ICT INDUSTRY IN SERBIA: CONDITION AND IMPROVEMENT BY QMS

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Abstract: The paper presents current level of the Serbian Information and Communication Technology (ICT) industry, global parameters of ICT in Serbia, as well as some economic indicators. Existing problems and suggest actions necessary for improvement of IT in the Serbian industry are also defined. One approach to improvement of Serbian ITC industry is adopting a general framework policy for the integration of the acquis in the field of quality, standards and technical regulations, developing an updated national Quality Plan for the ICT. This paper will also present development and implementation of Quality Management System (QMS) in Serbian ICT sector.

Keywords: ICT industry, QMS; quality management system; global parameters; economic indicators; SLOC; capabilities; infrastructures; standards; ISO; developing countries.

INTRODUCTION

While the development of the ICT in developed countries has been widely documented, its diffusion in developing nations has generally not been well researched. The effect of ICT on companies (in both developed and undeveloped countries) and successful businesses has been marked as very important by many different studies and reports in the past (European Union, OECD, 2002; Northern eDimension Action Plan (NeDAP) and European Commission, 2003; Hagel and Brown, 2001). Companies in developing countries cannot isolate

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themselves from changes occurring due to development of ICT in developed countries. On the contrary they need an extra effort to improve condition in their ICT sector and explore different approaches (Nair and Prasad, 2002; Winley et al., 2007; Ziadi and Kuofie, 2006). The objective of undeveloped countries was to understand the factors that help to accelerate, or which may retard, the development of the ICT in countries at different stages of economic and social development. Serbia is a developing country but, nevertheless, it has experienced many unique problems during the past decade. The major problem has been the economic transition very much alike to the processes that successfully finished in most countries of Eastern Europe. During the last few years, Serbia has changed its economic model and started to improve its ICT sector. One of the major tasks has been an evaluation of the level of ICT industry. The first attempts were made by the Serbian ICT Society, in November 2003 (Serbia, Department for science, technology and development, Government of Serbia, 2002). This research mainly analyses conditions of the ICT sector as a base for ICT development in the Serbian industry. Since many studies show positive and significant impacts from ICT investments at the country level, the Serbian government, in 2001, listed ICT development as the national priority in the long-term plan of development of the Serbian Economy. Successful experiences of less developed countries that invested in their ICT industry, such as India (Nair and Prasad, 2002) and Costa-Rica, are a great example.

In this paper, we will present current level of the Serbian ICT industry, global parameters of ICT in Serbia and some economic indicators. Then, we define existing problems and suggest actions necessary for improvement of IT in the Serbian industry. There are many different approaches in improving of ICT education (Lynch

and Szorenyi, 2005), financial investments (Sihvonen, 2006), improvement of quality (Dutta, and Sekhar, 2004). One approach of improvement of Serbian ITC industry is adopting a general framework policy for the integration of the acquis in the field of standards and technical regulations. Developing an updated national Quality Plan for the ICT and other industries. This paper will also present development and implementation of QMS in Serbian ICT sector.

GENERAL PARAMETERS OF ICT IN SERBIA

It is very important that ICT become basic infrastructure for many companies in Serbia. In companies where ICT supports business processes, design and decision support, we notice increase of productivity and other positive economic indicators. General estimations stated by Serbia, Society for Information Technology (2003) are:

- 1,350,000 computer users and more than 600.000 computers
  - 4,00,000 business computers
  - 2,00,000 home computers
- 5,00,000 Internet users:
  - 5,000 web sites
  - 200 web stores.

Serbia has a population of 10,655,774 people, where 67.7 computers come on each 1,000 individuals and where 50 Internet connections come on each 1,000 individuals. Different research projects have (Serbia, Society for information technology, 2003, 2004; Stefanovic´ et al., 2005) come to the same conclusion that the Internet service market of will be in expansion for a long time in Serbia and Southeastern Europe. Possibilities for sale of Internet services for the Serbian ICT industry is presented in Table 1.

