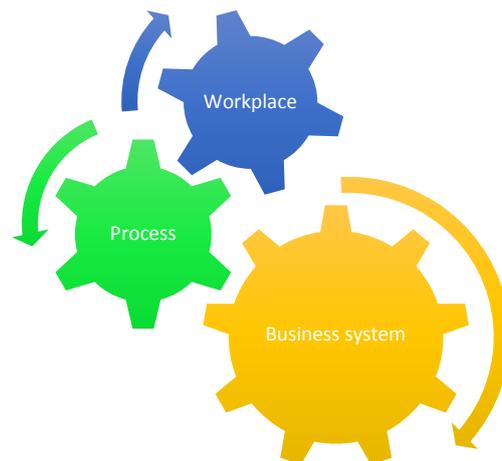


Figure 3: The mechanism of influence in one business system

When the process of implementation of a management system is entered, one of the main goals is to bring an immediate improvement to the organization and provide tools that these improvements are continuous in the future. On the effects of the application of quality systems or other management systems, there are a numerous studies and works and they all clearly testify to the positive effects on the business system.

However, in order to know how consulting influences what the effects will be like, it is important to understand the mechanism of influence within the business system (Figure 3). Unless even the slightest positive change is brought to each position, we cannot expect that the entire operating system will benefit from the management system.

4.1 The mechanism of influence in one business system:

- Workplace
- Process
- Business system

The direction of the individual workplace determines the direction of the entire business system. Mutual influence is inevitable and the only proper one in a well-implemented system.

The consultants are asked to give advice, to discover and propose solutions and to participate in their implementation in a wide range of issues related to company management. If we are to look just at the pole of the field of action of the consultants we may say that they can offer either classical solution, tested methods, properly defined instruments, in a standardized format, or new methods, solutions and instruments tailored to the specific situation of a client (Ciumara T. 2011).

Sometimes the opinion of operatives is unconsciously disregarded in the implementation of the management system. Thus is the initial and expected resistance only increases and the expected change will not be possible. It is extremely important that all employees, regardless of hierarchical levels understand that it is in the interests of them all and why it is important for the entire business system. If they their personal role in the improvement of the organization is clearly presented to them, the greater the chance that they will not only scrupulously respect the rules of the system, but also possibly make suggestions for improvements. For example, small number of employees, which means cumulative responsibilities and functions, especially in manufacturing companies, reducing the number of procedures, along with a document management using information technology, can be a solution to simplify QMS in order to increase its effectiveness (Pop L. D.,2016).

All data which are discussed in the annual management review speak of the importance of a single employee. Consulting service suppliers have the obligation to explain how the operation of one employee affects the operation of the other, how it reflects both on the process and the entire business system. Until a consultant does not ask himself who he designs the system for, the implementation and application of the management system can give unexpectedly bad results.

5. CONCLUSION

The term "holistic" is mentioned in the literature together with the description of the quality system however it is necessary that the approach in its implementation also be holistic. Thus the circle that leads us to permanent improvements is closed. From all aforesaid, it can be concluded that the consulting is more than just a job. Management consultants are often central figures in not only the promotion and diffusion of new organizational practices, but also their implementation (Wright, Sturdy and Wylie, 2012). As it were, it has a unique mission that can bring a lot of benefits not only in the level of the business world but in generally. The model presented is a good tool that helps in understanding all the basic elements that can affect both the effectiveness and the uniqueness of the implemented management system. The model also implies that the consultants should have a wider knowledge and a lot of experience in real business systems. By raising awareness of the seriousness of the consulting work, we encourage the next generation to improve methodology and maintain credibility that this profession requires.

According to Srinivasan R. (2014) the challenges facing the management consulting industry fall into three broad categories:

- Competition and differentiation
- Organizational design of the management consulting firm
- Internal organization of knowledge flows to serve client needs

Ciumara T. (2011), discuss most of the consulting services are situated somewhere between absolute standardization and absolute innovation. It is important to find a balance between innovation and standardization to maximize the results of all agents involved. As Larina L. N. (2015) discuss the system of components management should correspond to a flexible structure, adaptable to users' needs and a changing environment, which organizes and maintains the processes' functioning and creates a medium for their existence. The quality management system is an integrated instrument of management for all processes. It is necessary, however, to form not only the quality system as a priority, but also the integrated management system as a whole, and there it is important that consultants play a key role.

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FMEA APPLICATION IN RISK MANAGEMENT AS RESPONSE TO THE ISO 9001:2015 REQUIREMENTS

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Abstract: *The requirements in newest revision of the quality management standard ISO 9001 are related to risk management. For organizations in transition phase there is the challenge of meeting these requirements. Therefore explored was the identification of the critical risk points in telecommunication service using quality method Failure Mode and Effect Analysis (FMEA). The case study regarding spreading failures by causes was performed during the period of one year in Telecom Serbia Company. Findings of the case study on the application of FMEA has shown that this is a good model for performing risk assessment in telecommunication industry in accordance with quality management system requirements. Corrective actions were proposed for detected failures. Implementation of this actions leads to a greater quality of telecommunications service.*

Key words: *FMEA, ISO 9001, risk management, telecommunication service, Risk Priority Number*

1. INTRODUCTION

As an International Standard, ISO 9001 (Quality management systems - Requirements) is subject to review on a regular basis. When considering the 2015 revision, the committee responsible decided that some changes were necessary, such as Clauses related to "risk". Risk-based thinking is something we all do automatically and often sub-consciously to get the best result. The concept of risk has always been implicit in ISO 9001 - this revision makes it more explicit and builds it into the whole management system. In previous editions of ISO 9001, a clause on preventive action was separated from the whole. Now risk is considered and included throughout the standard. For example, In Clause 6 the organization is required to take action to identify risks and opportunities, and plan how to address the identified risks and opportunities (ISO 9001:2015).

Therefore the paper will focus on widely used quality method (Failure Mode and Effect Analysis - FMEA) and its application in services. In that manner, we try to identify risk points in enterprise in order to prevent and eliminate defects in service processes. FMEA is a step-by-step approach for identifying all possible failures in a design. The model fulfils the basic requirements of ISO 9001:2015 reference in terms of identification of the main and auxiliary processes.

The aim of paper is to identify the critical risk points in telecommunication service and, in accordance with that, suggest preventive and corrective measures. The first part of paper talks about literature review and FMEA method. The second part of article is focused on research methodology and third part is dedicated to case study on the application of FMEA method in telecommunication services in Serbia, more precisely Telecom Serbia Company. In this paper we have a detailed description of how the estimates were awarded and how we get risk priority number (RPN) for definition of the necessary corrective actions and their priority such as preventive measures to management risk.

At the end we discuss about what we have done through the research and about practical solutions that could find their application in the future.

2. LITERATURE REVIEW

FMEA is the best analytical method, because allow for establishing links between causes and effects of defects, as well as searching, solving and withdrawing the best decisions concerning applying

proper action” (Dudek-Burlikowska, 2011). FMEA was developed for the US Army as an official analysis methods. Military Procedure MIL-P-1629, entitled "Procedures for Performing a Failure Mode, Effects and Criticality Analysis" originally dates from 1949. (The International Marine Contractors Association, 2002).

“FMEA is a methodology for analyzing potential reliability problems early in the development cycle where it is easier to take actions to overcome these issues, thereby enhancing reliability through design. FMEA is used to identify potential failure modes, determine their effect on the operation of the product, and identify actions to mitigate the failures. A crucial step is anticipating what might go wrong with a product”. While anticipating every failure mode is not possible, the development team should formulate as extensive a list of potential failure modes as possible. The early and consistent use of FMEA in the design process allows the engineer to design out failures and produce reliable, safe, and customer pleasing products . FMEA does also capture historical information for use in future product improvement“ (Huber and Mraz, 2005).

All products and processes follow these ten steps of FMEA method (McDermott et al., 2009):

- Review the process or product;
- Brainstorm potential failure modes;
- List potential effects of each failure mode;
- Assign a severity ranking for each effect;
- Assign an occurrence ranking for each failure mode;
- Assign a detection ranking for each failure mode and/or effect;
- Calculate the risk priority number for each effect;
- Prioritize the failure modes for action;
- Take action to eliminate or reduce the high-risk failure modes and
- Calculate the resulting RPN (Risk Priority Number) as the failure modes are reduced or eliminated.

FMEA is very popular risk assessment method which was the subject of many articles within different topic (Fazlovic and Karahmetovic, 2012, Mentés and Ozen, 2015; Mock et al., 2002; Ookalka et al., 2009; Rhee and Ishii, 2003; Tavne et al., 2010). For instance, Fazlovic and Karahmetovic (2012) analyzed internal processes in one of the telecom operators in the market of Bosnia and Herzegovina by FMEA methodology, and gave suggestions for quality improvement. They analyzed the following package dimensions: voice services, data transmission services and terminal equipment. Also, Vriezokolk et al.(2011) are one of those who recommended FMEA as a way to analyse telecom service model in order to perform a risk assessment in crisis management where is essential knowing their service availability risks. Similar to previous authors, Pranoto and Nurcahyo (2014) used FMEA to identify the root cause of Network Performance High Speed Downlink Packet Access in telecommunication industry. They used this method „to examine the failure of a potential product or process, evaluate the risk priority, and help determine the appropriate action to avoid the problems that have been identified“ in telecommunication industry with the purpose of quality improvement. Gómez Fernández et al. (2016) applied FMEA in a telecommunications company to measure the influence of failures occurrence on losing customers.

Likewise, Zeng and Chun (2010) in China used the same method for risk management analysis within Integrated Management System, that includes OHSAS 18001 (occupational health and safety management), ISO 14001 (environmental management) and ISO 9001 (quality management). The authors showed the application of this method in organizations, where FMEA helps them to identify potential risk problems. They’ve discovered five major potential risks, including “Roof related falls”, “Elevator shaft falls”, “Holes in flooring on construction site”, “Hit by falling objects”, and “Run over by operating equipment” that are graded to be unacceptable, and suggested minimizing them using prevention such as protection.

In addition, in paper written by Xiao et al. (2011) „the minimum cut sets theory has been successfully incorporated into the traditional FMEA for assessing the system reliability in the presence of multiple failure modes“. They „expanded the definition for RPN by multiplying a weight parameter to characterize the importance of the failure causes or components. Following the weighted RPN, the utility of corrective actions is improved“.

3. RESEARCH METHODOLOGY

Telecom Serbia Belgrade is a modern, fully local telecommunications company that has the leader role in the field of home and mobile telephony, Internet and multimedia, both in Serbian and in the region, for the past 18 years (Telecom Serbia, 2016). The subject of FMEA analysis refers to the executive unit Jagodina and includes spreading failures by causes during the period January-December, 2010. The total number of observed failures is 129, sorted by the causes. The data were obtained in the company Telecom Serbia, executive unit Jagodina, with the approval of the General Director, at the request of a competent person for maintenance and repair. Original data contains objects grouped by interference, with defined causes of interference for each object, numerically and by percentage displayed eliminated interference as well as other parameters on which the estimate RPN (Risk Priority Number) was configured. Following the example of McDermott (2009), we estimated the next parameters:

- Severity (S)—The consequence of the failure should it occur.
- Occurrence (O)—The probability or frequency of the failure occurring.
- Detection (D) —The probability of the failure being detected before the impact of the effect is realized.

In order to help defining these parameters, some values were calculated:

- mean time between failures (MTBF);

$$MTBF = t/r \quad (1)$$

- failure intensity (λ);

$$\lambda = 1 / MTBF \quad (2)$$

- the total time of inactivity (Down Time) -The average duration of the interference.

Assessment of the probability of occurrence and failure severity were obtained using Ford's scale (Ford, 1996), while the estimate of the probability of detecting failure was based on the opinion of experts (Reliability and Risk Analysis, 2016). RPN is a mathematical product of numerical score for Severity, Occurrence and Detection:

$$RPN = Severity \times Detection \times Occurrence \quad (3)$$

It is used to determine the priority items that require additional quality planning or action.

4. CASE STUDY

In order to estimate risk priority number for further risk management, failure Severity-S, likelihood of Occurrence-O, and probability of Detection-D of every failure effect was measured.

The assessment of probability of Detection-D was obtained using the opinion of experts. The question that was asked during the visit to the company and interview with experts was: "What is the probability of detecting a system failure before the service user observes it and reports the malfunction? According to the submitted scale, where the scope of score ranges from 1-10, rate the probability of

detection while having in mind that the score is inversely proportional to the possibilities of the detection capabilities, so that failures with the least possibility of detecting will have highest score, and vice versa.

Probability of Occurrence-O was based on the MTBF (Mean Time Between Failure) value, which represents the ratio of total time in which the failures are observed (in this case represents a period of one year) and the number of failures in the stated period for every interfered object.

Example: In the case of ADSL user equipment, where the fault was observed in incorrect connecting, the number of removed interference would be 23 over a period of one year, or 8760h, where the ratio of this two would give us the mean time between failures, $MTBF = 8760/23 = 381$. Then, using Ford's scale we can determine that the value belongs to the range corresponding the score of 7 on given scale. Part of the table that relates to the mentioned interference and the probability of occurrence are given below.

Table 1: Annual report on the interference of 2010, the executive unit Jagodina (Excerpt 1)

Interfered Object	Cause of failure	Interference removed	MTBF	Occurrence
ADSL user equipment	Incorrect connecting	23	381	7

Assessment of the severity of the effects of failure (Severity-S) was obtained based on DT (Down Time), is total interval of failure, which represents the average duration of removed interference.

Example: Assessment of the severity of failure, calculated on the same case which was taken for assessing the probability of occurrence, is calculated using total time of inactivity which represents the average duration of removed interference, which in this case is 68 min, or 1.33h. By using Ford's scale it is determined that the severity score is 6. Part of the table containing mentioned information is provided below.

Table 2: Annual report on the interference of 2010, the executive unit Jagodina (Excerpt 2)

Interfered Object	Cause of failure	Average duration of interference removal	DT	Severity
ADSL user equipment	Incorrect connecting	68	1,33	6

In cases where the scale does not precisely define boundary between grade 5 and 6; 6 and 7; 7 and 8, the value which is closest to the inactive time (DT) was chosen.

Below is part of the FMEA worksheet that contains information on ways of failure, failure descriptions, the causes of failure, as well as the assessment of failure severity, probability of occurrence and the probability of detecting any effect of failure. Based on those values the estimate RPN was configured and preventive measures that could forestall failure occurrence or soften its effects and accelerate the possibility of detection were proposed.

Table 3: FMEA worksheet

Object	Failure Description	Cause of failure	S	O	D	RPN	Preventive measures
ADSL user equipment	User equipment	Inadequate equipment	6	4	7	168	Mandatory application and submission of procedure which defines the types of equipment.
ADSL user equipment	User equipment	Incorrect configuration	6	6	7	252	Testing the equipment before the mounting.
ATC	Commutation equipment	Age of equipment	6	8	3	144	Recycling and disposal of obsolete equipment in accordance with the Law and regulations.

Base station	Wireless network	Loss of power	5	7	4	140	Introduce greater quality equipment control.
Box	Wireless network	Equipment quality	5	3	10	150	Introduce greater quality equipment control.
FM	Wireless network	Unknown	6	2	10	120	Periodic inspection and maintenance of equipment in accordance with the instructions for maintenance.
Main hub	Wireless network	Poor quality construction	6	4	10	240	Training employees for work on field.
External copy	Wireless network	Cable sheet damage	6	9	10	540	Protect cables by placing insulation and protective equipment.
Telephone booth	Group fault on Telecom equipment	Third party	6	2	5	60	Periodic inspection and maintenance of equipment in accordance with the instructions for maintenance.
Internal copy	Wireless network	Reconstruction of the access network	6	2	10	120	Informing users about the reconstruction period.
Main cable	Wireless network	Creeping cable	4	2	10	80	Protect cables by placing insulation and protective equipment.
Distribution cable	Wireless network	Incorrect maintenance	4	2	10	80	Application of instructions for maintenance and staff training.
Cable hub	Wireless network	Severe weather	6	3	10	180	Protect machinery and equipment from severe weather by placing the appropriate protective box.
Network Termination (NT1)	User equipment	Unprofessional handling of NT ending	4	2	7	56	Application of instructions for use and training.
PCM	Wireless network	Power fallout	6	7	10	420	Introduce more frequent control of telecommunication installations

Based on the given FMEA worksheet, in which RPN is calculated, priority of corrective actions is determined. Failures with the highest RPN value have priority in the implementation of corrective actions. Sorting of failures by RPN was done in descending order, and after completion it came with the following conclusion: from the total number of failures that have been analyzed, which in this case is 129, 32 failures have RPN greater than 400, which represents about 25% of the total number of failures, while as many as 103 failures have RPN greater than 125, indicating that nearly all failures have an extremely high risk level.

While analyzing failures with the RPN higher than 400, which represent an unacceptable risk, following corrective actions were established (sorted by the priority of actions):

- Protect cables by placing insulation and protective equipment.
- Recycling and disposal of obsolete equipment in accordance with the Law and regulations.
- Informing users about the reconstruction period.
- Protect machinery and equipment from severe weather by placing the appropriate protective box.
- Periodic inspection and maintenance of equipment in accordance with the instructions for maintenance.
- Application of instructions for maintenance and staff training.
- Introduce more frequent control of telecommunication installations.

5. CONCLUSION

The subject of research is the analysis of maintenance in telecommunication company Telecom Serbia, the executive unit Jagodina, using FMEA method, with the goal of continued administration of potential risks as part of the international standard ISO 9001: 2015. The subject of analysis were failures and interferences of the system, along with their causes, that occurred during the 2010s. All the basic data used for the actual implementation of the method were collected during the visit to the company. Based on the description of failures and data on the manner and cause of the failures estimates were made for the severity, probability of occurrence and detection of any failure effects. Using these parameters RPN was calculated, sorted in descending order, and used to determine the priority of corrective actions, which were defined by the completion of the analysis.

The limit which represents an unacceptable risk in the system was determined, and failures in which the RPN exceeded defined limits were specifically discussed, as well as the actions that affected them. Corrective actions that have been proposed to accelerate the ability of detection, prevent failures in system or soften their effect, are applicable to all parts of the observing system and can lead to strengthening the position of Telecom Serbia in the market and achieve higher customer satisfaction by increasing the reliability and quality of a major part of their services.

