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Online Services Management Support for an Intelligent Locality

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Abstract. *As the number of habitants of large cities is expanding, put greater pressure on city infrastructure delivering vital services, such as health, education, public safety and transport. These efforts are added to changing public demands for better information, better education, environmental programs, a more open government, lower maintenance costs and other housing options for older people. Therefore, to achieve these goals, it must take into account the quality of all services, but especially the quality of online services based on the use of modern information and communication technologies.*

The management of service quality on-line offers a performance evaluation and comparative analysis of indicators. He also works as a decision support to improve the quality of online services and increasing customer satisfaction, essential elements in an intelligent city.

Keywords: intelligent locality; online services; Internet; virtual networks; quality management.

JEL Codes: R15, O30.
REL Codes: 8E, 18D.

1. Introduction

Technology knowledge society is an integral part of the life of any consumer, the result of exponential growth in the number of users. This is why the telecommunication networks have steadily progressed, and lately even spectacular. They are always created new services, new technologies are developed and new networks to face the market demand for telecommunications services.

For certain geographical areas, the existence of telecommunications networks offer possibilities for remote communication, remove the differences caused by lack of information and isolation. Appropriate use of modern technologies in order to increase the accessibility of quality information can lead to reduced administrative and social costs.

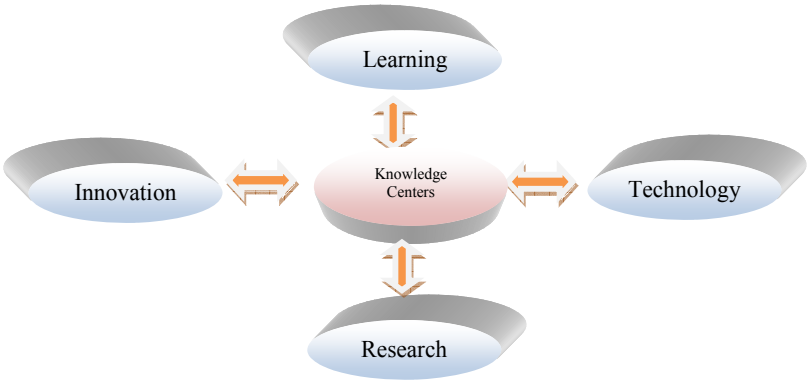

Figure 1. *Interconectarea prin intermediul centrelor de cunoaştere*

Centers of knowledge (Figure 1), an important step towards the area of intelligence, is the facility to use new technologies in a public place by members of a community. Local knowledge centers, spaces available to citizens, equipped with at least two telephone sets, two computers and a fax enable initiating and receiving telephone calls, facsimile and data communications at a data rate sufficient for functional internet access. Knowledge centers have appeared in all countries, regardless of development, following the desire of removing the negative effects: lack of training opportunities, employment, and migration of rural population to urban centers due to lack of access to information on benefits offered by new information technologies. In Peru were made in 2005 according to data provided by ERTIC (Establecimientos Rurales of the Information Tecnologias y la Comunicacion) 50 rural telecenters and are intended to be implemented in the period 2006-2009 approximately 1,050. In 2007 there were 700 rural telecentres in Hungary and

at present there are around 1,000. Important to note is that remote areas (islands) can have such access to modern information technologies. Projects and implementation of knowledge centers exist in most countries, such as those developed and the developing. For centers known to exist in time (Roşca et al., 2006) have to consider how funding and evolution of these in relation to changes that occur constantly in the society. Centers of knowledge are a real support for localities to build a smart being a window into training, training and knowledge. The next which is to be made is to increase the efficiency of these centers of knowledge thus leading to an increase in the level of training, the knowledge acquired by members of the society which opens perspectives for the knowledge society. The qualitative improvement of knowledge centers become virtual networks, within which is becoming increasingly used in today's society. Each center has its own guidance their knowledge center focused on areas of activity: medicine (eg, Knowledge Center – Texas Medical Association), education (eg, University of Illinois Educators' Knowledge Center).

We are currently talking more and more about interconnected virtual networks of local communities to provide information and online services to citizens and businesses. Networks are set up according to the needs of each community, city and ensure, through broadband connections, access to information and electronic services for the main institutions of the locality. Virtual network serving as knowledge centers provide access to telephone services, Internet and computer use, providing a great educational value. By building specific skills, students will be able to contribute actively to the value added of the educational process and to develop personal criteria for the selection and use of information. To adapt new technologies to social needs, to be able to exploit the potential, first it has to be possible staff training institutions and enterprises and the population. Appropriate use of modern technologies in order to increase communication, accessibility can lead to reduced administrative and social costs.