Table 1 Minimal possible sale of Internet services (in US$) (Serbia, Society for Information Technology, 2003)

Market	Sale in 2002		Sale in 2005	
	Millions of US ($)	%	Millions of US ($)	%
Serbian	8.0	66.7	25.0	75.8
Other republics of Former SFRJ (Slovenia, Croatia, Bosnia and Herzegovina, Macedonia)	1.0	8.3	2.0	6.1
Other Eastern European countries	3.0	25.0	6.0	18.1
Total	*12.0*	*100.0*	*33.0*	*100.0*

SERBIAN ICT INDUSTRY

The leading factor in reengineering and improvement of information systems in the Serbian industry is its domestic ICT sector.

According to research of Stefanović et al. (2005) Serbian information and communications industry consists of:

• over 1408 companies – predominantly small and medium privately-held companies (In Serbia, there are 835 companies developers software and there are 573 hardware manufacturers)

• the ownership structure of IT companies in Serbia is as follows: 95% are domestic companies, 3% are with mixed ownership and 2% are foreign companies,

• Strong information departments in large business entities with dominant development orientation,

• Universities and institutes with dominant focus on education in the field of ICT and implementation and development of ICT.

ICT industry's share in the gross domestic product of Serbia is 0.55% and its share of employment is 0.49%.

Advantages of the Serbian ICT industry are:

• quality of human resources

• competitively low costs.

Business analysis of the ICT industry is presented in Tables 2–6.

Number of companies in computer and related activities and number of companies in production of computing machines as well as import and export figures are presented in Table 2. It is obvious that Serbia has much larger import then export. Table 3 presents structure of companies in ICT sector by number of workers. Generally most of the companies have less then 5 workers and only 6 more then 100 workers (it is clear that Serbian companies do not have human resources for managing of large scale projects). Tables 4 and 5 give detailed information about increase of import in period of 2000 and 2003. Table 6 present ICT macro indicators and share of ICT in national economy.

Many analysis show that the Serbian ICT industry has better results than other industrial branches. But there are number of problems in the Serbian ICT sector. The Serbian ICT sector mostly consists of small and medium size companies. According to research of Stefanović et al.

Table 2 Structure of ICT – 1 January, 2004 (Serbia, Society for Information Technology, 2004)

	Total No. of companies	Total No. of active companies	No. of employed workers	Import I-XII 2003 ($)	Export I-XII 2003 ($)
Computer and related activities (nace:110072)	988	510	2883	7,459,911	1,269,185
Production of computing machines (nace:041230020)	470	369	2526	118,549,344	4,949,688
Total	*1458*	*879*	*5409*		

Table 3 Structure of employees (Serbia, Society for Information Technology, 2004)

	Total No. of empl.	No. of workers <5	No. of workers 5–10	No. of workers 10–20	No. of workers 20–50	No. of workers 50–100	No. of workers >100
Computer and related activities nace:110072	2883	376	78	28	23	1	4
Production of computing machines nace:041230020	2526	228	83	38	13	5	2
Total	*5409*	*604*	*161*	*66*	*36*	*6*	*6*

Table 4 ICT – trends 2001–2002 (Serbia, Society for Information Technology, 2003)

	computer and related activities (nace:110072)				Production of computing machines (nace:041230020)			
	No. of companies	No. of employees	Import ($)	Export ($)	No. of companies	No. of employees	Import ($)	Export ($)
2001	268	1512	1,840,310	388,817	508	4417	38,754,354	5,983,050
2002	330	2031	3,772,229	586,166	287	1895	65,594,601	4,118,170
2003	510	2883	7,459,911	1,269,185	369	2526	118,549,344	4,949,688

(2005) these companies are mostly oriented toward smaller projects, or they attach their business activities to larger business partners from abroad (Europe, USA).

