

E-SERVICE QUALITY MANAGEMENT

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Abstract: *A characteristic of today's society is the increasing use of modern information and communication technologies in all areas. Computer applications, called e-services, are being developed to provide efficient access to services, electronically. Quality management systems are needed to provide a consistent way to select, evaluate, prioritize and plan the right e-services. The increasing use of e-services has raised the need to define standards and means to assess and assure quality. Investment in e-services is an important step to improve the quality of life in our dynamic society.*

After a brief introduction that describes the adoption of electronic services in individuals' daily routine and the need for quality management, this article defines in its second chapter terms and concepts that are part of the Quality Management Framework. Then, the third chapter describes what e-services are, how they are classified and also their benefits to the user followed in the fourth chapter by definition of means to evaluate and metrics to measure the quality of e-services. In the end, this article restates the benefits of e-services, the need for e-service quality management and unveils future development initiatives in domain.

Key words: *E-services; Quality Management; Quality Management Framework; Quality Standards*

1. Introduction

In the last years, alternative ways to the traditional service providing have been introduced, taking advantage of the latest advances in information and communication technologies: e-government for public administration services, e-commerce as an alternative to classic retail, e-education or long distance education for those students that time and location don't allow them to attend traditional classes, multimedia centers and virtual

libraries for those looking to enrich their cultural knowledge on demand, remote working that allows employees to perform their tasks from their home office.

Is not a news anymore that the Internet and the advanced technology has influenced the way in which we perform our daily tasks, the way we live, the way we do business, the way we shop, the way we learn, the way we communicate and the way in which we spend our spare time. The alternatives to the traditional service providing, offer flexibility, speed and innovation.

Usability is one of the main issues that have to be addressed with the introduction of electronic services. Usability is an issue due to individuals' diversity and the need to operate a computer to access electronic services. In order to increase usability, existing quality standards for products and services need to be adapted to provide means to assess, assure and improve the quality of e-services.

Quality management concepts and terms and their definitions and description define the quality management framework.

2. The Quality Management Framework

Quality plays an integral role in all aspects of management. Delivering high 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 [1]³:

- 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 [11].

3. E-Service Definitions and Classification

About e-services [13] views them as an interactive, content-centered and Internet-based customer services, driven by the customer and integrated with related organizational customer support processes and technologies with the goal of strengthening customer-service provider relationship.

Technological progress depends on the access to more and more services (figure 1). New society proposes to made innovation and to produce knowledge and using e-services.

Technology in fact wouldn't exist without innovation and e-services. It is all about efficiently use of knowledge and innovation through e-services. All technology we have was a result of someone inventing a better way of doing something, a better service.

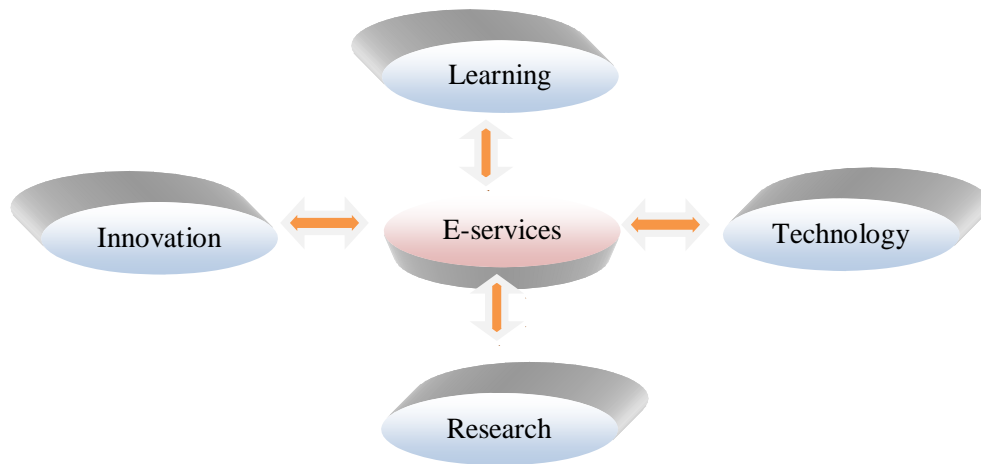


Figure 1. E-services interconnection

E-services are a key concept and a main source of interactivity, subject of many studies in social sciences.

We consider the research of characteristics most important in discussion about e-services, because through these the content of e-service concept can be defined properly.