2. Intelligent locality

Future developments in localities will have virtual networks, the growing dependence of modern technologies (Roşca et al., 2006), but also the elimination of bureaucracy, to reduce working time in exchange increase free time. In a intelligent locality the time and space restrictions are virtually nonexistent thus contributing to reducing social division. The creation of such places requires the construction of transportation systems, government, education, health and public policy more intelligent and also uses energy and water resources in an efficient manner.

According to the latest data in the field (Pacesila, 2007, pp. 12-23), unprecedented urbanization that we face is both a symbol of economic and

social progress and a huge burden on infrastructure planet. This is particularly a problem experienced by drivers of economic departments, school administrators, police officers and other persons in positions of leadership. Tasks that these leaders have met them - educating young people, maintain safety of citizens, attract and facilitate trade, implement a safe system of public transport are particularly difficult to manage in these times of economic decline. None of these systems is the responsibility of one entity or decision maker, all involving leading institutions, companies, communities and civil society, which are interconnected. For why, we need an infusion of intelligence in how our cities work. This infusion is currently producing the systems, processes and infrastructure that make it possible for physical property to be developed, produced, bought and sold, services are provided, everything from people and money to oil, water and electrons to move and billions of people to work and live. Indeed, almost anything – person, object, process or service to any organization, large or small – can become aware of the prospects digital infrastructure and can be connected in a network.

In IBM's vision of 2009, an intelligent locality requires: a transportation system smarter, faster and more effective interventions in emergencies, a more intelligent management of water and electricity, a more intelligent administration and health and education systems more intelligent one. This vision brings a new level of intelligence on how the world works – how each person, company, organization, government, natural and artificial system interacts. Each interaction is a chance to do something better, more efficient, more productive. But more than that, as all systems are intelligent planet, we have a chance to open up significant new opportunities for progress. Thus, virtual networks, through their impact on the town, put their imprint on the individual, but also the physical environment, economic and social.

Enormous potential of modern information and communication technologies are deployed throughout the world, being implemented in many systems that are interconnected and subject to an infusion of intelligence (Alpopi, 2008, pp. 57-68), led and lead conversion important activities from a locality in operations smarter.

For some localities, the modern society which is based on the use of modern information technologies constitutes new possibilities for expression of identity and cultural traditions, and for other regions an opportunity to minimize inconvenience related to distance and isolation.

European Union uses the names of "Telecities", "Cities On Line", "Intelligent Cities", "Digital Cities", etc. for projects in the United States are known as "Freenets. Terms listed above are used for local programs to foster the idea of efficient use of modern technologies, which in turn would stimulate development.

Amsterdam, Birmingham, London, New York, like IBM view (August, 2010), are just some of the locations where they see the results of

implementation solutions to a location intelligence evolution. They have implemented various intelligent solutions. Interconnections of all intelligent systems implemented locally go to a intelligence locality.

City of Stockholm, for example, developed a traffic surveillance system, allowing its citizens to decision makers. In Germany, MVV Energie AG, a company providing electricity, created the "market" energy based on the collaboration of all elements that are part of the supply chain, from suppliers and to consumers who wanted a change. In London, the desire of citizens for improved public safety led to the installation (by groups of private and public) has over 10,000 surveillance cameras that provide information 24 hours a day.

City intelligence provides a more clear view on all local issues, on how you can communicate more intelligently the necessary information and people seeking to visit a place, giving them accurate information about climate change, health care, education and banking, those related to transport systems and water management systems and electricity supply, as well as 3D image elements of local interest. In addition, various products made available to guide how best to those who are for the first time in this village but also for those who want to quickly reach a certain point.

According to Doukidis (2004), all developed countries have developed and implemented government policies supported concerning the development and adoption of modern information and communication technologies, strengthening the national information infrastructure, training and attracting specialists in modern technologies, the adult education, cooperation with private sector and encourage investment in this new economic branch, promoting government projects designed to demonstrate the utility of current society services.

City today is the result of remarkable progress made as a result of using information and communication technologies. Economic changes caused by the transmission, storage, processing and access to information and knowledge put their imprint on society. Locality aims to become intelligence through modern information and communication technologies daily activities are carried out more easily and efficiently.

Although Romania is not in a very advanced stage on the use of modern information and communication technologies, there are some tests and some achievements which are increasingly approaching knowledge society. Projects directory computerized of prefectures and town halls, designed by professional bodies at national level, are a first point of departure in the use of modern technologies. Current national developments were due in large measure both technological advances and new economic policies of privatization and promoting competition in the market of new information technologies and communications, new technical and legal regulations in the field, new national and regional strategies of development of society.