Many highly qualified experts in the filed of information technology have left their companies and university centres and moved to the Western Europe and USA. That migration of highly qualified experts started in the first part of the 1990's and culminated in 1999. Unfortunately, Serbian economy is suffering as this migration is still happening. Some analysis show a lack of

Table 5 Import/export (Serbia, Society for Information Technology, 2003)

	Computer equipment	(car.tar. 8471)	Total	Serbia
	Import	Export	Import	Export
2000	50,451,821	2,805,921	3,356,294,222	1,561,366,100
2001	74,798,055	4,26,003	4,307,417,184	1,725,204,322
2002	135,785,186	2,920,715	5,637,968,429	2,080,709,855

Table 6 ICT macro indicators (Serbia, Society for Information Technology, 2003)

ICT macro indicators	Total income (millions $)	Share in gross domestic product (%)	Total No. of employees	Total No. of employees in Serbia (%)
Information technologies	$54	0.55	15,000	0.98
Telecommunication industry	$40	0.41	3900	0.29
Telecommunication traffic	$306	3	13,500	0.9

experts, in Serbia who are needed for information system development implementation, and reengineering.

There some other parameter characteristic of the Serbian ICT companies:

• Different levels of production capacities.

• Young inexperienced development teams.

• There are enough resources only for few platforms (Microsoft) because Serbian ICT companies are mostly small firms. This fact dictates that those companies should have very narrow specialisation, or that they have to cooperate among themselves.

• Telecommunication infrastructure is not very well developed.

Perspectives:

• Increasing export of software and services

• Development of infrastructure for modern economy.

Computer and communications technologies, the two elements of the ICT are transforming national and global societies and economies into information-driven societies and economies. Presently ICT account for more than 5% of the global GDP and much more in industrialised countries. According to Table 6 Serbian's ICT has less then 5% of Serbian GDP.

ECONOMIC INDICATORS

Some economic indicators can describe position of the Serbian software development industry. This industry should play important role in development of ICT solutions for the Serbian industrial and other sectors.

One important economic parameter is GDP/h (Gross Domestic Product per employee per hour–Table 7) It shows (as well as data in Table 8) that GDP in Serbia is very

low compared to the ones from the EU and other countries (using information form different reports (Stefanović et al. 2005; e-Business Watch, 2003; Europe, OECD, 2004)). This is the main reason for migration of experts.

The migration of experts in the field of ICT is a huge problem for Serbia and Montenegro. Middle age experts mostly migrated to developed countries.

The European Union borders the Serbian' North. So large numbers of experts use short distance and large demand for educated ICT experts and migrate to the EU. Large number of institutes, universities, developed centres and IT sectors have lost their development and research teams. So companies in Serbia do not have significant human resources to start with information system reengineering or development of their own solutions. Those companies do not have financial resources to buy standardised solutions. Another characteristic is that development teams are compound of young people without experience.

This is the reason why number of errors in software development process, in Serbia, is relatively high. Therefore, a price of a line of code is relatively high compared to wages and other economic parameters (Tables 9 and 10) (e-Business Watch, 2003; Europe, OECD, 2004; Stefanovic´ and Arsovski, 2004).

Other reason is absence of developed and implemented quality system. Even the larges companies do not have quality systems. Some of them even do not have inner procedures or conventions.

Table 7   GDP per employee per working hour

No.	Country	GDP/h ($)
1	Luxemburg	48.09
2	Norway	39.12
3	Belgium	37.77
4	France	36.06
5	Switzerland	35.27
6	Japan	35.20
7	Germany	35.15
8	Denmark	34.66
9	USA	32.27
10	Austria	32.09
36	Venezuela	5.18
37	Czech	5.04
38	Poland	4.94
39	Turkey	4.21
40	Russia	3.78
41	Columbia	2.57
42	Thailand	2.54
43	Filipinas	1.33
44	Indonesia	1.25
45	China	0.64
	Serbia	*2.97*

Table 8 Wages of employees in software development and software maintenance

No.	Country	Development ($)	Maintenance ($)
1	Switzerland	48,869	48,869
2	USA	46,550	43,495
3	Germany	42,058	34,848
4	England	38,785	38,179
5	France	36,750	41,250
6	Canada	35,156	33,846
7	Australia	34,940	30,644
8	Netherlands	33,994	47,069
9	Austria	33,000	33,000
10	Brazil	20,032	20,032
11	Italy	17,655	17,655
12	Columbia	16,000	16,000
13	Estonia	12,000	8000
14	Mexico	10,843	13,292
15	Serbia	6500	7000
16	India	3638	4316

These problems are multiplicities in the phase of software testing and documenting. It is important to mention that, generally speaking, small number of companies in the Serbian industry use standard JUS ISO/IEC 12207 from 1997, which supports the software life cycle.