Certainly the most important action to implement is the protection of cables used for installing devices that clients use. Furthermore, same protection should be built on network installations, by placing protective tapes that will prevent damage to the cable sheath and other damage that can lead to cable breaks and therefore the loss of flow of signals necessary for the provision of services. Recycling and disposal of old equipment is also a measure with a high level of priority, because it can cause additional costs and lead to customer dissatisfaction, while satisfied customer is one of the most important goals of the company. It is important to constantly check the accuracy of the equipment, and if found to be worn, act in accordance with the law that applies to recycling, recycle and dispose it properly in order to prevent its unintended use.

If it is a period of reconstruction of telecommunication facilities, or any type of activities that can lead to malfunctions or even downtime, it is necessary to promptly inform customers and, if possible, provide them with an alternative to be able to access the network.

Weather conditions are very common occurrence that may cause adverse effects to the equipment which is not protected well when installed. If the devices used for receiving signals and other switching equipment are located outdoors, it is necessary to put them in appropriate protective box resistant to any influences from the environment (including natural disasters, as well as physical damage).

As already mentioned above, the equipment should be periodically reviewed and maintained in order to maintain in proper condition. Because of this, it is necessary to have instructions for maintenance, that the employee will follow and which will contain regulated ways for the reviewing and maintaining as well as recommended frequency of inspection. Likewise, the manual should be also delivered to users when their product is installed, and they are expected to follow the same. Employees must go through the proper training to be competent with appropriate knowledge, skills and experience to perform duties of providing all kinds of services. This applies to all, from those who work in the field, to operators and workers who are in direct contact with users.

And finally, quality control of devices customers use to acquire their services, as well as control of telecommunication facilities that enable them to do so is of crucial importance. The Law regulates the actual process and it is necessary for it to be performed by a professional team, at least twice a year, in order to reduce failures to the lowest possible level.

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QUALITY OF SOCIAL RESPONSIBILITY ACTIVITIES AND STAKEHOLDERS NEEDS IN SERBIAN EDUCATIONAL INSTITUTIONS

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Abstract: *Although many authors point out the multiple benefits of social responsibility for not-for-profit organizations, there is no many research about attitudes of educational institutions of such activities. The survey conducted in this study aims to determine the importance as well as the level of quality of social responsibility behavior of educational institutions in Serbia. Social responsibility activities are observed through three groups: charity work (donations and providing free education), getting involved in research beyond the curricula; cooperation with the corporate/business community. When it comes to the all of the social responsibility activities, results indicate a satisfactory level of the respondents' consciousness, but the implementation degree is not seen as high. The results are compared with results of such research in educational institutions of other countries Hence, the analysis can be useful for social responsibility - related positioning of the institutions and for the revealing the level of their social responsibility consciousness.*

Keywords: *social responsibility, educational institutions, quality and importance of social responsibility*

1. INTRODUCTION

Social responsibility refers to ensuring the success of a business by the inclusion of social and environmental considerations into a company's operations (Chopra & Marriya, 2013). Social responsibility is about values and standards by which a business operates and commitment of a business to behave ethically, operate legally and contribute to socio-economic development while improving the quality of life of its employees and their families as well as local community and society at large (Mang'unyi & Chege, 2014).

Organizations around the world, and their stakeholders, are becoming increasingly aware of the need for and benefits of socially responsible behavior (ISO 26000:2010). The perception and reality of an organization's performance on social responsibility can influence, among other things, its stakeholders which can also reflect the quality management system of the organization. Especially in view of changes of ISO 9001:2015, all the stakeholders have to be taken into consideration when designing quality management system. The international standard ISO 26000 provides guidance on the underlying principles of social responsibility, recognizing social responsibility and engaging stakeholders, the core subjects and issues pertaining to social responsibility and on ways to integrate socially responsible behavior into the organization.

In the last decades social responsibility has forcefully and irreversibly become a part of the corporate actions of a growing number of companies and continues to provoke the interest of governments, international institutions, scientists and researchers (Slavoval & Bankovall, 2015). As such, the notion of social responsibility is becoming more prevalent in the curricula of universities also (Elobeid et al., 2016). However, according to Idowu (2008), researchers in the field of social responsibility have tended to concentrate more efforts on the social responsibility of profit seeking corporate entities. Unfortunately this does not appear to be the case when it comes to the social responsibility of not-for-profit (NFP) corporate entities such as educational establishments (schools, colleges and universities) and other NFP entities that play equally important roles in modern economies. After that, Ojha (2012) points out that social responsibility is becoming more central to the societal expectations from commercial organizations, with the possibility that spending a certain percentage of corporate income on societal welfare is likely to have legislative sanction. Education is the most powerful weapon which can be used to change the world and to help in lighting the darkness of the society (Singh et al., 2015). Collaboration of social responsibility with the core education will require a change in the mindset of all stakeholders in realizing the importance of rigorous evaluation of educational programs and willingness to alter policies and practices in the light of the findings. The desire to change the current state of education and of the current less-than-adequate regard for the impact of business on larger societies are, however, prerequisites (Nandi, 2013).

Certain academic institutions have recognized the activities which they consider to be important in their work. For example, Bundaleska and Dimitrova (2012) have pointed out that in Macedonia there is a lack of implementation of social responsibility activities, but have also made suggestions about which activities could be conducted in order to raise the level of social responsibility. Some of those activities are: designing the curricula in such a way that challenges students to evaluate business behavior along environmental, social, and ethical dimensions; establishing Social Responsibility Centers within schools and universities; raising awareness and understanding of social responsibility via various events, seminars, conferences, trainings, etc; valuing student effort through awards for student projects and activities related to social responsibility and other. In Kenya, for example, a research by Mang'unyi and Chege (2014) has found that among the interviewed employees the statement social responsibility improves the school reputation had 75% of the responses being neutral. Most schools are not explicit in their social responsibility programs. However 15.625% strongly agreed and 9.375% agreed to the statement. The statement on social responsibility increasing employee motivation and retention was put and 84.375% of the responses agreed. Finally, 84% agreed and 16% strongly agreed that social responsibility protects resources on which the school depends. These resources include members of the community, the physical environment and employees. McDonald and Liebenberg (2006) have conducted a study to determine the level of understanding what social responsibility is and how it is perceived among employees in South Africa. They have found that there is no common understanding of social responsibility in South Africa amongst participants, or a common appreciation of the need for social responsibility. Participants generally confused social responsibility with human resources issues and felt that employee benefits and employee assistance programs should be primary areas of social responsibility focus within the organization. There was also a general tendency amongst participants to assume that social responsibility was more about spending money, than investing in a socially responsible manner

Besides the educational institutions that have only recognized the importance of social responsibility and are yet to implement social responsibility activities in their field, in some countries, there are educational institutions that are already implementing social responsibility activities. Some of those countries are listed below:

United Kingdom (Idowu, S.O. 2008):

- Widening participation;
- Developing and communicating performance on sustainable developments;
- Contributing both to national and international systems of university education;
- Managing the economic, social and environmental impacts of their activities;
- Take into account the interests of all stakeholders and act as good citizens;
- Joining Business in the Community (BitC) as an initial step;
- Responding to social needs in terms of education and Innovation;
- Engagement with corporate bodies through staff;
- Providing a more effective community service;
- Challenging, inspiring and supporting students to grow;
- Sustaining and adding value to country's culture, economy and the natural environment;
- To manage and govern itself with responsibility and sensitivity.

Kenya, Busia County (Mang'unyi & Chege, 2014):

- Provision of sanitary towels to 'unlucky' girls at school;
- Donation of clothing;
- Free education to needy bright children;
- Community use of school resources, e.g. playing ground, bore holes, school bus, electricity, etc;
- Subsidized training fees at resource training centers;
- Discussion groups with public schools.

Turkey, Istanbul (Dahan & Senol, 2012):

- Donation of their income for research;
- Free lessons for high school graduates;
- Free sports schools;
- Education made available to the poor;
- Courses, education centers etc.

Upon examining the data shown above it is concluded that these activities cannot be all observed as a whole so for the purpose of this paper they shall be divided in to three sub groups:

- Charity work (donations and providing free education);
- Getting involved in research beyond the curricula;
- Cooperation with the corporate/business community.

2. THE FRAMEWORK OF THE RESEARCH

2.1. The aim of the research

Although many authors emphasize the multiple benefits of social responsibility for not-for-profit organizations, very few have dealt with the survey of attitudes of educational institutions of such systems. The survey conducted for this study aims to determine the importance as well as the level of social responsibility behavior of educational institutions in Serbia. The results could be compared with results of such research in educational institutions of other countries. This analysis can be useful for social responsibility - related positioning of the institutions and for the revealing the level of their social responsibility consciousness.

2.2. Research questions

Taking into account the low level of social responsibility behavior research, there are two main research questions in this paper:

- Research question 1 – what is the level of social responsibility activities importance from the educational institutions point of view;
- Research question 2 – what is the level of social responsibility activities implementation the educational institutions.

2.3. Research instrument and sample characteristics

The research in this paper is conducted using the questionnaire. Through 20 questions, teachers expressed their attitude toward the importance and the level of implementation of social responsibility activities in their institutions. The Likert scale containing five levels was used for both the answers – the importance of social responsibility activities and the level of implementation of these activities. On the basis of the relevant literature, the elements that make social responsibility behavior involved in the questionnaire are:

- Help provided for students in welfare class;
- Institution involvement in any type of charity work;
- Students informing about the social issues through the curricula;
- Staff engagement in some type of socially responsible activities;
- Students engagement in some type of socially responsible activities;
- Staff engagement in research that enables you to be socially responsible;
- Institution cooperation with other institutions on a wider scale (national, international) in the field of social responsibility;
- Institution cooperation with the business sector on social responsibility activities;
- Students opportunities to further their education through the cooperation between the academic institutions and the business sector;
- The degree of social responsibility contribution to the reputation of academic institutions.

In the view of the standard ISO 9001 as well as the standard 26000, all the stakeholders should be taken into account when designing quality management system and social responsible activities. That is why several stakeholders are included into questions within this research.

The questionnaire was sent by e-mail to teachers of primary schools, high schools and faculties. From 50 questionnaires sent, we received and processed 35 questionnaires that were correctly filled out. The responding rate is 70%. The sample structure is given in Figure 1.

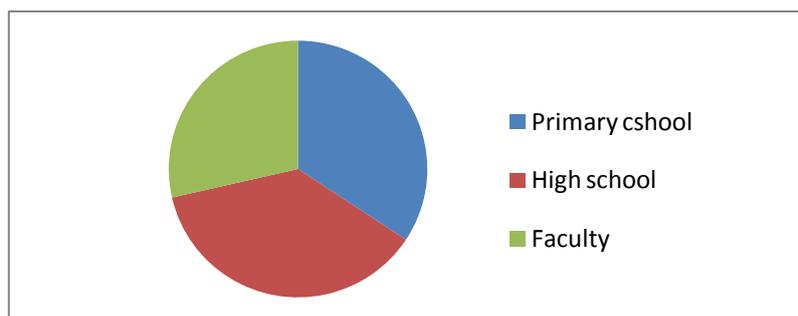


Figure 1: Sample structure

3. RESULTS

Ten key social responsibility activities are considered in this paper and results about the importance as well as the level of implementation of each activity are given and explained below.

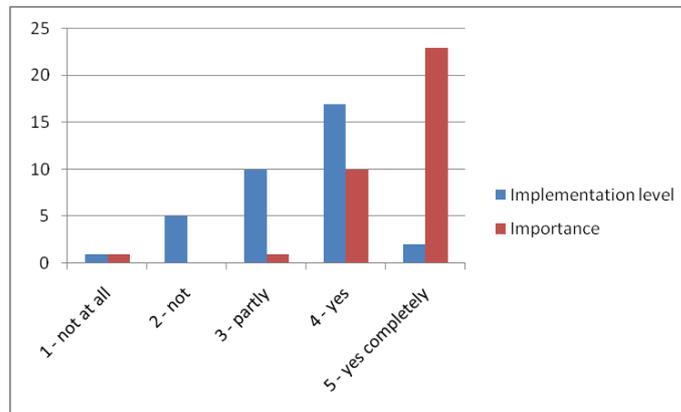


Figure 2: Help provided for students in welfare class

When it comes to the help provided for students in welfare class, it can be seen that there is a high level of recognition regarding the importance of providing help to students in welfare class. 28,5% of the teachers agree that help should be provided, and 65,7% absolutely agreed. When it comes to their opinion on if help is actually being provided, 48,5% of them consider that some form of help is provided, while 14,3% chose to answer with “no” and 1 with “not at all”.

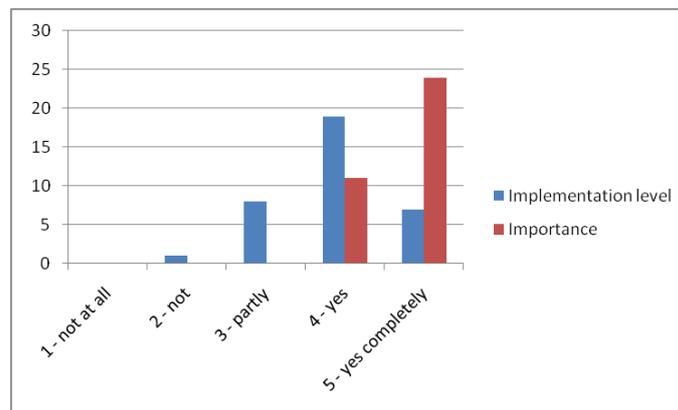


Figure 3: Institution involvement in any type of charity work

When asked about the school’s involvement in any type of charity work, 19 of them consider that the school does some type of charity work, 18 answered with “partly”, 7 with “yes completely”, while one participant chose “not” as their answer. Similar as in the previous question, most of the participants of the survey recognized the importance of charity work, 68,6% of the participants strongly agreed with the statement that the institutions should be involved in charity work and 31,4% agreed with the statement.

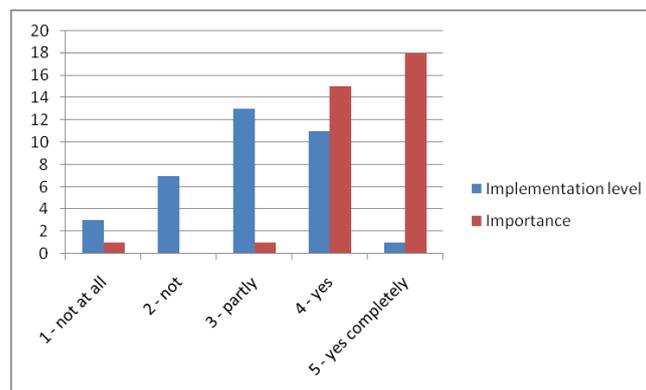


Figure 4: Students informing about the social issues through the curricula

Regarding the informing students of social issues through the curricula 37,1% of the participants consider the students to be partly informed, 31,4% consider the students to be informed, 20% found that the students are not informed, and 8,6% answered with “not at all”. Only one of the participants answered with “yes, completely”. As far as their views on the importance of the matter, 51,4% teachers completely agreed that students should be informed about the social issues through the curricula, 42,9% agreed with the statement, and 2,9% of the participants answered with “partly” and “not at all” each.

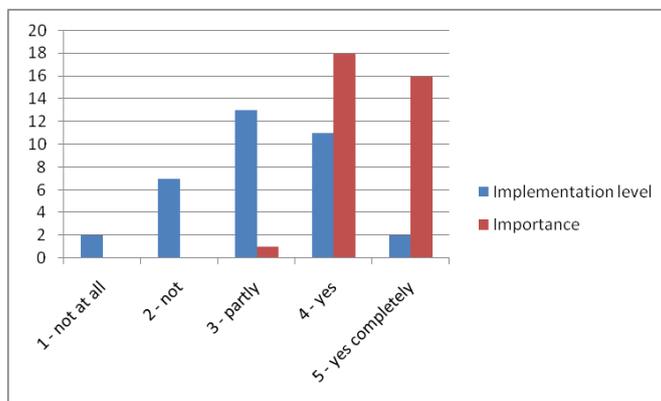


Figure 5: Staff engagement in some type of socially responsible activities

When asked about the extent to which the staff is involved in social responsibility activities 37,1% of the participants answered with “partly”, 31,4% with “yes”, 20% answered with “no”, and options “not at all” and “yes, completely” were each chosen by 5,7% of the participants. On the other hand, when it comes to the importance of staff involvement in social responsibility activities, only 2,9% partly agreed with the statement, while 45,7% agreed completely and 51,8% answered with “yes”.

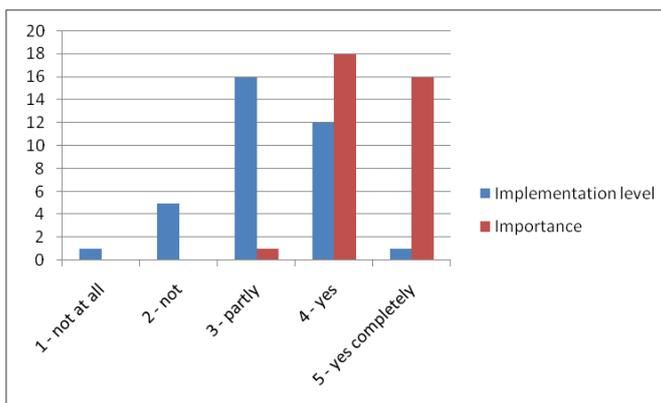


Figure 6: Students engagement in some type of socially responsible activities

Most participants consider their students engagement in social responsibility activities to be neutral, 34,3% consider them to be involved, 14,3% answered with “no” and options “not at all” and “yes, completely” were chosen by 2,9% of the teachers. But only 2,9% consider this to be of neutral importance, while 45,7% thought this to be completely relevant issue and 51,4% answered with “yes” when asked if students should be involved in social responsibility activities.

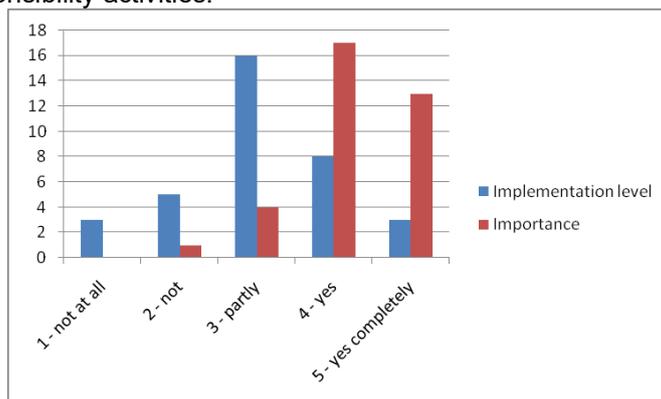


Figure 7: Staff engagement in research that enables you to be socially responsible

When asked about their involvement in research that enables them to be socially responsible, 45,7% of them were neutral on the matter, 22,9% said that they are involved in such research, 14,3% answered with “no”, while 8,6% of the participants answered with “not at all” and “yes, completely” each. 2,9% of the participants don’t consider this to be an important issue, 11,4% are neutral on the subject, 37,1% completely agreed that the issue is relevant and 48,6% answered “yes” when asked if such research is important.