Advantages and benefits of intelligent locality: Alignment with the latest technologies in the field of information; Example openness to modern technology; reducing costs; degree of sports in case of disasters; better communication with citizens and gain a picture; the transparency achieved; awareness of citizen participation in economic, social, cultural community life; democratization of information by providing coherent, consistent, updated data; improved access to national and universal culture by accessing databases of information and documentation; reducing the amount of work attributed to public servants and default time for solving citizens; reduce errors; higher information's security and transactions entered effectuate; training human resources on a large scale, the phenomenon of mass.

It is noted that the benefits of intelligent locality are based on access to use online services, and on interconnection**.** Therefore it is considered essential to assess the quality management model in the context of online services at the level of an intelligent locality**.**

3. The quality management framework

Quality plays an integral role in all aspects of management. Delivering good quality products and services on time and on budget is every project manager's goal. The purpose of a quality management process in a project is to ensure that its activities are appropriate for the project, to identify and report successful results, and also to identify and report those activities and processes where is still room for improvements and use this as a reference for the subsequent phases of the project and for future projects.

There is a multidimensional relationship between the quality of a service and the organization that is providing that service. Some of the factors that are making this multidimensional relationship are: business strategy, organization knowledge, available resources, etc. The Quality Management Framework (QMF) helps placing into context this multidimensional relationship between the organization and it’s provided services.

The following terms and their definition are part of the Quality Management Framework (Baker, 2008, pp. 1-34):

- Object (entity);
- Process;
- Requirements;
- User;
- Evaluation;
- Measure and measurement;
- Quality.

The object or entity in the QMF context refers to any product, service, process, activity, etc. to which quality can be applied. The quality of an object (entity) is directly related to the quality of the process used to create or deliver the object (entity).

Requirements are the sole purpose of producing a product or offering a service. The degree in which the final product or service meets initial requirements affects the quality of the product or service. The user formulates requirements and is the beneficiary of the product or service. The user can provide feedback in regards with the product or service that is being offered.

Evaluation is a qualitative process to analyze the degree in which requirements have been fulfilled. Measure and measurement is a quantitative process where quality metrics are being defined and calculated to enable quantification in the quality management process.

Quality represents the degree in which the object (entity) satisfies user's requirements.

The quality documentation is a record of progress and it supports continuity of development as the development team changes.

Quality management is comprised of the following activities:

- *Quality assurance* – Establish organizational procedures and standards of quality.
- *Quality planning* – Select applicable procedures and standards for a particular project and modify these as required.
- *Quality control* – Ensure that procedures and standards are followed by the software development team.
- *Quality management* – It should be a separate process from project management.

There are many methods and standards to improve quality of services and/or products including: ISO standards, Six Sigma and PDCA (Plan, Do, Check, Act).

As an example, ISO 9000:2000 and ISO 9000:2008 standards are based on the following quality management principles:

Principle 1: Customer focus – organizations depend on their customers and therefore should understand current and future customer needs, should meet customer requirements and strive to exceed customer expectations.

Principle 2: Leadership – leaders establish unity of purpose and direction of the organization. They should create and maintain the internal environment in which people can become fully involved in achieving the organization's objectives.

Principle 3: Involvement of people – people at all levels are the essence of an organization and their full involvement enables their abilities to be used for the organization's benefit.

Principle 4: Process approach – a desired result is achieved more efficiently when activities and related resources are managed as a process.

Principle 5: System approach to management – identifying, understanding and managing interrelated processes as a system contributes to the organization's effectiveness and efficiency in achieving its objectives.

Principle 6: Continual improvement – continual improvement of the organization's overall performance should be a permanent objective of the organization.

Principle 7: Factual approach to decision making – effective decisions are based on the analysis of data and information.

Principle 8: Mutually beneficial supplier relationships – an organization and its suppliers are interdependent and a mutually beneficial relationship enhances the ability of both to create value.

4. On-line services quality management metrics in intelligent locality

A Quality Management Framework in the context of on-line services has the following components: on-line service as object (entity), on-line service development and delivery process as process, business and consumer as users, specific service request as request as requirements, evaluation and measurement of the e-service to determine its quality.

On-line service quality management process uses surveys and questionnaires to evaluate the following qualitative aspects of the e-service:

- Awareness – the degree of which users are aware of the on-line service existence and its features.
- Expectations – what users think that the on-line service offers.
- Accessibility – the degree of which all individuals can access service regardless of education, age, sex, culture, religion or the existence of any physical handicap.
- Driving reasons for use – what made the user access the on-line service instead of using the traditional method.
- Use preventing reasons – what prevents the user from using the service.
- Feedback on additional features needed – what users are requesting in order to enhance their experience while using the on-line service.
- User impact – how on-line service changes user's routine.
- Overall satisfaction – how satisfied the user is with on-line service, overall.