PROBLEMS IN ICT INDUSTRY AND POSSIBLE ACTIONS

There are many different technical limiting factors that often preclude communities to enter in the ICT revolution are essentially two: an outdated infrastructure to support reliably adequate speed data, and the arbitrary high cost of the services. These technical limitations could be overcome by considerable financial investments. But there are many underlying problems such as the lack of sufficient well qualified human resources able to handle new systems and technologies. It is obvious that education system should educate better trained professionals for new jobs. This problem could be solved by improvement of education system. This approach as well demands time and financial resources.

ICT industry in Serbia is faced with many other problems (similar to all developing countries). According to the analysis comparing ICT sector (on sample of 93 ICT companies in Serbia; companies stated their major problems), Serbia is way behind developed countries of the European Union. Serbia is even behind neighbouring countries. Low level of investment, low number of employees in domestic ICT sector, weakness of ICT sector are characteristics of the Serbian ICT industry.

According to the analysis Stefanović et al. (2005) and Stefanović and Arsovski, (2004) following problems appear (Figure 1):

a *Economic and legal issues:*

- Unfair competition of foreign company
- Unfair competition in public purchases (and absence of mechanisms for confirmation of tenders)

Table 9   Number of errors on 1000 lines of code

No.	Countries	No. of errors
1	USA	1.6
2	Japan	1.8
3	England	2.1
4	Germany	2.2
5	Israel	2.3
6	Italy	2.5
7	France	2.5
8	Switzerland	2.5
9	India	2.6
10	Greece	2.8
11	Norway	3.6
12	Ireland	3.7
13	Canada	3.9
	Serbia	4.6

Table 10   Price per line of code – (LOC – Line of Code) documented and delivered

No	Country	Price of supported LOC ($)	Price of documented and delivered LOC ($)
1	Switzerland	1.6	27
2	Germany	1.3	22
3	Japan	1.2	21
4	Denmark	1.1	19
5	USA	1.1	18
6	France	0.8	13
7	England	0.7	11
8	Israel	0.6	11
9	Italy	0.6	10
10	Canada	0.6	10
11	Ireland	0.6	10
12	Greece	0.4	6
13	Serbia	0.4	5
14	India	0.3	5

- Owner transformations in the industry
- Software legalisations
- Absence of a law for electronic signatures and other regulations and accompanied papersLack of financial resources
- Necessary support of the government in development of:
  - o ICT, special software industry; this industry is export oriented and should be declared as one of the priorities of the political economy
  - o Develop and implement concept of scientific – technical parks (good examples are India, Ireland, Israel)

b *Problems in ICT sector:*

- Absence of stimulation in fiscal politics for intensive development of ICT
- Inappropriate loan politics of banks for ICT projects
- Absence of necessary support
- For Serbian ICT industry in promotion on the foreign marketHuman resources:
- Migration of educated experts, caused by the current economics
- Inadequate age structure of employees caused by migration of young experts

- Absence of qualified teachers in the education process; inappropriate curriculums and un-harmonisation of curriculums with the Bologna declaration
- Inappropriate stimulation in politics of employment of young experts
- Small number of experts employed in IT centres in different companies (in Serbian companies IT sectors have 2–3 times smaller number of employees, compared to the similar industries and companies in the European Union)