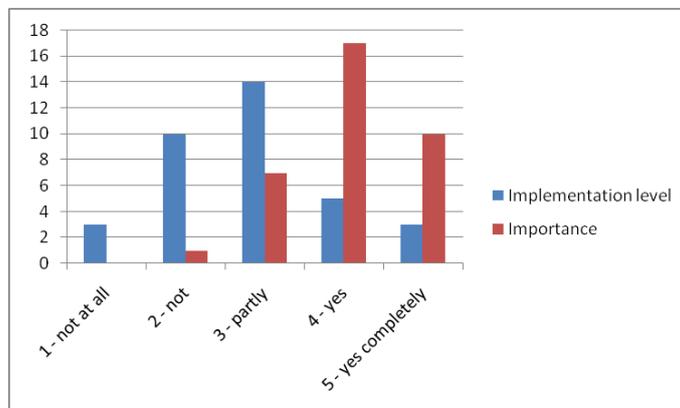


Figure 8: Institution cooperation with other institutions on a wider scale (national, international) in the field of social responsibility

40% of the teachers found that the institution they work for is neutral on the subject of cooperation with other institutions, 28,6% think that such cooperation does not exist, 8,6% thought that there is absolutely no cooperation, 14,3% think that there is some cooperation and 8,6% find that cooperation with other academic institutions is satisfactory. When asked about the importance 2,9% do not think such cooperation should be conducted, 20% are neutral when it comes to such cooperation, 28,6% find it absolutely important and 48,6% agree that it should be implemented.

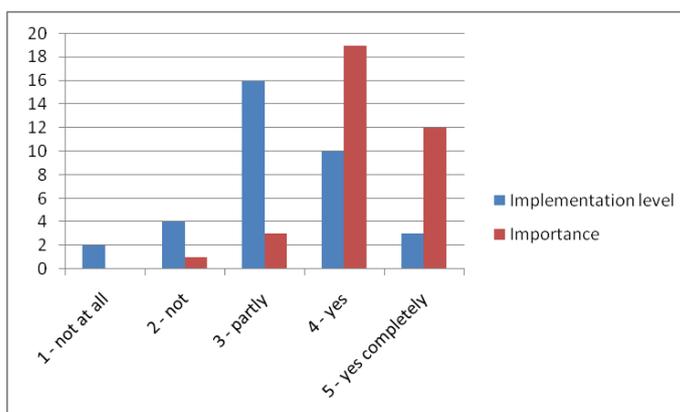


Figure 9: Institution cooperation with the business sector on social responsibility activities

Most of the teachers find their school to be neutral in cooperating with the business sector (45,7%), 28,6% thought that some form of cooperation exists, 11,4% think that there is no cooperation, 5,7% said “not at all” and only 8,6% thought that the level of cooperation is high. When it comes to the importance of such cooperation, only 2,9% don’t find such cooperation to be necessary 8,6% are neutral on the matter, 34,3% find such cooperation is absolutely important while 54,3% find it to be important.

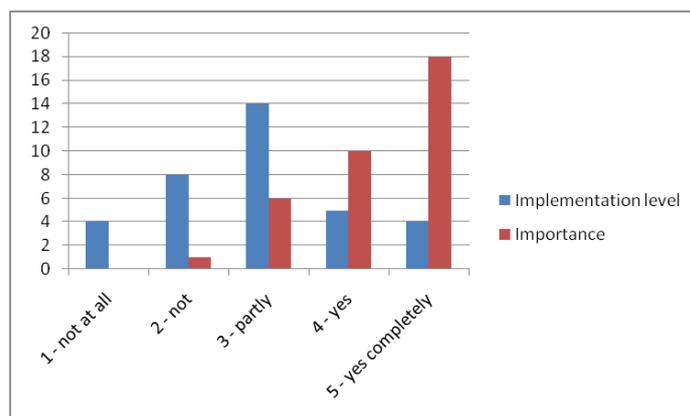


Figure 20: Students opportunities to further their education trough the cooperation between the academic institutions and the business sector

When asked if their students have opportunities to further their education trough cooperation with the business sector, 40% answered with “neutral”, 22,9% answered with “no”, 11,4% said “not at all”, 14,3% of the teachers thought that there are opportunities for students and 11,4% answered with “yes, completely”. On the importance of students furthering their education with such cooperation, 2,9% think that this is not important, 17,1% were neutral on the issue, 28,6% think that furthering students education in such way is important and 51,4% completely agree that this type of furthering students’ education is important.

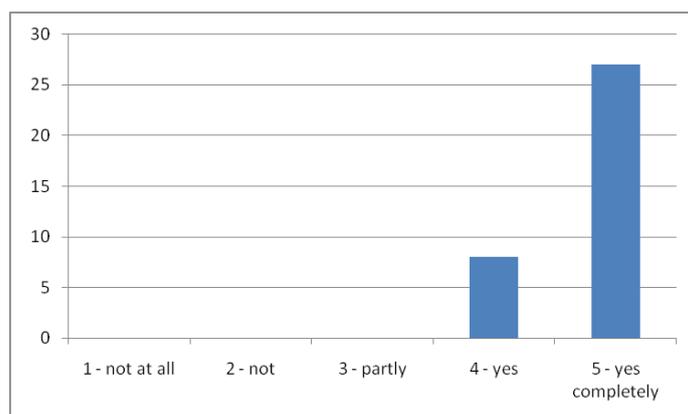


Figure 31: The degree of social responsibility contribution to the reputation of academic institutions

Finally, when asked if they consider if social responsibility activities contribute to the reputation of academic institutions, all participants agreed, with 22,9% answering with “yes” and the rest (77,1%) answering with “yes, completely”.

4. CONCLUSION

The idea of this paper was to explore the quality of various social responsibility activities in Serbian education institutions and the key stakeholders’ level of awareness of the importance of social responsibility in today’s environment. Our biggest restriction was the small sample of teachers we had the opportunity to distribute the survey to. In order to have a more comprehensive understanding of the general state in the country a more extensive research is necessary, for which the authors of this paper did not have the appropriate conditions. Regarding the results of the research, we have concluded that on almost every issue, the level of implementation is mostly on a medium level while the teachers agree that all of these issues are of high importance.

First two questions, which fall into the first category (Charity work – donations and free education) show that most schools do have some type of social responsibility activities that are correlated to students in welfare class. The questions of the second category (getting involved in the research beyond the curricula), most of the schools are in the “neutral” category on every type of the activities that the poll suggested, but the level of importance was estimated as high by almost all teachers. From this we can conclude that while the schools perhaps do not have the means to conduct such activities, the benefits of this type of activities are recognized among the staff. The questions from the third category (cooperation with the corporate/business community) also showed that most schools have a neutral stand on the subject, but unlike the previous

category, less teachers consider this to be a valuable asset to both the schools and the students, seeing as some teachers when asked if they consider such activities have a positive effect choose the “neutral” option or simply answered “no”. This might be a result of including primary school teachers in the survey, but the authors considered that the poll would not be as representative without their input on all issues.

From our research we can conclude that the academic institutions in Serbia can be placed in to the medium category when it comes to the implementation of social responsibility activities in education. We are yet to reach the level of implementation that the schools in UK have, but we have certainly surpassed the level that schools in Kenya for example are currently on. The teachers in our country already have a high level of awareness of the importance of social responsibility activities but the mechanisms of their implementation are yet to be developed. As for further academic research on this subject, inquires can be made to address the reasons of low implementation of social responsibility activities when there is a high level of awareness. Also, some suggestions about the ways of implementing social responsibility activities could be used as a guideline to show education institutions how to continue contributing society in new, innovative ways. The Guidance on social responsibility given in ISO 26000 should be incorporated into the design of organizations' activities that would direct them to include needs of all the relevant stakeholders.

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WHO IS GOING TO BE MORE INTERESTED IN ISO 50001 CERTIFICATION?

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Abstract: *This paper's main purpose was to indicate whether the countries in Europe with a higher usage of renewable sources of energy are more interest in getting ISO 50001 certificates and which ones will be more interest than others in the future. Data regarding the usage of wind power and solar thermal power was gathered, together with the data about the number of ISO 50001 certificates in European Union Member countries in order to determine which have the highest renewable sources of energy usage and ISO 50001 certificates, and to see if those two are proportional. Member countries have been split in three groups based on the level of their usage of renewable resources of energy and data about the number of ISO 50001 certificates has been added in order to present those countries which might be interested in ISO 50001 certification most.*

Keywords: *ISO 50001, Europe, renewable energy, renewable sources*

1. INTRODUCTION

Standardization has been working hard to make this world a better place. Therefore, many standards have been developed in order to affect certain areas of life. In the 21st century resources have become a grave issue, threatening to bring economical fall, increase in hunger and many more other disasters. Producing and using energy is another very important issue to be dealt with. A great number of countries does not address these issues as seriously as they should, but some are doing exactly what needs to be done. Having this in mind, this paper will gather the usage of renewable energy sources in the European Union Member Countries and the number of acquired ISO 50001 certificates, in order to present which countries would be most interested in certification in the future and if there is a connection between the renewable energy recourses usage and the number of certificates. Those with a high rate of usage of renewable sources of energy and a number of ISO 50001 certificates that grows year by year, are very important for the future of Europe as a continent and the world as a whole, since they can serve as an example for others and be the leaders in this area.

2. LITERATURE REVIEW

2.1. Overview of the Standard ISO 50001

Using energy efficiently helps organizations save money as well as helping to conserve resources and tackle climate change.(ISO 50001:2011) "Organizations are supported to use energy more efficiently in all sectors by ISO 50001, through the development of an energy management system (EnMS)." The purpose of this International Standard is to enable organizations to establish the systems and processes necessary to improve energy performance, including energy efficiency, use and consumption.(ISO, Requirements with guidance for use, 2011)This standard is, like many others, based on the management system model of continual improvement which allows it to make it easier for organizations to integrate energy management into their system and raise quality to a higher level. "ISO 50001:2011 provides a framework of requirements for organizations." Those are:

- Develop a policy for more efficient use of energy
- Fix targets and objectives to meet the policy
- Use data to better understand and make decisions about energy use
- Measure the results
- Review how well the policy works, and
- Continually improve energy management , according to ISO 50001:2011.

Implementation of this International Standard is primarily intended to lead to reductions in greenhouse gas emissions and other related environmental impacts and energy cost through systematic

management of energy (ISO, Requirements with guidance for use, 2011). It is applicable to all types and sizes of organizations, no matter their geographical state or the cultural and social conditions. The Standard gives general requirements, management responsibilities, energy policy and planning and checking requirements.

Implementation of ISO 50001 is not obligatory. This allows companies to implement this standard simply because of the benefits both they and their environment can receive from it. Unfortunately, the number of companies which do not realize the vast specter of possibilities and benefits this standard offers, is great.

Many organizations think of energy consumption as a fixed overhead that can't be controlled nor reduced (ISO practical guide for SMEs, 2011). "However, energy consumption can be managed and even reduced if the right approach is used." Organizations that take action and implement this standard in the right way make significant energy savings, which lead to financial savings and all that without any additional investments in new machinery or technology.

According to ISO practical guide for SMEs (2011) some of the direct financial benefits of managing energy effectively are:

- Reduction of cost of energy consumption
- Reduction environmental impact from the use of energy and reduced CO2 emissions
- Reduction exposure to rising energy prices
- Reduction availability of utility services
- Reduction production reliability and production output/yields
- Improvement of equipment performance
-

Additional indirect benefits will occur as well, and their value often exceeds the financial value of the saved energy.

Companies can achieve all of the above, without implementing the standard, but that is a less reliable and effective approach. Implementation of ISO 50001 would save a lot of time and energy for a company, and a certificate would use as a proof to all third parties which require it to build cooperation.

The process of certification requires a company to undergo a two stage ISO 50001 audit process of its Energy Management System (EnMS). "The first stage is pre-assessment and the second is certification."

Stage one is conducted with the goal to determine if the mandatory requirements of the standard have been, and are being met. It is also meant to conclude if the management system is capable to proceed further. Stage two determines the effectiveness of the system and seeks confirmation that the management system is implemented and operational (Certification Europe, 2012). If there have been any problems in phases one and two and if any corrective measures were supposed to be taken, the execution of needed actions is reviewed in the recommendation for certification phase. Certification review and decision follow. Organization's files are reviewed by an impartial panel and the decision whether the organization gets certified is made. Finally, if all turns out to be in sync with the requirements, the organization is issued a certificate.

For an organization to comply with ISO 50001 energy management system's requirements and achieve certification to ISO 50001 it must develop a number of policies, procedures and protocols in relation to energy management (Certification Europe, 2012). Some will be listed here:

- Management responsibility for energy management
- ISO 50001 energy policy
- Energy planning, review and baseline process
- Energy design requirements
- ISO 50001 energy performance monitoring
- ISO 50001 management review etc.

2.2. Renewable energy in the European Union

Renewable energy and its technologies offer long-term solutions regarding the saving of environment, breakthroughs in physics and engineering, as explained by Sorensen B. in *Renewable Energy- physics, engineering, environmental impacts, economics & planning* (2011).

Renewable energy policy in EU has started in 1997, and since then European states have started introducing measures to improve the development of energy from renewable sources such as wind power, solar power, etc. (Pascelia et al., 2016). Implemented policies resulted in rise of renewable sources' share in total primary production of energy from all sources to 24% by the end of 2013 (Pasceila M. and all, 2016). Each state of EU contributed differently, since their climate conditions and natural endowments vary.

Euroobserver barometers have been pointing out progress of every Member State of the European Union in the field of renewable energy, since 1998 (Euroobserver, 2014). The data shown by the Barometers was regarding solar thermal, solar power, solid biomass, heat pumps and photovoltaic. Comparative analyses regarding electricity production from renewable and head consumption in Member States of the European Union have been presented as well. Additionally, the Euroobserver team publishes bimonthly reports (the so-called thematic barometers) that track and analysis the development of eight renewable energy technologies (wind, solar PV, solar thermal, hydro, geothermal, heat pumps, biomass, bio fuels, biogas) in the EU Member States in the previous year. (Euroobserver, 2014).

In the form of compact and descriptive reports, the barometers help policy makers and other stakeholders understand the developments in all renewable energy sectors in the European Union (Euroobserver, 2014). The barometers describe completed projects, provide policy background information and information specific for each country. Euroobserver's report: "The state of renewable energies in Europe, edition 2014" provides a complete overview of the twelve renewable sectors.

Only wind power and solar thermal power data will be presented and analyzed in this paper, since those two sources are most popular in building eco houses that produce energy from renewable sources.

2.3. Wind power

The terms wind energy or wind power describe the process by which the wind is used to generate mechanical power or electricity (Office of Energy Efficiency & Renewable Energy, 2015). Wind is a clean source of renewable energy and it produces no air or water pollution, as mentioned in National Geographic's web site. Since wind is free, there are zero costs of operations after the wind turbine has been built and set. Turbines used to be very expensive, however action has been taken and costs of production are significantly lower now. Many governments offer tax incentives to spur wind-energy development, as well. Turbines can be nearly twenty stories tall with up to sixty meter long of blades. Even though the costs decreased dramatically in the past few years, there are still some issues regarding wind power. To start with, it is important to explain how the wind turbines work. "Wind turbines work opposite of a fan." Instead of using electricity to make wind, like a fan, wind turbines use wind to make electricity (Office of Energy Efficiency & Renewable Energy, 2015). This means that the strength of wind pushes the blades of the turbine, making them spin. This can be dangerous for bats and birds, even though the blades spin slowly. However, turbines kill much less birds and bats than cars, for example. The second problem that arose is the noise and it is followed by the claim that turbines ruin the esthetics of their surrounding due to their design. The biggest problem of wind power usage would be the inconsistency. Although wind is an abundant source of energy, one has to bear in mind that it is not a constant source with a constant supply (Hemami, 2012).

Despite all of these problems, many countries managed to use wind power efficiently, by building wind farms away from settlements, and building a smaller number of turbines on many different locations, so that most of the wind current can be caught.

Regarding wind power, United Kingdom and Germany were leading countries in 2013, as stated in "The state of renewable energies in Europe, edition 2014" report. Developers' resolve to exploit the best wind power purchasing terms before the new renewable energies law reform came into force in August 2014, holds most of the credit for Germany's market success (Euroobserver, 2014). In 2013

the level of UK off shore activity was high with more than 1 out of every 3 MW connected being offshore (Euroobserver, 2014). According to DECC (Department of Energy and Climate Change), the country connected 2 314 MW (1 614 MW onshore and 701 MW offshore), also mentioned in the Euroobserver report from 2014. However the market declined slightly on its 2012 level, when 2 437 MW was connected to the grid. The UK's aim, restated by the Energy Ministry in November 2013, is to install 39 000 MW of offshore capacity by 2030.

Euroobserver report states that the year 2015 was very important for the future development of wind energy and its share in the energy mix planned for 2030. The momentum surrounding the 2020 target has long been ahead of the set target, however the one in 2013 and 2014 was not large enough to reach the intermediate Europe wide target set for 2015.

2.4. Solar thermal power

Solar thermal power plants are designed in a way that allows them to use the heat of rays of sun in order to heat fluids to high temperatures. The fluid is then circulated through pipes so that it can transfer its heat to water and produce steam (U.S. Energy Information Administration, 2015). The technology behind solar thermal power generators is almost the same as the one behind generators that use fossil fuels to produce steam. There are three main types of solar thermal power systems: parabolic trough, solar dish and solar power tower (U.S. Energy Information Administration, 2015).

European Union solar thermal sector for hot water and heat production has proved to be problematic in the past several years. It has been suffering from development problems and in 2013, the market had slipped for the fifth time in a row, like Euroobserver report from 2014 shows. "The Euroobserver survey found out that in 2013 the amount of installed collector surfaces was 13.3% smaller than in 212." Installation figures for solar thermal collectors now resemble those of 2007, and are getting further away from the annual installation record set in 2008.