Qualitative characteristics of the on-line service are helping to construct an image of the current level of quality. They do have the disadvantage though that they can't be used in calculations, that they are difficult to compare or aggregate, can't be used trending analysis and targets can't be set-up for them.

The quantitative metrics of the quality management framework eliminate the disadvantages of qualitative evaluation. The following are metrics that can be included in the QMF for on-line services:

Accuracy represents the percentage of the number of times the on-line service has provided accurate results to users' requests.

The degree of satisfaction (Pocatilu, 2007, pp.122-125) can be computed as:

$$DS = \frac{\sum_{i=1}^{p} DSR_i}{TR}$$

where:

DSR – the degree of satisfaction for the requirement i;
TR – total number of requirements;
p – the number of requirements.

The degree of satisfaction for a user of executive requirement is a value from 0 (no satisfaction) to 1 (fully satisfied).

Repeat consumers represent the percentage of users that have used the same on-line service more than one time.

Awareness represents the percentage of targeted users that are aware of the e-service existence and its features.

Cost represents the fee that has to be paid to access the service. It can be expressed as per-use cost or per-membership cost. Per-use cost implies that the user is going to pay a fee every time he is accessing the service, where per-membership cost implies that the user pays a fee once a period, usually in advance, and gets access to the e-service for that period.

In (Pocatilu, 2007, pp. 122-125) the *cost of resources* takes into account the category of resources and the cost per unit for each category:

$$C = \sum_{i=1}^{w} NR_i \times d_i \times p_i$$

where:

NR_i – number of resource from the category i;
p_i – price per unit for the resource category i;
d_i – units of usage for the resource category i.

The total cost of on-line service can be defined as:

$$C_T = \sum_{i=1}^{k} c_i ,$$

where:

k – the number of project phases;
c_i – the cost of all resources from the phase i.

Request of satisfaction based on time represents the time consumed to access the on-line service. Depending on the e-service nature it can be expressed in seconds, minutes, hours, days, month and even years.

$$R_2 = \frac{\sum_{i=1}^{n} O_i}{T}$$

where:

T – period of time;

O_i – the output *i* (deliverables, results).

At a national level the following indexes are used for comparative assessment of the states' ability to deliver on-line services and products to their citizens.

Web measure index is based on a five stage model (emerging, enhanced, interactive, transactional, and connected) and ranks countries based on their position through the various stages.

Telecommunication infrastructure index is a composite index of five primary indices, each weighting 20% in the total value of the index:

1. Internet Users /100 persons;
2. PCs /100 persons;
3. Main Telephones Lines /100 persons;
4. Cellular telephones /100 persons;
5. Broad banding /100 persons.

Human capital index is a composite index of the adult literacy rate and gross enrollment ratio. Adult literacy rate is weighted 67% and gross enrollment ratio is weighted 33%.

Readiness index is a composite index comprising the web measure index, the telecommunication infrastructure index and the human capital index.

Table 1

E-Government readiness for Eastern Europe

Country	Indicator 2008	Indicator 2010	Position 2008	Position 2010
Czech Republic	**0.6696**	**0.6060**	**25**	**33**
Hungary	**0.6494**	**0.6315**	**30**	**27**
Poland	**0.6134**	**0.5582**	**33**	**45**
Slovakia	**0.5889**	**0.5639**	**38**	**43**
Ukraine	**0.5728**	**0.5181**	**41**	**54**
Bulgaria	**0.5719**	**0.5590**	**43**	**44**
Romania	**0.5383**	**0.5479**	**51**	**47**
Belarus	**0.5213**	**0.4900**	**56**	**65**
Russia	**0.5120**	**0.5136**	**60**	**59**
Moldavia	**0.4510**	**0.4611**	**93**	**80**

As we can see in table 1, Romania ranks 6th in Eastern Europe and 47 in the world in the report by the United Nations - e-Government Survey 2010.

5. Conclusions

On-line services are offering speed, efficiency, flexibility and innovation to their users. In most of the cases they are available 24/7 and accessible from any location. E-services are mostly paperless which therefore they have a lower environmental impact than traditional paper based public administration services.

The management of service quality on-line offers a performance evaluation and comparative analysis of indicators. It also works as a decision support to improve the quality of online services and increasing customer satisfaction with essential information in an intelligent city.

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