c *Problems attached to infrastructure:*

- Inadequate telecommunication infrastructure (Serbia has high-cost and low quality telecommunication services).
- Low level of quality systems (very few companies in the ICT sector have developed and implemented quality systems. Research was performed on larges Serbian ICT companies Digit, Spinnaker ComTrade, SAGA, Informatika AD). This problem was elaborated and partially solved in project described above.
- Development of infrastructure IS have to have priority e Hardware problems:
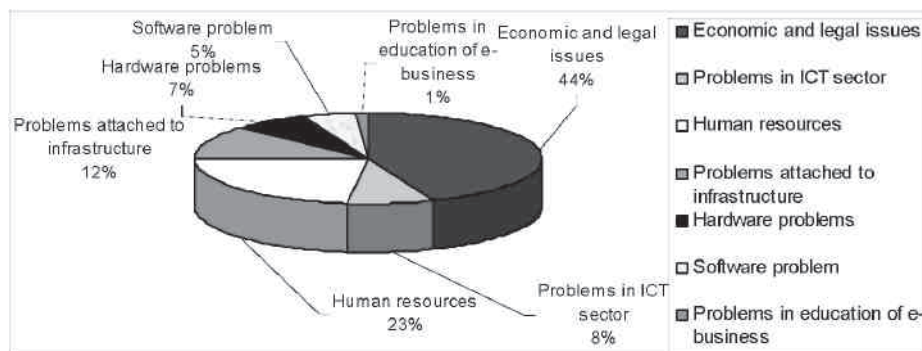

Figure 1 The major problems in Serbian ICT industry (% answers)

d *Hardware problems:*

- Usage of low configuration working stationUsage of low configuration serversUsage of low configuration network components

e *Software problems:*

- Lack of appropriate products due to high cost
- Lack of integrated software solutions (Large number of companies have 'information islands' instead of integrated solutions)
- Large number of companies have their information systems developed based on prior legacy platforms, DB solutions and development tools
- Usage of their own solutions – usually this solutions are not quality ones
- Lack of financial and human resources for implementation of complex, integrated IS (made by domestic or foreign companies)
- Very low percent of presence of complex solutions (ERP, SCM, CRM and EDI.)
- Lack of developed methods, methodologies and approaches for reengineering of information systems in the Serbian industry, respecting specific situation of the Serbian metal processing industry.

f *Problems in education of e-business: Lack of education of IT managers*

- Lack of expert preparation for implementation of digital signature
- There is a low level of implementation of different standards for data exchange (XML) and standard software development tools

- Low level of quality web hosting for e-sores and support of e-business.

There are many possible actions that could improve present condition in ICT industry in developing countries:

- Implementation of politics and actions for stimulation of ICT development
- Support for development and design of few ICT products
- Support for domestic software development industry
- Development of Quality Policy for ICT sector
- Improvement of education on all levels
- Government should make tax stimulations for employment of young experts in the field of ICT, reduction of taxes on projects oriented on development and implementation off ICT
- Support for development of e-business environment
- Development of telecommunication infrastructure
- Development of methodologies, methods, approaches and patterns for information system reengineering.

Some of possible actions are connected with significant financial investments and long time for implementation (improvement of infrastructure, education (Lynch and Szorenyi, 2005), financial support (Sihvonen, 2006; Bagchi and Putnam, 2004). Some other actions are accompanied with government interventions and development of general ICT framework. Development of Quality Policy for ICT sector on the other hand does not demand high financial investments or eider long time. Since quality of products and/or services is directly proportional with the quality built into

every step of development process (Berg, 2006). Improvement, development and implementation of Quality Policy for ICT could produce significant benefits at reasonable cost or benefit ration. Of course many other approaches could be employed to improve ICT industry in Serbia, such as: education in order to overcome skilled manpower shortage or improvement of infrastructure. But this paper discusses improvement by strengthening of quality management, because this approach does not need large amount of financial investments or long time. According to different experiences and clear.

STRENGTHENING QUALITY MANAGEMENT, CAPABILITIES AND INFRASTRUCTURES IN SERBIA TO SUPPORT ICT INDUSTRY

QMS is a collective term for methods and techniques developed to ensure the quality of products and processes in a company. It's usually represented as a formal set of process descriptions, procedures and routines that the company wants their employees to follow. A QMS can often be seen as existing of three parts that altogether makes up a complete QMS:

- The documented QMS – documented routines and procedures in the company, job descriptions, quality handbooks

- The formalised QMS consists of both the documented QMS and other non documented routines in the company.