The key solar thermal markets in EU are France, Germany, Austria, Italy, Portugal and Greece. However, they were severely put off course by the 2013 market slide. United Kingdom had also been affected, due to a delay in implementing the Renewable Heat Incentive (RHI) for private individuals. Fortunately, the UK managed to get the RHI to kick into play in 2014, so that it has effect in more sectors than before.

3. RESEARCH METHODOLOGY

The main objective of this paper was to analyze the usage of two renewable energy sources – wind power and solar thermal power in Member States of the European Union in order to conclude which countries might be most interested in ISO 50001 certification.

The first step was to gather data from EUROSTAT, Euroobserver and to analyze the information given in a paper by Pascelia et al., 2016. on renewable energies in the European Union. The result was the separation of EU countries into three groups. Members that belong to the same group show similar tendencies and behavior in the field of using renewable sources of energy. The next step was to gather data about the number of existing ISO 50001 certificates in those countries.

3.1. Data Collection

The paper by Pasceila Mihaela and all from 2016 on renewable energies in the European Union and data gathered from EUROSTAT suggest that EU countries can be separated in three groups:

- 1st group: Sweden, Denmark, Romania, Estonia and Czech Republic. These countries have registered energy dependence rates less than 30%.
- 2nd group: Austria, Latvia, Finland, Slovenia, France, Germany, Croatia, Bulgaria, Greece, Poland, Slovakia, Hungary, Netherlands, United Kingdom. These countries have registered energy dependence rates between 30% and 70%.

- 3rd group: Portugal, Lithuania, Italy, Spain, Ireland, Belgium, Cyprus, Malta, Luxembourg. These countries have registered energy dependence rates higher than 70% (Pascelia et al., 2016).

Sweden and Denmark, from the first group are very successful in achieving their targets. Sweden has even managed to achieve a share of 52.6% of renewable energy in gross final energy consumption, while Denmark was very close to achieving its target of 30% by having 29.2% in 2014. Swedish share of renewable energy production is 50.97%, however 28.70% is imported. On the other hand, Denmark has a lower percentage of renewable energy production 25.9%, but they managed not only to import additional energy, but they export 3.4%.

Latvia and Austria are the countries from the second group that have come very close to fulfilling their targets. Latvia had 38% out of 40% and Austria 33.1% out of 34%. Austria has the dependence of 64% and Latvia of 56%.

Lithuania is a country from the third group that has managed to surpass its target of percentage of renewable energy in gross final energy consumption in 2014, by having 23.9% while the target was 23%. However, it is an exception from the rest of the group, since others have achieved 17%-20%. Regarding their dependence, Lithuania is 80% dependant, and the rest are more than 80% dependant.

4. RESULTS

The table below (Table 1) shows the cumulative capacity regarding wind power at the end of 2013 (MW), the corresponding capacities regarding solar thermal power (MWth) in 2013 and the number of ISO 50001 certificates in member countries of the European Union.

Table 1. “Cumulative capacity regarding wind power, solar thermal power and number of ISO 50001 certificates in Member countries of European Union”

Country	Cumulative capacity regarding wind power at the end of 2013 (MW)	Corresponding capacities regarding solar thermal power in 2013 (MWth)	Number of ISO 50001 certificates in 2013	Number of ISO 50001 certificates in 2014
Germany	34660	728.0	2477	3402
Italy	8 542	207.9	258	294
Poland	3 429	191.9	22	38
Spain	22964	162.8	196	310
France	8 202	159.9	86	270
Greece	1 809	147.7	16	25
Austria	1 684	126.4	67	109
Denmark	4 810	72.8	45	51
Czech Republic	270	55.7	16	32
Netherlands	2 713.2	42.1	21	24
Belgium	1 653	41.3	28	28
Portugal	4 731	40.1	11	12
UK	11 209	31.5	330	376
Ireland	1 896	19.4	64	56
Romania	2 459	16.8	60	56
Hungary	331	12.6	13	29
Croatia	254.3	12.2	6	10
Cyprus	146.7	12.0	*	*
Slovenia	2.3	6.3	14	16
Sweden	4 194	6.3	94	87
Slovakia	3.1	4.7	12	12
Luxembourg	60.6	4.3	3	1
Bulgaria	676.7	3.9	6	12
Finland	447	2.8	9	10
Latvia	67	1.9	2	4

Lithuania	279	1.3	*	*
Estonia	248	1.3	1	3
Malta	0	1.2	*	*

5. DISCUSSION

Countries from the first group who stand out by the amount of renewable sources of energy usage are Sweden and Denmark.

Sweden can do this thanks to its good natural conditions. One of its most valuable characteristics is that 53% of land is covered by forests while the global average is only 30%. This allows the amount of 85% to be provided by this sector. The district heating and cooling became free of fossil fuels, thanks to the widespread of heat pumps and biomass. They have also set a goal to use machines and transportation equipment without any fossil fuels by 2030. Due to the incentives to support renewables (quota system, tax regulation mechanisms, subsidy schemes, tax exemptions) and to the requirement to purchase green electricity, the number of companies that are invested in renewable energy is growing. This is crucial because investors are exactly what this sector generally lacks.

Denmark has a well-developed renewable energy sector, although it is almost completely devoid of hydropower resources (Pascelia et al., 2016). The usage of biomass, solar power, hydropower, tidal power and bio fuels all contribute to the amount of electricity obtained from renewable sources. A number of households, 60% of them, are provided with heat buy the power received from mostly biomass and other renewables. The heat system is a result of long planning and the awareness of need to conserve energy. The Danish government has introduced a premium tariff and net-metering, together with other initiatives to support renewable sources of energy such as loan guarantees and subsidies. These mostly refer to the encouragement to build wind power plants and install small-scale renewable energy systems. Tax exemptions and obligations to use renewable heating and cooling systems in new constructions have been made in order to support the heating and cooling sector.

Germany, however has biggest capacities regarding both wind and solar thermal power. It is also the leader in the number of ISO 50001 certificates in both 2013 and 2014, having had 2477 certificates in 2013 and 3402 in 2014. Denmark and Sweden had a much smaller amount of certified organizations in this period, and Sweden even had a smaller number in 2014 compared to 2013. However, ever since 2011, its numbers had been going up and it can be assumed that the same would happen in the future.

6. CONCLUSION

This paper's main goal was to analyze the data regarding the usage of renewable energy sources in European Union Member Countries together with the data about the number of ISO 50001 certificates in them and see which ones have been most interested in certification so far as well as try and predict which will be interested in the future and if there is a connection between the level of usage of renewable and the number of certificates. Data was gathered from Eurostat, ISO survey, Euroobserver, the paper by Pascelia M. and all (2016) "Analysis of renewable energies in European Union" and other sources. The analysis shows that countries which belong to the European Union can be separated into three groups, based on their energy dependence. Countries with the lowest dependence are Sweden, Denmark, Romania, Estonia and Czech Republic. Sweden and Denmark are most involved in making renewable sources of energy widely used and Germany has had most certified organization regarding ISO 50001.

It can be concluded that those countries with the highest usage of renewable sources of energy have been more interested in ISO 50001 certification than those with lower usage rate. Given the fact that the number of certificates grows each year in most of the countries, it can be assumed that those leading ones in renewable energy resources usage will be most interested in certification in the future.

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THE ROLE OF HIGHER EDUCATION IN BUILDING AND IMPROVING NATIONAL QUALITY INFRASTRUCTURE – THE CASE OF SERBIA

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Abstract: *The paper investigates presence of quality infrastructure elements within higher education curriculum. The target institutions are public universities in Serbia as an important part of quality infrastructure institutions. The data were collected from the official web sites of faculties in Serbia, using syllabuses of optional and compulsory subjects. The analysis is performed to classify the faculties into three categories depending on usage term related to quality infrastructure. The results show that nowadays quality and standards are widely recognized as interesting and popular topic of study but usually offered through optional subject within certain departments of faculties. Results of our study showed that only four faculties within University of Belgrade offer more than five QI subjects, and only one is from University of Novi Sad (Category I). Four faculties from University of Belgrade belong to Category II and only one from University of Kragujevac. Finally, four faculties of University of Belgrade are categorized within Category III.*

Keywords: *higher education, quality infrastructure, standards, syllabus, Serbia*

1. INTRODUCTION

The growing educational opportunities and needs for development of education are creating a changing environment for higher education systems throughout the world. Most countries have developed an entire industry of service providers that specialize in the diffusion of quality and standards through the provision of quality assessments, technical assistance, information, and training services. Higher education institutions are one of the public institutions that are important link in developing of national quality infrastructure (from now on referred to as: NQI). Nowadays, a functioning quality infrastructure (hereinafter referred to as: QI) is a prerequisite for access to regional and global education market and a key determinant of competitive advantage. In our research we will only focus on program and syllabus of public faculties in Serbia. Aim of this paper is to provide basic insight in current situation about involvement of QI elements in higher education in Serbia. For that reason, we analyzed contents of compulsory and optional subjects using official web pages of faculties. The results show that nowadays quality and standards are widely recognized as interesting and popular topic of study but usually offered through optional subject within certain departments of faculties. Only Faculty of organizational sciences, University of Belgrade – Department of quality management and standardization develops and offers the largest number of mandatory subjects focused on quality, standards, accreditation, metrology and conformity assessment as basic part of QI.

The reason for the investigation is popularization of the topic (QI and its elements) as well as accentuation of importance of educated experts (in the quality management and standardization field), who make decisions and policies at all macro, micro and meso levels. If the quality of education is not treated the right way, consequently, it will decrease the quality in the whole country.

2. NATIONAL QUALITY INFRASTRUCTURE

“Quality Infrastructure is the totality of the institutional framework (public or private) required to establish and implement standardization, metrology (scientific, industrial and legal), accreditation and conformity assessment services (inspection, testing and product, system certification) necessary to provide acceptable evidence that products and services meet defined requirements, be it demanded by regulatory authorities (technical regulation) or the market place (contractually or inferred)” (Kellermann, 2011). „These activities provide a vital link to global trade, market access and export competitiveness as they contribute to consumer confidence in product safety, quality, health and the environment” (Pejović, Filipović, Tasić, 2011).

Also, QI is important for the international recognition of product and service and its further competitiveness. Correspondingly, national quality infrastructure is significant for export. Therefore, we can say that establishing the good quality infrastructure is a step towards good governance which creates a favorable trade climate in region. “Good governance is understood as good political framework conditions, rule of law and a responsible handling of political power and public resources by the state and thus an important

precondition for poverty alleviation and ensuring sustainable development“(PTB, 2007). What is necessary is that all these QI elements are connected through QI institutions and communicate with regional and international institutions, making the invisible global network (Figure 1).

In the QI system, accreditation plays a very vital role. “It is a formal confirmation that a body is competent enough to perform certain tasks” (Shaukat, 2010). It builds confidence in the work of testing laboratories, certification and inspection bodies, and facilitates mutual recognition of certificates, in addition to promotion of trade (Ibid.). No less important QI elements are „metrology“, which guarantees accurate and reliable measurements (See Wehmer and Frota, 2012), and “standard“, as a tool in free trade and in conformity assessment. International Standard ISO/IEC 17000:2008 defines conformity assessment as a “demonstration that specified requirements relating to a product, process, system, person or body are fulfilled.” What is necessary is that all these QI elements are connected through QI institutions and communicate with regional and international institutions, making the invisible global network.

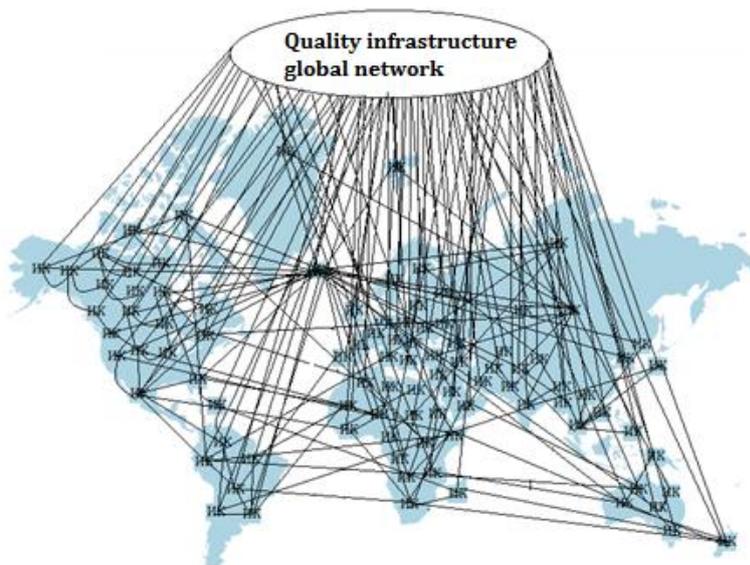


Figure1. Quality infrastructure global network (Inspired by Wheatley и Frieze, 2006)

3. KNOWLEDGE AND POLICY MAKERS

The article "*How to strengthen the Serbian politicians*", published in 2013 on the web page "Policy Online", said that "our political elites are semi-educated, regardless of formal education, without experience and morals. Only few people in politics are from practical sphere and they do not confer with science. In accordance with Hulnick (1986), "policy makers are government officials who formulate, choose, and implement policy". In the decision making process, policy makers' education and professional experience is likely to be important because they are more likely to distinguish good from bad advice and might be more able to resist the pressure of lobbying groups preferring the status quo. Dreher et al., (2009) had tested whether the educational and professional background of heads of governments influences the implementation of reforms and their results showed that "reforms are significantly more likely when the politician has an entrepreneurial or scientific background" and vice versa. They claimed, entrepreneurs are strong leaders and have a proven record of experience in leading a company and they have basic knowledge of the issue while trained and educated policy makers are more rational and less emotional in taking economic decisions.

The research was limited just to heads of governments in economic field. They did not consider other policy makers and other policy fields. Similarly, Jones and Olken (2004) find a positive relation between the education of leaders and the rate of growth and Besley et al. (2011) find that more educated politicians generate higher growth. Mikosch and Somogyi (2008) quoted by Dreher et al. (2009), find that political leaders with education in economics generate significantly lower budget deficits than those with education in law. Accordingly, we can say that "more educated politicians are better" (World Bank, 2005) in decision making. Therefore, if we want to develop national prosperity, we need educated and competent decision/policy makers with a lot of experience. The correlation of education background and other characteristics of decision makers could be interesting for this topic. Actually, how much "knowledge base" allows them to locate that knowledge in a broader social and political context.

All this indicate that education in the field of quality infrastructure is very important, because if there are no institutions that educate people in this area, many wrong decisions could be made. So, in the next chapter we are going to position faculties as a part of QI network.

4. HIGHER EDUCATION IN SERBIA RELATED TO QUALITY INFRASTRUCTURE

Higher education institutions are one of the public institutions that are important link in developing of national quality infrastructure (See Ruso et al., 2015). The modern University faces the challenge of adjusting to a complex world with new demands for professions and skills associated with the knowledge society. To successfully meet these important challenges, it is fundamental that universities' governing bodies have good relation with the academic community in order to respond to the social and productive needs of its environment (Espinoza and González, 2013). If the policy is embraced by institutions that have the ability to influence decisions and actions, such institutions can be called policy makers.

In Figure 2 we mapped the QI institutions and relationships among them. The basic institutions in the QI network are Directorate of measures and precious metals, Accreditation body, Institute for Standardization, Ministry of Economy (QI department) and conformity assessment bodies. Partly involved institutions in the QI network by certain departments are Ministry of trade, tourism and telecommunications, Ministry of finance, Ministry of agriculture and environmental protection, Ministry of education, sciences and technological development, the Chamber of commerce and industry and faculties. Faculties educate people in the QI field that are employed in other relevant institutions in Figure 2. Other connection between faculties and QI institutions are QI experts which are involved in teaching as visiting lecturers. Also, institutions' cooperation allows students to do internship and volunteer in quality management and standardization sector.

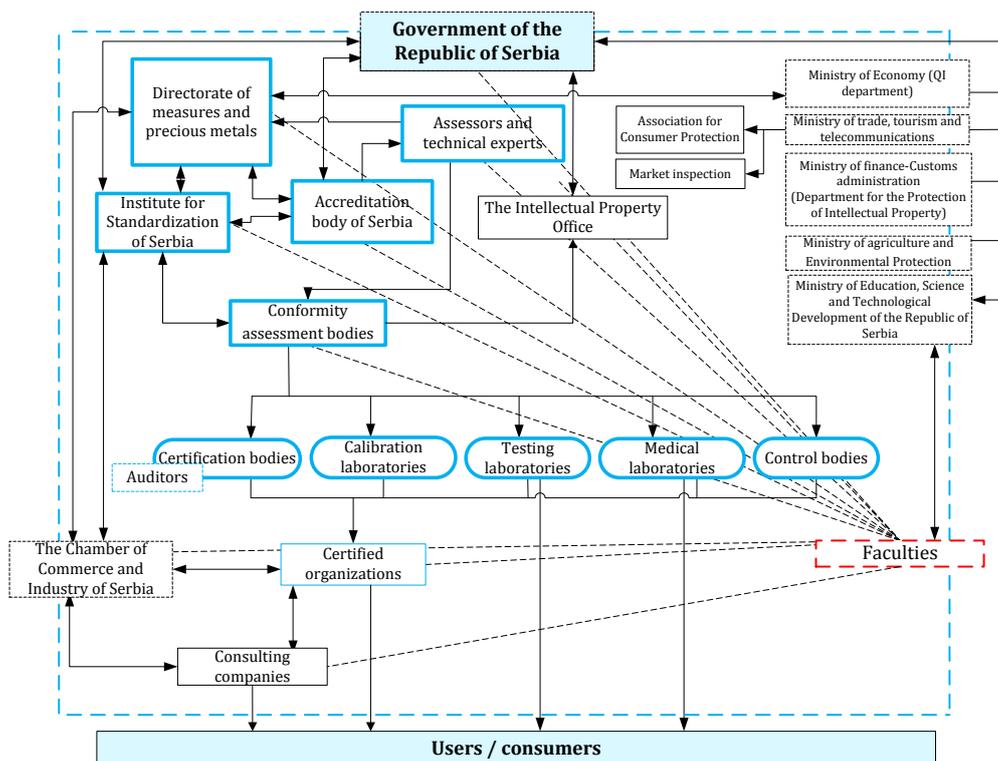


Figure 2. Quality infrastructure institutions (Source: personal)

People who have knowledge about IQ and its elements are more competent to plan, control, improve and assure quality at all levels take initiatives and make decisions related to it. Therefore, quality infrastructure and its elements should be recognized as essential topic of study in Serbia. With the aim to investigate the current state, we carried out research to display if Serbian higher education system recognizes IQ as important and essential part of quality life.