E-Services have two main characteristics:

- The service is accessible with electronic networks;
- The service is consumed by a person via the Internet;

About e-service [9] say that they are:

1. e-services are intangible in their nature. They can't be seen and can't be palpable. The e-service is intangible, if the customer is only using e-services to select and pick-up the most interesting objects.
2. e-services contain various processes the users have to follow in order to get the service.
3. e-services are perishable. This is the characteristic of e-services that doesn't let us save, store, resale, or return them.
4. Inseparability refers to the use of e-services that derive from other. Hotel booking e-services, flight/train tickets booking e-services, vacation packages booking e-services and food delivery e-services are inseparable: customers have to go through a multi-step process that completes with e-payment or gets canceled and thus the e-service is produced and consumed simultaneously. [8]
5. Interaction in e-services materializes in the interaction between customers and service providers. Many e-services have eliminated personal interaction and customers are interacting only with their computers.

Starting from [9] and using the characteristics we are finally proposing another definition for e-services: a benefit providing object of transaction that can be characterized as an intangible and perishable process that is used inseparably in a simultaneous interaction between new technologies, Internet and customer.

A better service is offered through e-service to organizations and individuals and the main reason is the accessibility to the public administration operations anytime, anywhere.

E-service is offering a large number of benefits to their users:

- Familiarizes individuals with electronic information and educates them about the benefits of using advanced technology.
- Enables telecommuting.
- Provides integrated informative systems with social, cultural and economical aspects of the individuals.
- Transparency of information
- Removes time and location barriers
- Enhances data acquisition, transformation and retrieval, unlike the data chaos in a traditional service provider
- Promotes reuse of information
- Reduces operation time
- Reduces costs
- Improves information access for decision-making
- Cultivates better relationships with customers
- Reduces overhead costs such as benefits administration
- Speeds process turnover such as expense reimbursement
- Allows searches of large volumes of heterogeneous data (documents, pages, database, messages, multimedia)
- Involves the citizens in governmental activities providing easy access to information using Internet.

Using the advantages of the electronic services we can classify them (table 1) in two main categories: e-services for individuals and e-services for organizations.

Table 1. E-Services Classification

E-services	For citizen	For firms
e-tax services	√	√
e-job services	√	√
e-health services	√	√
e-government	√	
e-declaration services	√	√
e-banking service	√	√
e-insurance services	√	√
e-financial advise services	√	√
e- acquisition services		√
e-commerce	√	√
e-library	√	
e-ticket services	√	
e-learning services	√	
e-booking services	√	

As a result, five types of e-services can be identified:

1. business-to-business;
2. business-to-consumer;
3. government-to-business;
4. government - to-consumer;
5. consumer-to-consumer.

E-services represent one of the most dynamic areas of the actual society, as well as a field of major theoretical interest. [2]

E-services are a consequence of networked technologies. In fact, networked ICT technologies such as the Internet or mobile networking are having a dramatic effect on how e-services are innovated, designed, produced and distributed [14]

4. E-Services Quality Management Metrics

A Quality Management Framework in the context of e-services has the following components: e-service as object (entity), e-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.

E-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 e-service existence and its features.
- Expectations – what users think that the e-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 e-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 e-service
- User impact – how e-service changes user's routine
- Overall satisfaction – how satisfied the user is with e-service, overall.

Qualitative characteristics of the e-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 e-services:

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

The **degree of satisfaction** [10] 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).

Repeated consumers represent the percentage of users that have used the same e-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 [10] the cost of resources takes into account the category of resources and the cost per unit for each category:

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

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 e-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 e-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 2. E-Government Readiness for Eastern Europe [18]

Country	2008 Index	2005 Index	2008 Ranking	2005 Ranking
Czech Republic	0.6696	0.6396	25	29
Hungary	0.6494	0.6536	30	27
Poland	0.6134	0.5872	33	38
Slovakia	0.5889	0.5887	38	36
Ukraine	0.5728	0.5456	41	48
Bulgaria	0.5719	0.5605	43	45
Romania	0.5383	0.5704	51	44
Belarus	0.5213	0.5318	56	51
Russian Federation	0.5120	0.5329	60	50
Republic of Moldova	0.4510	0.3459	93	109

As we can see in table 2, Romania ranks 7th in Eastern Europe and 51 in the world, by the e-government readiness index. Sweden, Denmark and Norway are top 3 in this order by the same index and United States is ranked 4th.

5. Conclusion

E-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.

E-Service Quality Management Framework provides benchmarking capabilities and comparative assessment of e-services. It also supports making decisions in improving the quality of service and overall customer satisfaction.

The advances in mobile devices technology have increased the functionality of cell phones. This enabled development of new applications for mobile phones like: contacts

management, email capabilities and Internet browsing. It also made possible the development of just-in-time services, or mobile services that literally offer anytime and anywhere access to services like: mobile banking, mobile learning, mobile commerce, etc. as long as the cell phone has a broadband internet connection enabled. This allows users to either update their skills or pay their bill while waiting in the airport for their flight, while waiting at the bus terminal for their bus or while commuting.

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