- The practical QMS which contains the former two, but also includes aspect of "how we do it", which is non-documented and non-formal routines that may evolve in a company. This is the culture, norms and rituals that exists in the company.

There are various different standards for making formalised QMSs and each company has to perform an individual effort to support their development and production (Hagel and Brown, 2001). In paper the focus will be on QMS made for ICT industry.

Different countries have different results in this field (some of them are neighbouring country or countries all over the world). According to Bulgaria, Bulgarian ICT Cluster, (2006) Bulgaria has 87 firms having achieved the ISO 9001 standard. Bulgarian ICT organisations have recognised Capability Maturity Model Integration as a reference model for their software process improvement programs.

Today, a majority of the companies in India have already aligned their internal processes and practices to international standards such as ISO, Software Engineering Institute – Capability Maturity Model (SEI – CMM (USA, Naval Centre for Cost Analysis)), Six Sigma, etc., which has helped establish India as a credible sourcing destination. According to Dutta and Sekhar, (2004) as of December 2005, over 400 Indian companies had acquired quality certifications with 82 companies certified at SEI CMM Level 5.

Dutta and Sekhar (2004) stated that the quality practices in IT industry could evolve through three distinct stages:

- The first stage was the creation of basic processes to handle all activities relating to order fulfillment (Implementation of ISO 9000 standards). This ensured consistent and orderly execution of customer engagements and provided a framework for measurable improvement.

- The second stage was associated with a focus on software engineering, which was often achieved by companies aligning their QMS with the CMM framework.

• The third stage was driven by the desire to institute processes, metrics and a framework for improvement in all areas including those relating to sales, billing and collection, people management and after sales support and all accompanied processes.

The stages have not been strictly linear, as organisations have continued to build on accomplishments even as they moved on to the next stage. For instance, organisations certified to the ISO 9000 family are migrating to the new ISO 9001:2000 standards. Organisations assessed on the CMM framework are aligning their QMS to the new CMMI framework (Dutta and Sekhar, 2004).

Since the gap between Serbian ICT industry and ICT industry in Europe is wide one possible approach for improvement of ICT sector is development of quality infrastructure to support ICT and to support rapid improvement of quality in ICT industry by integration of many aspects of three stages approach in quality improvement through strategy and quality policy.

European Agency for Reconstruction and AFNOR started project "Strengthening Quality Management, Capabilities and Infrastructures in SCG", project beneficiary was Union of Serbia and Montenegro (SCG). The project covered Serbia, Montenegro and Bulgaria as well. Quality policy was implemented in Serbian ICT industry, tourism in Montenegro and textile industry in Bulgaria. The mission of project is to develop competitiveness in the ICT sector in Central and Eastern European countries by promoting proven methodologies for establishing and continually quality improving adequate work processes.

The overall objectives of this project are as follows:

• Assisting the government in adopting a general framework policy for the integration of the *acquis* in the field of standards and technical regulations. Developing an updated national Quality Plan for the ICT industry (for Serbia).

• Strengthening the Federal Office for Standardization (SZS), in order to support the integration of European and International standards into national standards collection and to increase their diffusion in the industry.

• Establishing the conditions for future international recognition of tests and calibration results, as well as certificates by restructuring the National Accreditation Body (JUAT).

• Implementing a strong and recognised national metrology institute, and establishing the conditions for international recognition of the calibration and measurement certificates.

• Developing selected certification bodies with the capacity of establishing the Notified Bodies necessary for the implementation of the NA Directives. Developing selected testing and calibration laboratories to improve confidence in test reports and to ensure the traceability of measurements conducted in SCG.

These steps must ensure strengthening quality management, capabilities and infrastructures in Serbia and further more to define integrated Quality Policy for ICT sector.