4.1 Methodology

4.1.1 Data Collection

The data were collected from the official web sites of faculties in Serbia, using syllabuses of optional and compulsory subjects. Key search words were: quality, standard/standardization, accreditation, metrology (for Category I), control, measure, production, technology, management, business, environment (for Category II) and marketing, sales, trade, market, transport, and trade laws (for Category III). The total number of faculties, used in this analysis was 19 (University of Belgrade, University of Novi Sad, University of Kragujevac and University of Niš).

4.1.2. Data Analysis

An analysis was performed to classify the faculties into three categories depending on usage term related to quality infrastructure. In Category I we grouped faculties which directly study subjects such as metrology, standardization, quality and accreditation. In Category II, we grouped faculties whose subjects are important for the issue. This kind of subjects could partly shape knowledge about QI, and people who pass it could possess enough knowledge to understand and manage problems related to QI. The last but not the least, in Category III we grouped faculties which are somewhat important as input in decision making processes. They can give some basic knowledge for understanding the problem, but not enough for making main decisions and quality control.

4.2 Results

The results show that faculties which directly target quality infrastructure elements (Category I) are Faculty of organizational sciences - FOS (Quality Management and Standardization Department) - University of Belgrade, Faculty of Technology and Metallurgy, University of Belgrade (Chemical Engineering Department - Quality Control), Faculty of Sciences, University of Novi Sad (Chemistry, Biochemistry and Environmental Protection Department - Quality control and environmental management) and Faculty of Agriculture, University of Belgrade (Food Technology Department – Safety and quality control in food production). Particularly subjects are: standardization, metrology, accredited laboratories, quality control, quality planning, quality costs, fundamentals of quality, quality system, quality control of industrial products, quality assurance system in production, quality control of environment, quality inspection and environment control, quality standards, statistical quality control, techniques for quality improving, normative regulation of quality, quality control in agribusiness etc.

Faculties which offer quality infrastructure subjects related to IQ elements, could help in better understanding of the topic and they are classified into Category II: Faculty of organizational science, Faculty of Agriculture, Faculty of mechanical engineering, Technical Faculty in Bor (University of Belgrade) and Faculty of engineering (University of Kragujevac). The list of subjects includes: production systems, management of key production performance, cost control, risk control, sales management, packaging and food packaging, the management of the food industry, business management system, production management, process management, merchandising, measurement and control processes in the metallurgical industry, protection management systems etc.

Finally, the third category of faculties includes Faculty of Transport and Traffic Engineering, Faculty of Economics, Faculty of Law and Faculty of Pharmacy. These faculties offer the subjects related to some of the QI elements at the introductory level. For example: transport of goods, fundamentals of logistics, supply chains, economic relations of Serbia with foreign countries, trade marketing and sales management, international business and management, foreign trade operations, International commercial Law, Trade Law etc.

5. CONCLUSION

Aim of this paper is to provide basic insight in higher education curriculum and investigate how the curriculum, including subjects (optional and compulsory), is connected to QI elements. In syllabuses, we analyzed the presence of usage of the term standards, quality, accreditation, certification and other (control, measurement, production, service, risk etc.) by the official faculty web sites. We categorized faculties in three groups depending on the number of subjects, directly linked to QI. Results of our study showed that only four faculties within University of Belgrade offer more than five QI subjects, and only one is from University of

Novi Sad. Specific subjects belong to Category II, where the subjects indirectly target QI elements such as FOS, Faculty of Agriculture, Technical Faculty in Bor, Faculty of mechanical engineering and Faculty of engineering, University of Kragujevac (more than 10 subjects). Ultimately, the third group includes the subjects at the introductory level refers to market, marketing, trade, trade laws, supply chains, logistics etc. The faculties which take place in the Category III are Faculty of Transport and Traffic Engineering, Faculty of Economics, Faculty of Law and Faculty of Pharmacy. In summary, our results suggest the least number of subjects belong to Category I and Category III. The subjects in Category II are most numerous. Only Faculty of Organizational Sciences develops certain department with the biggest number of mandatory subjects directly connected to quality infrastructure.

However, our results have certain limitation due to availability of syllabuses. For example, University of Novi Pazar does not have all "book of subjects" available on the web site. Also, the investigation does not include master, PhD studies and private faculties, therefore the limitations are suggested as an area for future research. We need to keep in mind that the results are not so strict, because they give just basic insight in current situation in Serbia. Likewise, there is the possibility of carrying out research among the Balkans and compare it with Serbian higher education program related to IQ elements such as quality, standardization, certification, accreditation and conformity assessment. Also, the students of quality management and standardization department could be interviewed and asked for their opinion and satisfaction about subjects in comparison with market needs for experts in the field of quality management and standardization. Also, the experts in the QI field could give their opinion about the education system (QI departments) and it could be compared with the students' opinions.

The results could help scholars, policy-makers, decision makers and the Government to understand how the quality and standards are perceived and considered in higher education in Serbia.

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THE ROLE AND THE PERCEPTION OF THE STANDARD ISO 22000

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Abstract: *The problem in this research study refers to the review of the standard ISO 22000 management system's role for food and safety, applied by a company which implements the requirements of this standard through its processes, managing risks for food safety, ensures a safe product which customers would recognize as a necessary quality for their needs. The topic of this letter is tied to the explanation of terms of the standard, brief explanation of standards, Global GAP, British Retail Consortium (BRC), International Food Standard (IFS), and particularly the system of Hazard Analysis and Critical Control Points (HACCP), representing an introduction to the explanation of the standard ISO 22000 and review of its structure. The significance of the above mentioned is shown by the results of the conducted survey, its ultimate target being to increase profitability in the food supply chain industry and ensure customer protection by improving food health safety.*

Keywords: standards, quality, HACCP, ISO 22000, food safety

1. INTRODUCTION

A business system that aims to achieve a profit, survive and secure development in the domestic and global markets, as an imperative must have quality, as the most important condition of success and longevity of each subject, and therefore cannot have an alternative. The mentioned quality of the product, understood from a customer's subjective viewpoint, can have multiple dimensions, and when discussing about food as a product, the most important aspect is indeed its usage safety. For this reason, the aim of this paper is to demonstrate the role of ISO 22000, which ensures the customer with a safe product and a feeling of satisfaction, by applying such standard demands of food safety from the customer.

Firstly, this paper will briefly explain the term standard, after which it will mention the international standards for food safety, Global G.A.P., the British Retail Consortium (CONNIE), the International Food Standard (IFS) and the system for Analysis of Hazards and Critical Control Points HACCP displaying their connection with the standard ISO 22000 primarily through a common goal – which is to increase food security, from the consumers' point of view as well as market operators who apply them.

In terms of what was said at the beginning, about the subjective way of looking at quality, the final section of this paper will focus on user perception, where the terms quality and food safety will be explained for which we can consider to represent the two key terms of this standard. Survey seeks to answer the user's position on certain aspects related ISO 22000.

2. STANDARD

A standard is a document established by consensus and approved by a recognized body, which shall set out for the general and reusable rules, policies, characteristics of activities or their results, in order to achieve an optimal level of quality in a given context. Standards should be based on validated results of science, technology (techniques) and experience, in order to achieve optimal benefits for the society (Zakon o standardizaciji, 2005). Therefore, the standards are accepted and defined norms that define specific properties and characteristics of products, methods and ways of their production, testing and evaluation of conformity with the requirements of the product.

3. INTERNATIONAL STANDARDS FOR FOOD SAFETY

The current situation on the market implies rapid changes to the selling methods of food that will increasingly lead consumers to supermarkets. Supermarkets will demand, through certification and different standards, for all products to have clear and distinct traceability.

Global G.A.P. is a standard that includes the production of primary agricultural products and activities after the harvest. This standard is intended to provide assurance about the retail and consumers, as well as to show that all the necessary measures and controls to make the product safe for consumers' health were taken. The principles of these standards are (R. Mijatović & M. Mirčevski, 2011):

- manufacturing of high-quality products;
- environment protection;
- the optimal use of natural energy resources;
- support of economically acceptable agricultural production;
- combining the best available profitable practice;
- improvement of local communities' living conditions.

The British Retail Consortium (CONNIE) was created because of the need for certification bodies that inspect food vendors in accordance with a unique set of requirements and, thus, avoid duplication and extra work when they check it. CONNIE allows food distributors to focus on market and in doing so, doesn't have to think about food safety. The standard was developed to assist retailers in fulfilling statutory obligations and protection of clients, or consumers, as a basis for the evaluation of companies delivering branded food products. Also, the standard gives suppliers an opportunity to meet the criteria of different retailers with a single certificate, which on the one hand reduces costs, and on the other, these same traders reduce the costs related to suppliers' control.

International Food Standard (IFS) is a standard developed to verify the competence of food producers in terms of security, but also the quality of the food with the help of a single standard, thus saving time and money. The IFS is the standard of quality and standard for food safety all in one. Those highest standards of food are based on the principle of traceability i.e. the possibility to, at any time on the way from the primary producer to the end user, escort the correctness and quality of the product at each stage of production and distribution. The standard applies to suppliers at all levels of the food processing, except for agricultural production.

3.1. HACCP (Hazard Analysis Critical Control Points)

HACCP Definitions

The HACCP system involves a series of procedures to control processes and sensitive points in the chain of food production with the ultimate goal of consumer's food items used in a state and in a way that is safe for his/her health. The World Health Organization has adopted it as the most effective means to control diseases caused by food (R. Mijatović & M. Mirčevski, 2011).

HACCP is currently defined through five preliminary steps (from 1992) and seven principles. HACCP is not testing end products in order to guarantee food safety. Instead, it incorporates food safety in the production process and relies on the process of control to prevent or reduce existence of known risks to acceptable level of in food product.

Key aspects and objectives of Codex HACCP are (R. Mijatović & M. Mirčevski, 2011) :

- measurement and control;
- critical control stage;
- risk analysis;
- preventive actions;
- corrective actions;
- planning;
- HACCP (control) system;
- the HACCP team;
- surveillance and monitoring;
- seriousness
- V&V (verification and validity).

The main goal of the HACCP plan is to identify potential hazards, evaluate what points in a manufacturing process lead to a high risk for food safety, and in which it is possible to control such danger.

Benefits of HACCP

As one of the first food safety management system that is widely accepted in food processing operations, its gains obtained from the establishment of an effective HACCP system are multiple. For operators who operate with food, these include producing safer foods and lower business risks, improving and maintaining your reputation, better organization and staff time utilization. From the consumers' point of view, they include reducing the risk of food-borne disease and greater confidence in food safety. For the country's government, the gains include rational control food safety, reducing the cost of healthcare and facilitating international trade in food.

4. FOOD SAFETY MANAGEMENT SYSTEM ISO 22000

Food comes to consumers through a supply chain, which can link different types of organization and that can be spread through multiple borders. One weak link can mean unsafe food that is hazardous to your health. When this happens, the risk for consumers can end up being very dangerous, and expenses for a chain of suppliers of food very high. How a risk to food safety can occur at any point in the chain, it is very important to have adequate control on every step of the way. Food safety is the responsibility of all participants in the production and distribution of food and requires common efforts by one goal (M.M. Markuš, 2006).

The growing demand for food safety by pressuring manufacturers and distributors to develop food safety management system based on HACCP led to the ISO to take measures for the development of appropriate standards in 2001. The first intention was to rise above the usual requirements for food safety.

The goal was harmonization of national and private standards and inclusion of the management system of ISO 9001.

4.1. The Scope of Application

The standard ISO 22000 refers to a food safety management system. A subject to the application of ISO 22000 is managing risks to food safety in order to ensure a safe product and hence enhance the satisfaction of end-users. The work is focused on controlling measures that should apply to ensure the harmonization process with the client requirements and regulations concerning health food safety.

The standard is intended for communication between business partners (B2B) and is not intended for communication with end consumers, and thus set the logo on the product is not allowed.

ISO 22000 is designed to enable for all organizational types in the movement of food to implement food safety management system, its requirements apply to all types of organization in the food chain: food producers, primary producers, food processors, transportation and storage, along with mutually related organizations such as producers of equipment, packaging material, cleaning agents, additives and food ingredients. That is, for all organizations, regardless of size, that are involved in any aspects of the food chain and that want to implement a system that would constantly produce products safe for health (Z. Abdirahman & L. Sauvee, 2012).

4.2. Structure Standards

ISO 22000:2005 is a proprietary standard, established by the International Organization for Standardization (International Organization for Standardization-ISO). It uses the methods of management of health food safety through specifying requirements that combine key elements to ensure food safety throughout the food chain to the point of final use. The before mentioned requirements encompass (N. Živković, 2012):

1. **The management system** of the ISO 9001-as 22000 standard gives requirements to management responsibility, measurable objectives and expected impact as a basis for quality management system, contributing to constant improvements through continuous monitoring, through corrective and preventive measures.
2. **Communication in the food chain** – as already mentioned in the course of this paper, the danger for the security of food can occur at any stage of the food chain so accordingly it requires an efficient control and elimination, or reduction of error possibility. The purpose of ISO 22000 is to require from all participants in the food chain to communicate and provide effective flow of information.
3. **Previously necessary programs (PRP)** are the basic conditions and activities that are necessary throughout the whole food chain for maintaining hygienical environment that is suitable for the production, handling and supplying safe final products and safe food for human consumption (J. Babić, 2014). Previously required programs are aimed at the protection of products from contamination caused by biological, chemical and physical food safety risks, the control of bacterial growth that can be a consequence of temperature disturbances and maintenance equipment. PRP is practically representing those activities that do not belong to specific HACCP plans, what would later be covered, that affect health food safety.

4. HACCP Plan

Training and formation of teams for HACCP-The staff operator that operates food needs first to finish training for HACCP, which is adapted to their responsibilities in the HACCP plan. For anyone who is into direct or indirect contact with food, the HACCP plan should be clearly shown and explained, and procedures that this feature must be adhered to.

The HACCP team typically makes more people because for the development of HACCP system is necessary to rule a broad spectrum of knowledge and experience. The team shall possess all the necessary specific

knowledge about the products and processes, in combination with the general knowledge in the field of systems of quality management and food hygiene (United States Department of Agriculture, 1999).

Description of the product and a description of the intended use—the HACCP team must be provided the complete insight into all of the products that the HACCP plan applies to. The description of the products is a necessity to be composed for each product separately.

Also, it is important to identify the potential users of the products and, if relevant, especially look at the use of the products by the sensitive group in the population (infants/children and youth, old, pregnant women, sick).

Manufacturing process flow diagram – the flowchart process needs to be designed by the HACCP team and to cover all steps in the production of what is it in reality. For each production operation there are steps that precede and follow the specific operation and production process present in the HACCP plan. The HACCP team needs to verify the accuracy of the (verified) flowchart process carefully by comparing them with actual activities along the whole line of production ("on the spot"), during all stages of actual work. Then, if necessary, it needs to improve or add value to it (United States Department of Agriculture, 1999). Similarly, comparing constructed diagrams and actual activities on a production line, the competent authority shall verify later that the flowchart is true and complete.

Each step in the manufacturing process necessarily has to be described in form of standard work procedures/operations (SOP).

Principle 1 – Risk Analysis

Risk analysis involves listing all potential hazards for which there is a realistic expectation that will affect every process in the area of primary production, processing, and distribution to consumption that can threaten the health of consumers and includes two main elements:

1. Identification of danger - the HACCP team needs to identify and accurately specify all dangers for which reasonably expects that could be associated with the product as a result of direct or indirect contamination on any point of the production process. By their nature, hazards can be biological, chemical and physical.

2. Categorization and ranking the risk of specific hazards - For each risk it is necessary to perform risk assessment. The main goal is to create a clear picture of which of the identified hazards is the most important problem for the safety of the products. Depending on the results, the main efforts and resources should be focused on the successful prevention of the the most important problems, because they represent the highest risks for the safety of the product.

After that, the HACCP team needs to consider what control measures are available to eliminate or at least reduce the risk in the product, as well as whether, how and on what process step those measures can be applied.

Principle 2 – Determine the critical control points

Process step where a risk is unacceptably high risk is considered critical for the safety of the product and is called the critical point. At this point, the risk must be eliminated or significantly reduced by applying specific control measures; named critical control point (CCP). In order to identify critical control points, use the decision tree for the CCP (D.A. Corlett Jr., 1998).

Principle 3 – Establish critical limits for each CCP

A critical limit is the criterion that separates the acceptable from the unacceptable. In other words, a critical limit defines the parameters of the process which must not be exceeded (H.Hughes, 2008). When this value is exceeded, is considered that CCP is no longer controlled and corrective action must be taken (J.G. Surak & S. Wilson, 2014). These limits must be based on scientific, measurable, and validated knowledge.

Principle 4: Establishing monitoring procedures

Definition of monitoring Codex Alimentarius reads as follows: "the implementation of a planned sequence of observations and measurements to assess whether a CCP is under control and security/keeping accurate records for use in future verification." (D.A. Corlett Jr., 1998)

Principle 5: Determine corrective measures

Specific corrective measures must be developed for each CCP in HACCP system, which resolves the errors and deviations of the process if/when they arise. Corrective measures must ensure that the CCP is brought under control (H. Hughes, 2008); to prevent potentially noxious food reaches consumers and preventing it happening again.

Principle 6: Establish procedures for verification

The HACCP system must be adequately and regularly checked to ensure its effectiveness and coherence between what is meant or planned and what is really going on regarding food safety in a given subject.

The HACCP plan validation is performed before implementation of the HACCP system, and is a confirmation of successfully developed all elements of the HACCP system. That is, it means that the HACCP plan, once applied, control food safety adequately.

Verification of the HACCP plan is a confirmation, after its implementation, the plan is effectively implemented and that is effective – that the danger for the security of food is under control.

Principle 7: Establish procedures for documentation and records

A successful and orderly maintenance of documentation is essential in the application of the HACCP system. All activities undertaken in the system of HACCP must be planned, documented, and they must take the records as proof that they were executed (Lj. Jovanović, M. Pavlović, D. Panković, N. Penezić, V. Radović, M. Pucarević, G. Dugalić, N. Bokan & M. Petrović, 2014).

A review of the standard structure

In the structure, similar to ISO 9001, in addition to the foreword and introduction, ISO 22000 contains eight parts: the first three are global, while the following five are related to the requirements of the management system.