Case study: development and implementation of QMS

One of the most important element is definition and implementation of politics and action plan of quality in companies that represent different branches (ICT n Serbia, tourism in Montenegro and textile industry in Bulgaria). The main goals of these plans are:

Table 11 Strategy – goals matrix

Goals	Strategy											
	Improvement of marketing activities	Improvement of sale conditions	Continuous improvement of quality	Orientation to better post-sale activities	Management of expanses	Improvement of education processes	Purchase of modern hw/sw	Improvement of planning process	Improvement of measurement process and monitoring	Improvement of resources management	Implementation of modern methods	Improvement of conditions of work (salaries)
Increase number of customers	*	*	*	*								
Increase of sale	*	*	*	*							*	
Increase of quality	*	*	*	*	*		*	*	*	*	*	*
Increase of technological level						*	*			*	*	*
Definition of terms							*	*	*	*		
Improvement of processes			*		*		*			*	*	
Increase of motivation level							*					*
Increase of level of knowledge			*			*	*			*	*	*

- Useful results for companies, which will improve quality of products, processes and services

- Development of Quality Policy for ICT sector

- Contribution to improvement extern and inner characteristics of all interest parties (ICT industry).

The strategy – goals matrix for implementation of QMS in ICT company is presented on Table 11. This strategy goal matrix contains many goals and strategies that are covered with three stage model for ICT industry.

The ultimate, indirect beneficiaries of the project is the industry and consumers of the Serbia and Montenegro, who will benefit from modernised quality infrastructures able to support the competitiveness of the industry and to ensure compliance of products with essential requirements. Improvement of quality and implementation of QMSs in ICT industry and ICT sectors in other industries should improve condition of IT in Serbian companies. This project is still in the progress in the phase of implementation of Quality Policy in ICT industry.

In this paper we selected one company from ICT sector from Serbia-Digit – Belgrade. DIGIT company from Belgrade is recognisable on Serbian service market of IT (Information Technology) by usage of modern technology (brand name) and build in this technology in integrated products (ERP solutions, networks, services and training). Company is working as stock company for 14 years and now it is in mature phase.

Domestic market has following characteristics: foreign competition with higher quality of products and services; increase sale of product substitutes from Far East; changing in demands and habits of customers; leading experts are leaving domestic companies. Those are the reasons why selected company needs system approach to develop effective and efficiency development policy in order to achieve our strategic goals and become leader in our filed.

Project of implementation of QMS could be presented in following phases:

1   Project phases

| No. Name	Time (month)								Responsible
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	
1 Analysis of present condition									KONS
2 Training for QMS									KONS
3 Development of QMS documentation									PRK
4 Implementation of QMS documentation									PRK
5 Inner audit									KONS
6 Certification									KONS
7 Maintenance and improvement of QMS									PRK

PRK: Manager responsible for quality.
KONS: Consultants.

2 *Selected methods*

- Monitoring of current stage
- Development of QMS documentation
- Implementation of QMS documentation
- Inner audits
- Certification
- Maintaining and improvement of QMS.

3 *Action plan*

| Actions and steps | 1. year | | | | | | | | | 2 |
| | | | | | | | | | | 1T |
	Apr.	Mar.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov	Dec.	2T
Monitoring of current stage Development of QMS documentation					△——△ ▲——▲					
Implementation of QMS documentation						△——△ ▲	▲			
Inner audits							▲			
Certification								▲		
Maintaining and improvement of QMS								▲△		

Action, planned step △——△   △
Action, realised step ▲——▲   ▲
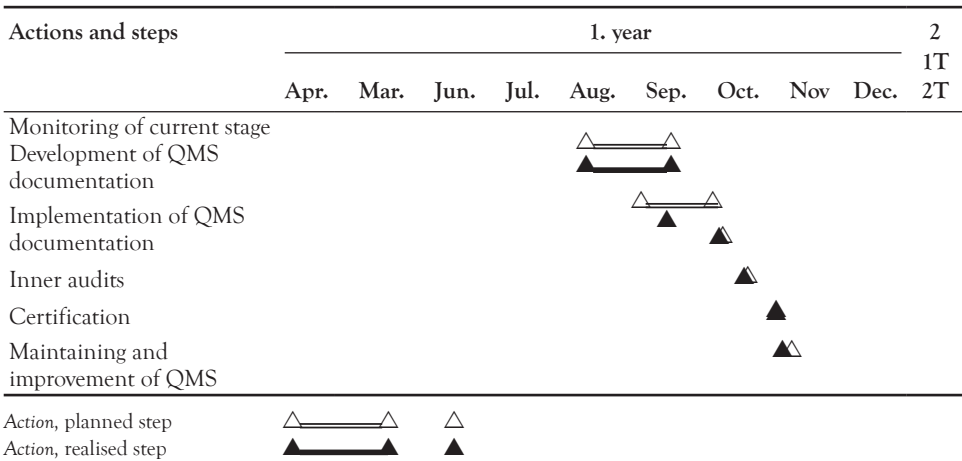
4 *Results and evaluation approach:*

○ *Project results:*

- Improvement of process quality – 6%/year
- Improvement of quality of service – 7%/year (level 3 CMM – The process is documented, standardised and integrated.)
- Certification for having better starting position in public tenders and marketing promotion
- Number of errors per SLOC is decreased for 27% (level 2 CMM – counting source lines of code).

○ *Evaluation approaches:*

- method of expert evaluation
- compare planned/realised.

This approach contributes to improve extern and inner characteristics of ICT industry. Defined Quality Policy and implementation of quality system in ICT sector produce significant results. There were 47 ICT companies that improved there performances by implementing quality policy for ICT sector. Average improvement of process quality is 5%/year, improvement of quality of service is 6%/year and reduction of errors per SLOC was 20%.

Quality Policy for ICT sector will produce the following outcomes:

- Increased productivity/decreased cost
- Increased competitiveness
- Increased 'on-time' deliveries

- Increased employment in software and ICT industries

- Increased software exports

- Aligning QMS with CMM

- Improved competitiveness of local industry, especially SMEs, through the use of ICT

- Improved quality of ICT industry managers, professionals and workforce.

The principal target group for this program is ICT industry, ICT training institutions and ICT-related professional associations. All of them have road for improvement of their quality and competitiveness.

CONCLUSION

According to the analysis of ICT industry, Serbia is behind developed countries of the European Union, developed countries of Far East and USA.

The main reason for this situation is specific economic situation and insufficient financial resources for ITC sector, and small and underdeveloped ITC sector. According to the analysis following problems appear in: economic and legal issues, human resources, problems attached to infrastructure, hardware problems, software problem, and problems in education of e-business.On the other hand we can define list of actions: implementation of politics and actions for stimulation of ICT development; Support for development and design of few ICT products, support for domestic software development industry; development of Quality Policy for ICT sector; improvement of education on all levels; government should make tax stimulations for employment of young experts in the field of ICT, reduction of taxes on projects oriented on development and implementation off

ICT; support for development of e-business environment; development of telecommunication infrastructure; development of methodologies, methods, approaches and patterns for information system reengineering.

One possible approach for improvement of ICT industry is implementation of quality policy. There are different stages and approaches in implementation of quality in ICT, starting with ISO standards, QMS and migration toward CMM. This paper presents Quality Policy implemented in Serbian ICT industry in order to present integrated approach and to cover aspects from different stages in order to rapid improve quality and shorten needed time.

The ultimate, indirect beneficiaries of improvement and development of Quality Policy in ITC sector will be the industry and consumers of the Serbia, who will benefit from modernised quality infrastructures able to support the competitiveness of the industry and to ensure compliance of products with essential requirements. Improvement of quality and implementation of QMSs in ICT industry should improve condition of ITC companies in Serbian and make step toward aligning quality policy with CMM. Case study that covered 57 companies shown significant results: improvement of process quality – 5%/ year; improvement of quality of service – 6%/ year; certification for having better starting position in public tenders and marketing promotion; number of errors per SLOC is decreased for 20%. It is clear that implementation of QMS and Quality Policy in ICT industry could lead to significant improvement on considerably low costs. Integrated appraoch will ensure useful results for companies, which will improve quality of products, processes and services., dvelopment of Quality Policy for ICT sector and contribution to improvement extern and inner characteristics of ICT industry.

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