Point 4 of the standard: food safety System-This point is stressing the health food safety management system requires establishing, documenting, implementing and maintaining an effective ISO 22000. This includes procedures and required records to ensure the effective development, implementation and updating of ISO 22000.

Point 5 standards: leadership Accountability-Accountability of leadership for this standard is covered through eight detailed requirements related to: dedication, the establishment of a food safety policy, for planning activities, responsibility and influences, naming the team leader for safety, ensuring effective communication processes, review of management (M. Bugdol & P. Jedynak, 2015).

Point 6 of standard: Management resources-Effectively applied FSMS requires the top level management to provide adequate resources, budget and staff to the system so it works effectively.

Point 7 of standard: Planning and delivering safe products – the ISO 22000 standard requires the Organization to plan and develop the processes needed for the realization of safe products. The organization will establish, implement and ensure the efficiency of the planned activities, as well as any changes in these activities, which are expected to include previously required programs, as well as the HACCP plan.

Point 8 of standard: Validation, verification and improvement of FSMS - to maintain and demonstrate the effectiveness of FSMS, organizations need to verify that all of the assumptions that were used in the system, scientifically based, or implemented are a validation rule. In addition, organizations need to plan, implement and document the regular verification of all system components, to assess whether, or not, modifications are necessary. Verification would also have to be a part of a continuous process of advancement, which is why organization verifies the system (I.S. Arvanitoyannis, 2009).

Organization needs to worry about constant improvement of effectiveness of product safety management system using policies, objectives, results, analysis of data, and corrective and preventive measures reviewed by management.

Advantages of application and the role of ISO 22000

The role of standard for a company is to, by applying it, achieve several advantages such as:

- better communication in food chains;
- enhanced document management;
- a better planning process;
- strengthen confidence in State agencies that control the quality of food (R. Mijatović, M. Mirčevski, 2011);
- lead continuous improvement process;
- reduction/control check by business partners;
- increase the safety of products, reduce cost and risks related to the return of products;
- greater efficiency and control food safety hazards;
- ensure the production of safe products;
- increase the confidence of users of the product.

5. USER PERCEPTIONS SURVEY

The behavior of consumers in relation to food security can be predicted if there is a systematic understanding of how consumers perceive the risks and benefits, in connection with various food safety issues, which will be attempted in a survey below.

The aim of this study is to examine the user's position on the importance of using safe products intended for human consumption, the procedure and the method of its use, its features bearing on the manufacturer of the product in case of submitting complaints, as well as their attitude about the need for the use of standards in the food industry and familiarity with standard ISO 22000. The survey covers 97 respondents, and largely consists of students of the Faculty of Technical Sciences in Cacak, while a smaller part is composed of employees of Chips Way Company.

The first two questions help in categorizing and analyzing results and relate to the gender and age of the respondents. Out of total number of respondents 70.1% are men, and 29.9% women. As for the age, 89.69% of the respondents are in the group between 19-26 years, 3.09% in a group between 27-35 years old, 4.12% in a group between 36-45 years, 2.06% in a group between 56-65 years, and 1.03% in over 65 years. The following questions in the questionnaire are designed according to the specific requirements of ISO 22000, which agrees to the stated objectives of the research. In this regard, the results and their graphical representation are presented below.

Question 3: Assess the level of security of food products that you buy?

The term refers to food safety, i.e. obligations of food companies to classify the products and the user's stance on this issue.

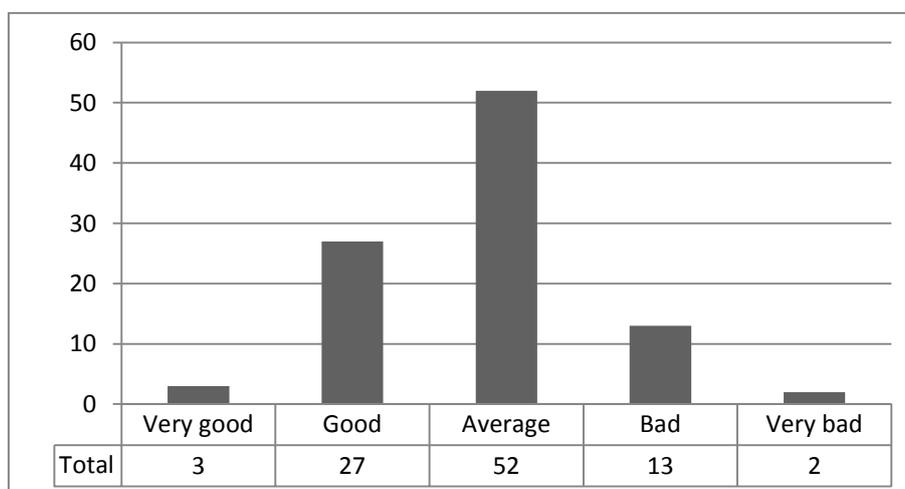


Figure 1 - Answers to question number 3 in a survey

The results show that 53.6% of the respondents considered that the food that they buy the average quality, where together with those respondents who responded with bad or very bad that percentage is even 69,07

percent. These data tell us that companies must make efforts to increase awareness by consumers and assure them that the products placed on the market are safe for consumption.

Question 4: Rate the level at which you think food companies are trying to eliminate all potential dangers in the production process of their products?

Refers to the requirements of point 4. ISO 22000-Risk Analysis.

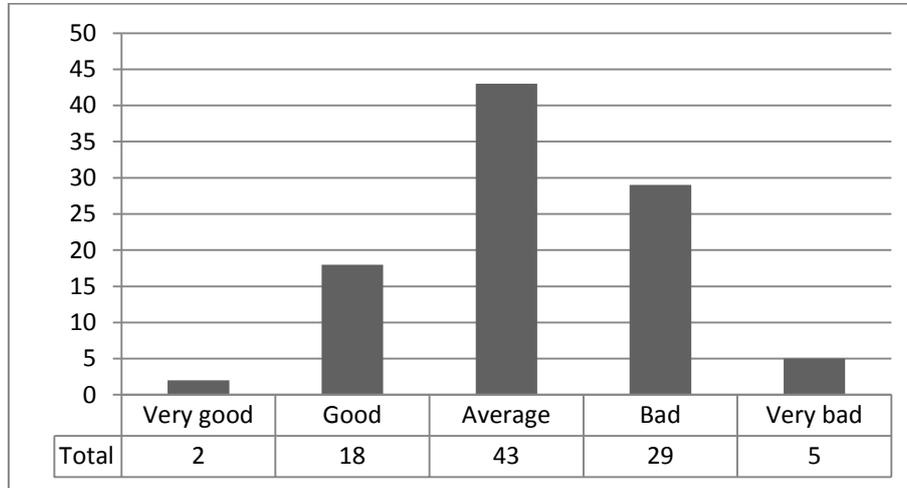


Figure 2 - Answers to question number 4 in a survey

The results show that the largest number of respondents considers the effort food companies are putting in eliminating potential dangers in the production process average and makes 44.33%. If we combine this group of subjects with those who gave as "Bad" or "Very bad" as their answer to the previous question, they make a percentage of 79,38%. Same with the previous question, companies engaged in food production, in case they want to change this attitude of respondents, should primarily change the picture of themselves and their actions in the food industry.

Question 5: Rate the importance of options of filing appeals on the safety of the purchased food products?

Refers to the requirements of point 5 of standard ISO 22000 – External communication.

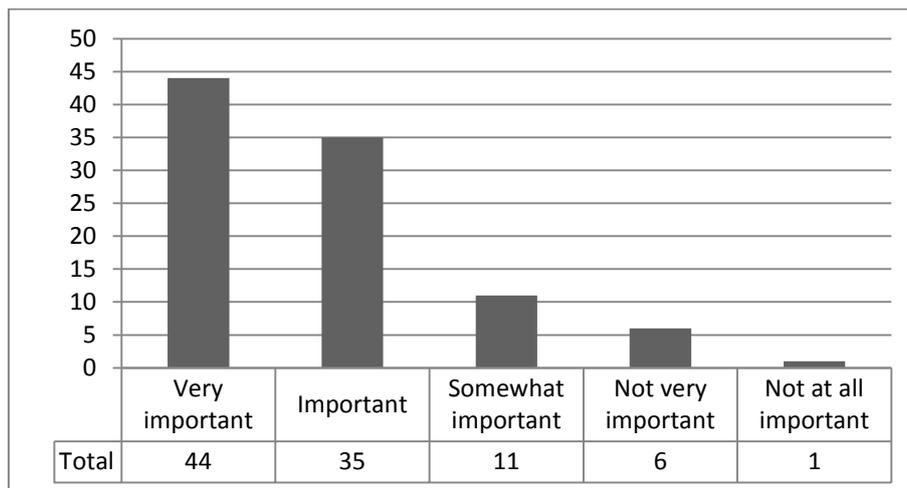


Figure 3 - Answers to question number 5 in a survey

As expected, the highest percentage of respondents makes for 45.37% and gives great importance to the possibility of submitting complaints to the observed failure of the purchased products. When we add this to the number of respondents who graded this question as "Important", that makes for 81,15%, which proves the importance of established procedures for appeal for users in every company that deals with the production of food products, and what the requirements of ISO 22000 are essentially about in the above mentioned point of standard.

Question 6: How well do you consider staff involved in the process of manufacturing food products is trained for tasks that affect food safety?
 Refers to the 6. ISO 22000-Management resources, human resources.

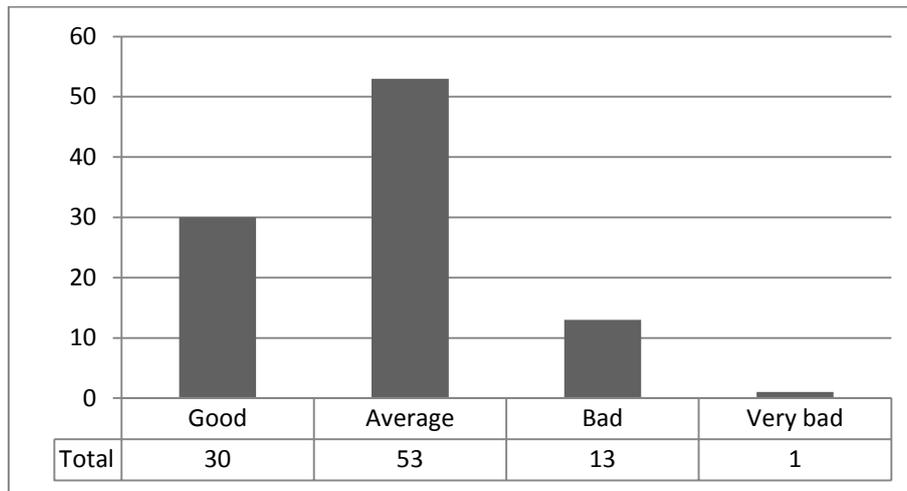


Figure 4 - Answers to question number 6 in a survey

The results of testing where none of the respondents did not answer the question as "Very good", returns us to the field of activity of companies in terms of increasing awareness of their activities and efforts to increase food security, and requiring users to recognize it. as what is shown, the answer that was given most frequently in this issue is "Average", which makes for 54.64% of the total.

Question 7: Rate the importance of hygiene in the production process/ storage process/distribution.
 Refers to the previously required programs, i.e. good hygienic practice.

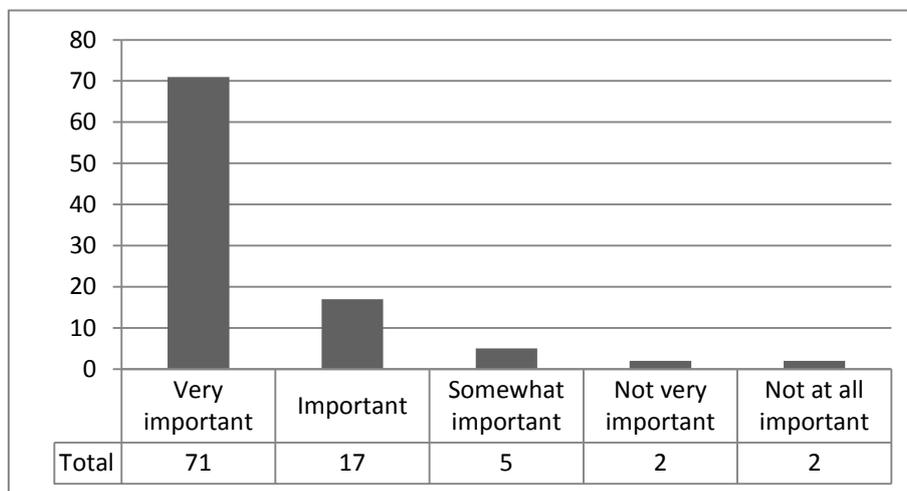


Figure 5 - Answers to question number 7 in a survey

The result of this issue is, as with the fifth one, completely expected. Primarily serves as a confirmation on user's general attitude about the importance of hygiene products in all processes of managing food. So, response to this question that is most often given is "Very important" and makes 73.20% ,and answer "Important" is given 17 times and makes 17,53%. If we add the percentages of the two responses up we get to 90.73% of respondents considers it very relevant for every company that approach the hygiene seriously in the sense that the end product is safe for consumers health.

Question 8: Are you familiar with standard ISO 22000 - food safety management system?

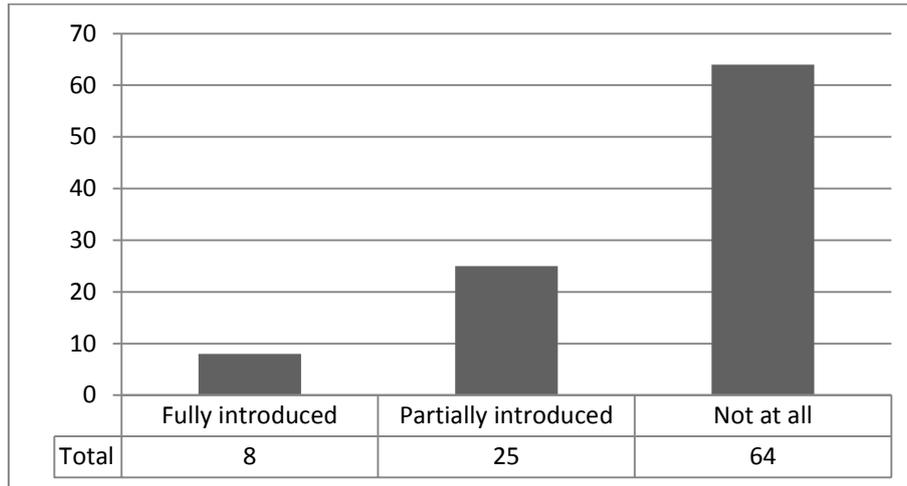


Figure 6 - Answers to question number 8 in a survey

The last question in the survey refers to the examination of those surveyed about knowledge of ISO 22000. The result of examination is such that 65.98% of respondents did not know about it, 25.78% is partially introduced, while only 8.25% is fully introduced with this standard.

6. CONCLUSION

The period of the last few years can be noted for how discussions relating to quality and food safety have become very common. The risks in ensuring food safety, as serious problems, are identified by international organizations, governments around the world, as well as our legislation and society as a whole. Parts of the public are becoming more interested and often critical in terms of raw materials, technology and hygiene of food production, both at the level of primary production and processing, and at the level of distribution/selling/serving.

ISO 22000 food safety is improving health and it provides consumer protection. In this way it strengthens the confidence of customers and increases the profitability in the food industry. It is used to accelerate and simplify the processes without compromising the other quality management systems or the health, safety and also, once implemented, this standard increases international acceptance of food products marketed on the market.

The results of implemented surveys unmistakably demonstrate the importance of requirements of ISO 22000 and the importance of the implementation of these requirements for every company that deals with the production and processing of food. Further on, these results also show that each company in addition to having efforts to meet the requirements of this standard, must make even greater efforts to that end that users become familiar with the level of the products' safety, aimed to be provided, because the end user, although considered relevant, is not familiar with the requirements of the company with an implemented standard ISO 22000 needs to meet. A solution to the problem can be found in implementing the channels of communication to the end-consumer and presenting work and effort in obtaining high-quality and safe products.

It should be emphasized that in today's business world, primarily in highly affluent markets where there is strong competition, but also the willingness of users to pay more for better quality, it is almost impossible to break in, for example in a chain supermarket, without the quality or safety of the product. Not only that consumers will not choose such a product, but it is also impossible to enter the market without them.

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INNOVATIVE STRATEGIES FOR NEW COMPETENCE DEVELOPMENT – BRINGING THE REAL WORLD IN HIGHER EDUCATION

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Abstract: *This paper is aiming to raise issue of employees' competence development for future global business environment in quality management. The quality management professionals lately point some key trends which are transforming the future of quality: talent of people, creativity and innovation or knowledge and agility. The quality management profession needs "leadership talent worldwide" and the role of the quality managers are changing. The skills critical to the success at the work places are: teamwork/collaboration, creativity and innovation, critical thinking, problem solving, professionalism/work ethic, oral and written communications, information technology application, leadership and lifetime learning. The main challenge in higher educational institutions is how to prepare students for their future jobs and what type of learning method should be applied to match business environment needs. Creative active teaching includes using case study method in classroom and preparing talent students for case competitions. This innovative learning strategy integrates curriculum objectives with learning outcomes. Based on previous researches, case competitions have been shown to have multiple benefits for the students who are participating: developing managerial skills with focus on creativity and innovation, learning benefits and employability skills.*

Keywords: *quality management, higher education, case study competition, managerial competence*

1. INTRODUCTION

According to data of World Bank Enterprise Survey, based on sample of 10,690 enterprises from 23 Eastern European countries, one of the most important obstacles for doing their business is inadequately educated workforce. It is particularly important to note that inadequately educated workforce is stated as obstacle after others obstacles: access to finance, corruption, political instability, practices of competitors in the informal sector and tax rates. According to same data source and based on data collected in 2012 in Serbia 37.5% of enterprise representatives reported inadequately educated workforce as obstacle to current operations.

Global and dynamic business environments influence the changes in the needs for organizational knowledge and competence. Social (global village), economic (global economy, worldwide sourcing and global offerings) and technological (technological progress as a base for globalization) changes influence practically every society and company. In many organizations obsolete knowledge, competence and skills are the main obstacles to development. Everett and Pege (2013) pointed that: *"At no time in the recent past have flexibility and creativity been needed more in rethinking and retooling the models of the relationship between universities and society...society wants value for its investment...But what is this socially sanctioned values? It includes at least that the average college graduate will be a more informed and better thinking citizen, better able to live a personally satisfying life because of their higher education experience – to be a prepared citizen. This in itself does not seem so different from past aspiration, except that now 'value' the idea that practical knowledge produced by higher education experience should be measureable in the short term and of sufficient magnitude..."*.Based on OECD (2008) forward looking perspectives on higher education:

- The differentiation of the HEIs leads to an increasingly visible profile of institutions. What would be desirable is that different missions and visions (i.e. world-class research vs. catering for the needs of the national/regional labor market) are accepted as equally valid and worthwhile in terms of public support.
- The intensive networking among institutions, scholars, students and with other actors such as industry - more on collaboration than on competition. International collaborative research is also strengthened by the dense networking between and among institutions, driven by the availability of free and open knowledge.

In both cases the results related to research and/or quality of students are measureable which suggest that future of higher education will be highly competitive. The average first time employee with university diploma

should have practical knowledge, competences and skills of sufficient magnitude which can be used and evaluated by his/hers employer in the short term.

This paper is aiming to raise issue of employees' competence development for future global business environment in area of quality management. The paper is organized into five sections. The next section briefly introduces some new trends which are transforming the future of quality management. The third section deals with the need for crossing the lines between the corporate and academic world and the role of higher education in providing adequate future employees in such situational frame. The fourth section is presenting results of research studies related to case study method and case study competitions as creative and innovative tool for knowledge acquiring, developing of competence and skills needed in the business. Finally, the fifth section derives conclusion remarks.

2. THE QUALITY MANAGEMENT NEEDS TALENTS AND INNOVATIVE PEOPLE

The quality professionals lately point some relatively new words: *talent of people, creativity and innovation or knowledge and agility*. Many of the more or less new concepts in the quality management might be in connection with Draker's claim: "management is doing things right; leadership is doing the right things" and need to better connect quality with "right things" in knowledge economy. According to the research report of Gutner and Adams (2008) key trends which are transforming the future of quality are: globalization, customer sophistication, talent management and leadership issues and environmental concerns and social responsibility. The authors elaborate that future "*leadership talent worldwide will likely be in short supply and a battle for the best and the brightest will continue*" and that critical aspect will be knowledge transfer within an organization. The role of the quality professional must become that of teacher and mentor, coach and player (Nash, 2014).

Study of Power (2014) showed that quality management in the plants in industrialized economies can be expected (on average) to be more competent (better in terms of "what we can do now") than those in emerging economies, however, the plants in emerging economy group are able to leverage investment in quality management programs to both promote greater competence in quality management, and to build capability for further improvement over time – which does not proved to be case in the group of the plants from industrialized economies. The data and results provided by Power (2014) can be read from different points of view – the industry organizations from developed countries might be faced with pressure to innovate and to connect their quality management learning initiatives and activities with results in the short term, while quality management in developing countries still can use existing knowledge to achieve improvements – not for a long time.

Not by the chance, new version of ISO 9001:2015 standard introduces new concepts in quality management system standards: concepts of risk and risk based thinking and its counterparts – opportunity, as well as concept of knowledge (Bureau Veritas, 2016). In the new version of ISO 9001, concept of knowledge as a resource and knowledge management have seen as a key to successful business development – requirements related to identification necessary knowledge, anticipation changes in knowledge needs as well as risk of failing to acquire needed. This was starting point for many management systems' training providers and consultants to start with courses related to the managerial competences and knowledge management - with the main idea that every organization within its context should deal with knowledge such as every other resource (in the meaning of PDCA). So, the quality managers are again in the trouble - if they do not have at least decent business management education.

The new edition of the EFQM excellence model integrates, for the first time the fundamental concepts such as: managing with agility, developing organizational capability, harnessing creativity and innovation and succeeding through the talent of people with explanation that "excellent organizations value their people and create a culture of empowerment for the achievement of both organizational and personal goals." Knowing that the fundamental concepts of excellence have been identified through a rigorous process that included benchmarking globally, this is novelty in fundamental concepts can be explained by new needs of global business.

However, the roots of those new concepts can be found in quality management theory. According to Dahlgaard-Park (2011), "as the most widespread quality management approach during the last 25 years, the term TQM seems to have lost its attractiveness in Western parts of the world and instead new terms such as Business Excellence, Organizational Excellence, Six Sigma, and Lean seem to have overtaken the position even though the contents of these new terms can be understood within the framework of TQM". The study of Dahlgaard-Park et al. (2013) show that the total number of articles under the subject of TQM has been decreasing after having reached its peak in 1995, at the same time papers focusing on concepts within the quality management framework (e.g. Lean, Just in-Time, Toyota Way and Six-Sigma Quality) have been

increasing. Many reports about ineffectiveness of TQM were based on its highly complex concepts, many different forms – some authors of the TQM approaches define TQM as philosophy, some as dominant management practice. However, many TQM models, for example TQM models provided by Oukland, Besterfield or Dahlgard, are underlined importance of management of organizational knowledge, competencies and skills. With implementation many quality initiatives and practices, it was difficult to link these initiatives within a single business framework and transferring ownership from Quality Department to the business as a whole (O'Brien and O'Hanlon, 2000, taken from Adebajo). Problems of many quality management initiatives are related to insufficient capabilities of quality managers to cope with deploying activities, responsibilities and commitment to the issues. That might be one of the reasons for popularity of term business excellence.

According to the European Foundation for Quality Management (EFQM) - excellence is about doing your best. The EFQM Excellence Model, based on a cause and effects, provides a holistic framework for assessing how effective you are in developing and delivering a stakeholder focused strategy. The EFQM model was largely based on the concept of total quality management TQM and European Quality Award (EQA) was based on other TQM models such as Malcolm Baldrige National Quality Awards (Adebajo, 2001). Regarding to effectiveness of EFQM models and based on present studies, still it is difficult to have hard positive or negative opinion. The EFQM models and many other authorized business excellence models (authored by individuals or other organizations) or customized versions are generic and effects are not only results of the model but of the quality of activities or solution conducted in order to obtain specific results. Integration in the processes of the organization in various ways can highly influence effective implementation of the EFQM Excellence Model (Davis, 2008). According to Gomez (2011), based on analysis of the relationships in the 2003 version of the EFQM model, leadership has a significant effect on policy and strategy, people and partnership and resources, however policy and strategy, people, or partnership and resources have no significant effect on operative results and processes. The study of Aryanaset al. (2016) explored whether the EFQM Excellence Model mentioned model is suitable for the businesses that are based on cleaner production and sustainable business models - it was shown that despite adoptability of the fundamental concepts of EFQM Excellence Model, there were some lacking criteria for adapting them to sustainable business model.

The quality management development of competitive excellence emphasized a new role of recruiting the right talent as imperative for providing sustainable and profitable organization for long term.

3. CROSSING THE LINES BETWEEN THE CORPORATE AND ACADEMIC WORLD

In order to adopt higher educational needs to US market, Rochester Institute of Technology conducted research of key drivers of change in higher education today, including: technology (on line learning), globalization, changing demographics, changing students' expectations and understanding the Net Generation and changing employer needs (Casares et al, 2011). The rate of technology change and growth has been exponential and on line learning is growing. Millennials generation expect flexible work hours, expect to be mobile and work from home, office and cafes. The most important millennial work values are: meaningful work and high salary (Meeker, 2015). Globalization influences higher education in multiple ways from a need to "internationalize" the curriculum and provide support services for non-native English speakers. International dimension is crucial for preparation of students for international careers developing educational program (European business) that fit the needs of students (Teichler, 1999). Another very important phenomenon to researchers relates to the impact of demographic changes, such as a large population growth in Asia, which represents an opportunity for business schools. On the other hand, characteristics of countries in the eastern part of Europe, such as very low birth rates, out-migration and rather high death rates, influence a decrease in the number of young population. That further implies a decrease in the number of potential students, and increased competition among business schools (Lutz,2011).

In the knowledge economy, employer needs for new entrant skills as critical to success in work: teamwork/collaboration, creativity and innovation, critical and thinking/problem solving, professionalism/work ethic, oral and written communications, information technology application, leadership, lifetime learning. The University of Glasgow (2011) investigated employers' perceptions of the employability skills of new graduates, and the steps which universities take to develop them. They used interviews method with 22 key informants from representative organizations for employers HEIs and other relevant groups (e.g. Association of Graduate Recruiters, Chambers of Commerce, Council for Industry and Higher Education etc) to explore issues pertinent to the research objectives and identify examples of good practice. Employers expect graduates to demonstrate a range of skills and attributes that include team working, communication, leadership, critical thinking, problem solving and often managerial abilities. Employers are frustrated that

higher education courses do not meet their needs. There is also a lack of systematic practice to promote employability across higher education institutions and schools do not see employability as an important part of their mission.

4. CASE COMPETITIONS AS CREATIVE AND INNOVATIVE STRATEGY

In modern business arena higher education provider is facing increased pressure that competitive advantage can be built not only with research but also through excellent in creative active teaching. Creative active teaching includes using case study method in classroom and preparing talent students for case competitions as innovative strategy in a manner that integrates curriculum objectives with learning outcomes.

Erskine (1998) defines case studies as “a description of a real event, which includes a decision, challenge, opportunity, problem or attitude with which a person or people in an organization are faced”. There are two main areas for using case study method in higher education in the classroom and case competitions. The implication is that the classroom needs to include active and interactive learning as the basis for developing understanding of core disciplinary concepts, and these underpin academic success with strong implications for student retention (Crosling et al, 2009.) Active learning is often associated with experiential, problem-based and project-based learning, and other forms of collaborative learning, and less reliance on the large lecture format. Problem-based and project-based learning promote collaboration among students to solve problems, and by using realistic problems or situations for learning, a deeper understanding of the relationship between theory and practice can be developed and understood by students. Considering Jelenc's (2011) comparison study of using case methodology in classroom in the West (USA) and East (Croatia), it is crucial to point out that the role of the student in the West is to become a partner with the professor, while in the East the student has a subordinate role. Another important difference in applying the case study method is that students in Western countries are more stimulated to prepare themselves for the classroom and are motivated to actively participate. Furthermore, in the East students are usually not familiar with the material used in class and are less interested to learn. The main constraints of students in Serbia, as an eastern representative, with regard to the case method in classroom are: focus only on knowledge covered by the exam, lack of time to learn more and demotivation for active learning (Damjanovic, 2011). This study will focus on case competition as innovative strategy approach.

However, applying active case learning at the case competition described an opportunity for undergraduate students to apply concepts they have recently seen in their coursework to „real world“ business problems (Bale et al., 2013). Competitions enable students to deal with the challenge of delivering results under pressure, given an enigmatic real-world business problem. The Auckland University has compiled a list of results from past undergraduate international case competitions with invitation only from 2011 to 2016. This list contains information on the winner of the competition, as well as universities that came second and third (or made it to the final). Statistics show that number of global case competitions that are being organized yearly has increased from 13 in 2011 to 18 in 2015(The University of Auckland, 2016).

Our best practice from the Faculty of Organizational Science University of Belgrade with great results at the global level at the prestige case competitions from 2012 to 2016 enabled organizing The Belgrade Business International Case Competition. Belgrade Business International Case Competition is a global undergraduate business case competition organized by the Faculty of Organizational Sciences of the University of Belgrade since 2013 in South Eastern Europe. This competition consists of 16 leading business schools from all around the world (USA, Canada, Europe, Australia and Oceania, Asia) and the jury members, who evaluate student solutions in Power Point format, are practitioners and business consultants. Students have two cases to solve, the first one in five hours and the second one in 30 hours. They have 20 minutes for presenting their solutions, followed by 15 minutes of question-and-answer (BBICC, 2016).

Based on previous researches, case competitions have been shown to have multiple benefits for the students who are participating: managerial skills with focus on creativity and innovation, learning benefits and employability skills.

4.1. Managerial skills

According to Umble et al (2008) using team case projects in education can encourage the development of problem-solving skills, engender deeper and more critical and creative thinking, increase confidence, provide a context for the relevance of the subject matter, encourage group interaction. Students felt that the Consulting Challenge as case competition in Minnesota helped them be effective teammates, manage heavy workloads, apply theory, solve organizational problems, present a persuasive argument to a client, manage their emotions, answer difficult questions from a client, present creative ideas to a critical audience, perform

under short deadlines, manage time, complete large amount of work in a short time (Sachau and Naas, 2010). In order to use case competition to prepare students for the future work case study method helps students develop managerial skills: problem - solving approach, critical reasoning and analytical skills. Student participation in case study competitions can enhance their communication skills, making them more suited to negotiate an increasingly competitive work environment. (Burke et al, 2013).

In reviewing materials available in case competitions in South Eastern Europe - Serbia and Croatia (Damjanovic and Dlacic, 2015) it is evident that skills that students' developed the most are teamwork skills and learning how to perform market research. The rest of the answers are distributed among developing creative thinking, developing presentation skills, identifying target markets, collaboration with companies, learning how to make decisions and identifying trends on the market. Considering the teamwork in business student case competition in Serbia, Radisic and Nedeljkovic (2012) point out the creativity and thinking out of box in brainstorming session are crucial for development of business ideas for company representatives in order to provide different solutions for companies. Brainstorming as the initial stage in case solving analysis include: everyone write ideas on paper, all ideas being equally valued by the decision making criteria and no criticism of other people's ideas is allowed. Besides learning individually, students from Serbia and Slovenia at case competitions are additionally improving their skills through interaction with their colleagues. Cases make learning relevant and meaningful to the student through active participation in analyzing, discussing and solving real problems (Todorovic et al, 2014)

4.2. Active Learning

Active learning benefits from cases approach usually recognized alignment of theory with practice, and using managerial tools for solving life problems. Cases make learning relevant and meaningful to the student through active participation in analyzing, discussing and solving real problems. Learning is moved from memorization of numerous facts to practical application of theories, concepts and techniques to real problems. Students are in a position to accumulate the knowledge and experience of older people, lecturers and jury members (Todorovic et al, 2014). Case study competitions expose students to real world experiences, encourage them to take ownership of their learning and help to assimilate their ideas into theory and practice (Burke et al, 2013). Furthermore, case studies not only make theory and principles meaningful and useful in practice but also provide specific knowledge and the ability to act in real life. The skills and knowledge attained from well-planned application of case studies are transferred and imposed on the student. Case studies improve personal integrity and the ability to choose right action with active learning through case competition. The case study thereby contributes to the realization of the aim of educating good managers and administrators (Rendtorff, 2015). According to research from New Zealand (Corner et al., 2006) case competition reflects the four elements of a grounded learning exercise. These elements are: creating a real-world experience, optimizing learning transfer, integrating theory and practice, and shifting learning responsibility to the students.

4.3. More attractive on the job market

Referring to potential employability skills case study competitions improve teamwork, critical thinking and communication skills, which are the skills that employers want from their new employees (Burke et al, 2013). Case competitions provide an opportunity to make business education meaningful to business students, while providing students an opportunity to prepare for upcoming career challenges. Competitions enable students to deal with the challenge of delivering results under pressure, given an enigmatic real-world business problem (Bale et al., 2013). Reflections from past participants suggest that the competition is a more memorable university experience than are obligatory prerequisites for career qualifications and better prepare students for future career (Ali et al., 2011, Damjanovic, 2012). Lastly, the benefits for managers and company side from case competition are: potential employment - selection and recruiting of the best students and networking of organization that provide case with faculty.

4. CONCLUSION

An obsolete knowledge, competence and skills are the main obstacles to development of many organizations. The global dynamic business environment needs new entrant employees ready for the immediate start and in many companies there is no time for learning at working place. All of the given changes have an impact on the fact that business schools have to be competitive on the market of higher education, and have a leading role in terms of providing the "best" students for the "best" companies in the job market (Damjanovic et al, 2014). Role of the business schools is in providing "a prepared citizen" (see Everett and Pege, 2013) is crucial for the future of the business. What is the future of the business? "It's not

necessarily overnight shifts – they're ongoing and perpetual – but they're going to change everything the way we know it today. If you're not competing for the future, you're by definition competing for irrelevance" (see more in Clark, 2013).

The quality professionals lately point some key trends which are transforming the future of quality: *talent of people, creativity and innovation or knowledge and agility*. The quality profession needs "*leadership talent worldwide*" (Gutner and Adams, 2008) and the role of the quality professionals must become that of teacher and mentor, coach and player (Nash, 2014). Study of Power (2014) indicated that quality management in developing countries can still use existing knowledge to achieve improvements however innovative approaches are expected in the near future. Considering difference between students from Western and Eastern countries (Jelenc, 2011, Damjanovic, 2011) such as: collaboration with professors, motivation to actively participate, familiarity with the material used in class and factual learning - the main constraints of students from Eastern European countries might be seen in absence of needed skills for global business. In the knowledge economy, critical to success skills of new entrants are: teamwork/collaboration, creativity and innovation, critical and thinking/problem solving, professionalism/work ethic, oral and written communications, information technology application, leadership and lifetime learning.

Even though future of higher education in area of the quality management is complex issue, the general strategies for the specific skills development should be based on new and innovative higher education. Creative active teaching includes using case study method in classroom and preparing talent students for case competitions as innovative strategy in a manner that integrates curriculum objectives with learning outcomes. Based on previous researches, case competitions have been shown to have multiple benefits for the students who are participating: improved managerial skills with focus on creativity and innovation, learning benefits and employability skills of the talent. Our best practice from the Faculty of Organizational Science University of Belgrade, with great results at the global level and the prestige case competitions from The Belgrade Business International Case Competition (BBICC) are the excellent starting point for recruiting the right talent.

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SOFTWARE QUALITY ASSURANCE

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Abstract: *This paper analyzes the approaches of quality management in the software industry and emphasizes the application of quality concepts in software development, which includes the key elements necessary for the survival of an organization and its growth. The paper also shades some light on the ways quality management principles are applied throughout all stages of software development. It also elaborates in one of the specialized and belonging disciplines, such as: software testing. In this context, various aspects in the field of quality assurance in software development: methods and techniques of software testing and software lifecycle are described. In the paper is given compared quality management principles and principles of software development.*

Keywords: *quality assurance, software, testing, CMMI, PDCA, quality documentation, process approach*

1. INTRODUCTION

This paper is about different quality management approaches in software industry. Use of quality in software development is essential for advancement and development of a company, especially if one of the goals is long-term business success.

It is necessary to make a distinction between testing and software quality assurance, as well as what can be achieved by software testing. Each project has its beginning and end, which is also the case with software development. Which phases of development is software going through and can those phases apply not only to software development, but also to other products we want to successfully place on the market?

Why is the process approach important and how can the direct connection between this approach and Deming's well known cycle be made? What is test plan, test case and software quality assurance plan and why is the documentation in software development usually formatted like this?

Some of the most common methods and techniques in the field of testing and quality assurance will be mentioned. In order to ensure software quality, as already mentioned, it is necessary to conduct software testing. Black and white box methods are essential in order for tester to start testing process.

Software industry is engaged in development, maintenance and software delivery, as well as related services such as trainings, documentation, advising and support for software use. Software testing consists of verification and validation correctness of the software itself, but it also identifies important defects, errors caused by people or environment, lack of knowledge or mistakes in the application code.

Software development process includes:

- Definition and detailed documents for development
- Prototype as a proof – concept
- Presentation of prototypes and correction of products (if necessary)
- Software encryption and code verification
- Individual product testing

2. PHASES IN SOFTWARE DEVELOPMENT

Each phase of software development should be tested in order to ensure quality of end product. So

in each of those phases quality can be ensured by testing. Testing without preparation, which is mostly for informational purposes, is called walkthrough.

Inspection is more formal than casual testing and it usually includes three to eight experts. The subjects of supervision are phases of development that are documented and specified and the goal is to find the lack but not to be removed. Participants should prepare for this type of check by reading the documentation and procedures where all of the development steps are being defined. The result of inspection is also written report.

There is a huge similarity with internal check from ISO 9001:2008 where it says - „The organization shall: plan, establish, implement and maintain an audit programme(s) including the frequency, methods, responsibilities, planning requirements and reporting, which shall take into consideration the importance of the processes concerned, changes affecting the organization, and the results of previous audits.“

Planning, analysis, design, implementation and testing are the phases through which the software evolves. From a conceptual phase to delivery, software must be monitored and tested in order to prevent problems to happen. The earlier you recognize the potential defect or defect itself, debugging will be more efficient and with lower costs.

Three famous models of software development are:

- Waterfall model
- V-model
- Spiral model

Waterfall model is the oldest and most commonly used model. It follows software development through all phases, characterized by clearly identified user requirements, procedures with clearly defined development processes where any deviation can cause an error or bag. In more traditional models, such as the waterfall model, the testing phase is done after defining the requirements and when the encoding process is completed. However, this practice is obsolete, and even though the testing phase is the last phase, it is used at all phases of development so that each phase can be well tested and ready to make it to the next phase.

3. TESTING AND QUALITY ASSURANCE IN SOFTWARE DEVELOPMENT

It is necessary to make a difference between testing and software quality assurance. *Jonassen Hass (2008) says that testing is an activity that can be applied in all phases of software development in order to secure software quality as the main goal and that testing involves system or application operations under defined conditions and evaluation of system's testing results.* What makes testing interesting is creating such conditions where things will go wrong, in order to determine when and why software doesn't work and its correctness or malfunction if the software doesn't respond to changed conditions. (ie. will Facebook homepage start if username and password are not entered; if it starts under those conditions, that can cause huge privacy concerns.)

Software testing is process of validations and verification in order to prove that:

- 1) Software meets business and technical requirements
- 2) Software works as planned.

Muyers, Badgett and Sandler (2012), describe software testing as identifying defects and mistakes that must be corrected, therefore, from the perspective of the end user, mistakes and defects must be removed so the functionality of software isn't changed or damaged.

As Desikan and Ramesh (2008) describe, software testing can give an answer to some of these questions:

- *Does software really work as expected?*
- *Are the user requirements met?*
- *Are users satisfied?*
- *How does it work and is it "user friendly"?*

- *How does it react when it's being used by many people at the same time?*
- *Which parts of software have to be improved?*
- *Is it ready for delivery to the end user?*

Software quality assurance includes whole process of software development, tracking and process improvement, making sure that each process, standard and procedure are being followed. Quality assurance ensures that the process is noticed in the early stage of development and the team of experts was involved in removing the potential or existing problem. Quality assurance is focusing on "preventive action". Software quality assurance can provide complex approach to maintenance, not only in the context of eliminating mistakes, but also:

- Work on re-engineering solutions that meet new requirements of the market
- Solutions improvement
- Contribution to the overall evolution of the solution through the implementation of proactive analysis of key causes for all critical questions,
- Quality improvements of original solution through refactoring the original code, etc.

Definition proposed by ISO standards for software quality (ISO/IEC 2001, 2003a, b, 2004) says that "QA is a measurable physical or abstract property of software product that bears on its ability to satisfy stated and implied needs". According to Balasubramaniam et al. (2009), "achieving QAs in SBS is critical due to the following reasons:

- *Application developers need to be confident that the services (and compositions of them) will meet end user quality requirements.*
- *"Application developers need to understand the cost and risk of achieving quality requirements, given that system QAs often must be traded off or built in" (O'Brien et al. 2007).*
- Application developers require information for selecting between alternate services with similar functional capability.
- Application developers require information about Quality of Service (QoS) to monitor and enforce service level agreements (SLAs).

4. QUALITY IN SOFTWARE DEVELOPMENT

Software quality implies the absence of bugs in the software, delivering at the right time and to the right place with minimal costs, the software that meets the requirements and expectations of users and that is suitable for maintenance. But quality is a subjective term. It depends on who is the software's end user and what is its impact on the development phase. The end user may be a foreign buyer, internal tester that gives a confirmation for the further development, the employer of organization itself, shareholders, etc. The perception of quality depends of priorities and requirements of the end user.

4.1. The use of CMMI maturity model

Falessi, Shaw and Mullen (2014) point out that five levels of "maturity" process model helps in providing the efficiency in quality software delivery. CMMI models are collections of best practices that help organizations to identify and improve their processes. That model is focused on larger organizations. However, many of the quality processes are generic and applicable to all organizations, regardless of the size and complexity. Organizations can obtain an estimation of CMMI maturity levels by authorized valuers, or it can be conducted by organization itself.

Maturity levels:

- ✓ At the *initial level*, processes are disorganized, even chaotic. Success is likely to depend on individual efforts, and is not considered to be repeatable, because processes would not be sufficiently defined and documented to allow them to be replicated.

- ✓ At the *repeatable level*, basic project management techniques are established, and successes could be repeated, because the requisite processes would have been made established, defined, and documented.
- ✓ At the *defined level*, an organization has developed its own standard software process through greater attention to documentation, standardization, and integration.
- ✓ At the *managed level*, an organization monitors and controls its own processes through data collection and analysis.
- ✓ At the *optimizing level*, processes are constantly being improved through monitoring feedback from current processes and introducing innovative processes to better serve the organization's particular needs.

Characteristics of the Maturity levels

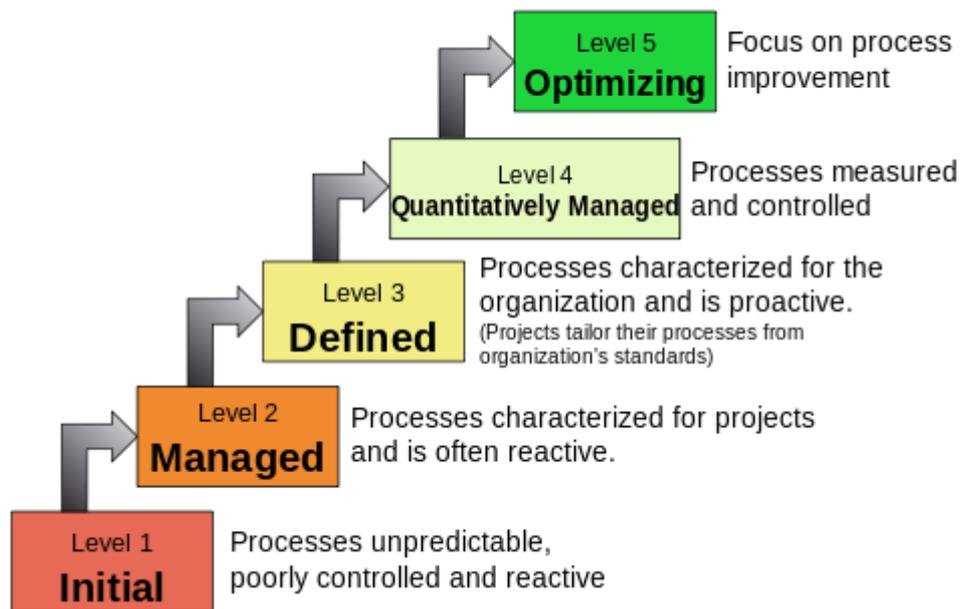


Figure 1. CMMI Maturity Model Levels - Falessi, Shaw and Mullen (2014)

4.2. Introduction of quality assurance process in organization

The introduction of quality assurance processes in the organization depends on the size of the organization and possible risks. For larger organizations with high-risk projects, formal processes of quality assurance and great commitment of the management is necessary. Not only the leadership but all employees must be aware of the importance of introducing quality processes and they have to be involved in the introduction of these processes. Communication between users, testers, programmers and managers must be adequately permeated throughout the organization, because of the cooperation and regular communication is the basis for coordination and improvement of business processes.

Other possibilities for the introduction of process quality can be seen in the implementation of different approaches, such as Kaizen - a method of continuous process improvement, Deming's method Plan-Do-Check-Act and many others.

Example model of Deming's PDCA (Plan-Do-Check-Act) in software development

Company "Mera" is in charge of software production. One of the clients ordered a software as a desktop application for the computer. The application is called Team Tracker, which is used as an internal application, where employees can enter their work tasks, time spent on working on activities, time spent outside the company (having a break), vacation planning, problems and plans for the next day.

Application of PDCA cycle is given below as an example.

Plan

Company "Mera" has found his client's claims:

- Making daily reports
- Launching applications quickly and easily
- Transparency commands
- Relation with other operating system
- Expansion possibilities, introduction of new options
- Easy maintenance

Do

Processes are being realized and mistakes are being processed simultaneously.

Check

Process performances are being monitored and measured. Mistakes and bugs are identified. It is checked if application is working in the required environment and whether it can operate in alternative environment.

Act

Continuous improvement of process performances. It is possible to give certain remarks and comments, it is important that both employees and end users are being involved. New solutions or edit of the existing ones are being proposed. Every employee has the right to propose improvements. Degrees of influence are being determined - how much influence do certain software features have on individual customer requirements. Standardization of process or the introduction of a model of maturity is being conducted.

4.3. The role of documentation in providing software quality

Processes of quality assurance should be documented to ensure the repeatability of success. Specifications, standards, schemes, business rules, configurations, test plans, test cases, reports, manuals etc. should be documented in some form (electronic, paper...).

Based on the good documentation, the system can be set up where certain information can be easily found. Documentation often becomes more important when it comes to long term projects.

What is test plan, test case and software quality assurance plan?

"Test plan is a document which consists of basic information about testing and it is describing objectives, scope, approach and focus which help in software testing approach", Filipovic and Djuric (2009) point out. The process of preparing the test plan is useful way of thinking which phases software should go through, which methods are used and what are the expected test results.

Test plan includes:

- Name
- Version of the software that is being tested,
- Document audit that includes test plan makers, date, who approved it,
- Content
- The purpose of the document and to whom it is intended,
- Testing objective
- Description of the software that is being tested
- Relevant documents that is connected with test plan, such as standards, procedures, project documentation and other test plans,
- Traceability requirements
- Test team,
- Scope and limitations of testing,
- Risk analysis,

- Results
- Additions, vocabulary, abbreviations, etc.

Filipovic and Djuric (2009) explain that “test case is a collection of different environmental conditions under which the software is being tested and it’s being determined whether software system or its part works as planned.” They also point that it must describe the desired result. Test case won’t be evaluated if there is no defined statement about the expected output.

It describes the entrance, action or event and the expected result in order to determine whether the characteristics of software application work correctly.

Test case can consist of information such as:

- Test number
- Test name
- Creation date
- Test description
- Objective
- Test conditions
- Requirements necessary to perform the test
- Steps of implementation
- Expected results

The level of detail can vary depending on the organization and project. Organizations often use less detailed test cases that allow documentation that is simple and more flexible, that refers to test implementation.

Test developing processes can help find problems in requirements or application design because it requires thinking about how exactly the application will work. Because of that, it is useful to prepare tests at early stage of software development, if possible.

5. TESTING METHODS OF SOFTWARE QUALITY ASSURANCE

Burnstein (2003) said there are many ways and testing methods of software quality assurance, such as:

Black box testing - does not require knowledge of the inner code design or how the application is being programmed. Basic functionality and compliance with the requirements are being tested.

White box testing - based on knowledge of the internal logic and application code. The internal code, algorithms, environmental conditions, etc. are being tested.

Alpha testing - application testing before the end of development process; minor design changes can also be the reason of such testing. Usually the alpha testing is done by end users, not programmers or testers.

Beta testing – it’s done when the development and all necessary testing are completed; bugs and problems need to be found before the final delivery to the user. It is usually done by end users, not programmers or testers.

Mutation testing - a method for determining whether existing tests are useful even when some changes (errors) are deliberately made. Changed (muted) parts of application are being tested again using the original tests, to determine detected errors, which are expected because they are deliberately made changes ie. mutations.

Sanity / smoke testing - the simplest initial testing of basic functionality of the application components. If such testing proves to be reasonable, or if the results are acceptable, it is sent to the next phase of testing.

Load testing - testing of the application under load when it’s being used by multiple users or when it opens simultaneously with other applications, to determine at what point an application stops working

due to the overload.

Recovery testing - How and for how long the system is recovering from a crash, hardware failures, or other catastrophic problems.

6. THE PRINCIPLES OF QUALITY MANAGEMENT AND SOFTWARE DEVELOPMENT

Filipovic and Djuric (2010) say that "The eight quality management principles represent a comprehensive, fundamental rules followed by the organization, with the goal of continual improvement of performance relevant for customers and other stakeholders."

Those are:

1. Customer focus
2. Leadership
3. Involvement of people
4. Process approach
5. System approach to management
6. Continual improvement
7. Factual approach to decision making
8. Mutually beneficial supplier relationships

Jung, Seung-Gweon and Chang-Shin (2004) point out that, as is known to software engineering experts, the ISO/IEC 9126 was a long run software evaluation standard which dealt with a quality of software products, "by presenting an appropriate framework for modeling the processes by segregating quality dimensions into six categories (functionality, reliability, usability, efficiency, maintainability, portability), consequently divided into 27 smaller groups."

Polillo (2012) claims that "these processes should lead to better customer satisfaction with the software quality, while within the organization they serve as enablers for understanding of software quality dimensions and open space for new improvements." Recently, this standard has been replaced by the newer version entitled ISO/IEC 25010:2011.

6.1. Focusing on the customer

By ISO 9000:2015 customer satisfaction is the "customer's opinion of the level to which the customer's requirements are being met." "Organizations depend on their customers and therefore should understand their current and future needs, the need to meet their requirements and strive to overcome their expectations."

Customer satisfaction is achieved when goods and services match or overcome the demands and needs of the user. Therefore, all processes and all employees in the organization must be focused to users. In software development, quality is defined by group (users, clients or customers) which software is dedicated to and organization should identify their stated and possibly unexpressed needs and approaches to software development in a way to satisfy customers.

Essential aspects of focusing on users are:

- Understanding clients' needs and overcoming their expectations,
- Taking responsibility for customer satisfaction, so the quality of service the highest priority,
- Confidentiality of information, intellectual property protection and business reputation: own and reputation of users.

Measuring customer satisfaction can be achieved in various ways, by using direct (surveys) and indirect (Monitoring Body) methods. For example, the software company "Mera" uses methods of colors - next to the each software features is green, yellow or red color, representing satisfied, medium satisfied or dissatisfied users.

"Recently, the User Experience concept (UX) has become more used than usability in the Human Computer Interaction (HCI) discipline and SQUARE (Systems and Software Quality Requirements and Evaluation) [1] is the standard that defines the system quality or the software quality. Nevertheless, HCI practitioners still have not come to an agreement about defining UX. Also, the standard attributes which researchers use for analyzing the UX in a specific interactive system do not exist. For these reasons, the main aim of this research is the specification of UX based on the facets

that the ISO/IEC 2010:2011 considers according to its attributes.” (Masip, Oliva and Granollers, 2011)

6.2. Staff involvement

ISO 9000:2015 says that *"the staff at all levels makes an essential part of an organization and their full involvement enables to take advantage of all capabilities for the organization's benefit."*

It is good idea to listen to ideas, suggestions and comments of employees, because everyone has some additional features, knowledge and skills. Opinions of programmers and testers should be considered, because together they can come up with the right solution. It is well known that if a thing is being impartial observed, better conclusions and solution proposals can be made. A new idea can easily be accepted, does not only applies to projects, but also to the policy of the company, interpersonal relationships etc. Employees should be treated with respect and their rights have to be protected. It is necessary to create equal conditions for employees with the same qualifications.

6.3. Process and system approach to management

In ISO 9000:2015 is said that *"the desired results can be achieved more efficiently, if the management of certain activities and resources is done through processes."*

The use of this principle leads to lower costs and shorter software development time and respect deadlines for testing and delivery, more efficient use of resources, improved and predictable results, prevention of the possible occurrence of errors or bugs, creating more capable workforce, establishing clear responsibilities and competencies for managing key activities.

Process approach in software development means that processes are defined, managed and measured.

"Identifying and understanding of a system of interconnected processes, and management of that system, contribute to the effectiveness and efficiency of the organization in achieving its goals" as defined in ISO 9000:2015.

The purpose of the quality management system is to achieve customer satisfaction.

Key advantages of this principle are: the creation of comprehensive plans that include test plans, integration process through the stages of software development, the ability to focus all efforts on the key processes that need to be tested in particular, a better understanding of the errors causes and taking timely actions to prevent or remove the deficiency.

7. CONCLUSION

From all mentioned in this paper it can be concluded that use of quality has a major impact on business processes, which are of prime importance for the success of an organization.

Through this paper is explained the application of quality in software development.

The basic difference between the software testing and software quality assurance and that testing is an activity that can be applied at all stages of software development, in order to ensure software quality. Quality assurance can influence on costs reduction, process efficiency improvement, because the software that was delivered to the user's perception of quality, will definitely be adequately valued in the market.

Successful software has successfully passed through all stages of development, and by testing each stage quality of parts and then the final product or software can be provided. The application of Deming PDCA cycle in direct application production that is delivered to user after the last phase of development and testing is shown.

Some of the most common methods and techniques in the field of testing and quality assurance are explained. It is necessary to implement software testing to ensure its quality.

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