National Portal for the Permanent Assessment of Clients' Satisfaction in Water Supply and Purification- Sewerage Services

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Abstract: The development and implementation of the National Portal for customers' satisfaction related to water supply, and purification-sewerage services represents the main goal of a national research project developed in a partnership built by the involvement of the academic area, Romanian Water Association and a private IT company. The project aims at developing a model to measure the customers' satisfaction, by designing the methodology, main indicators, tools, and the institutional framework for the assessment of the end-users' satisfaction related to the water supply services. One main objective of the project is represented by the development of a virtual environment which will support the online interaction among the main actors involved in the evaluation of the water quality and in the decisional process concerning the improvement of this service. The main information sources used in the benchmarking process will be represented by the customers' opinion and the water services providers' technical data. The analysis and the correlation of these two types of information will support the identification of short-, medium- and long-term trends and scenarios concerning the quality of the water supply and purification-sewerage services. This barometer will be an important tool in the quality management of the public utility services.

Keywords: customer satisfaction, e-citizen, statistic model, water quality

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1. Introduction

This article intends to present a research project financed under the national research, development and innovation scheme, which started in October 2007, and is the first one in a set of studies illustrating the progress of the project and the main research results, related to the ICT field. Consequently, this article introduces only the general concepts related to the customers' satisfaction measurement in a virtual environment, and the development of a water virtual barometer. The authors intend only to provide the innovative approach and the general plan for the development of the project with its main phases and the results estimated. In line with the project progress, we intend to develop and publish a set of articles illustrating the concrete outcomes, the model developed, the technical innovative solutions and the research methodology implemented.

Public services referring to water supply and the treatment of the wastewater have a maximum importance for life quality. Due to these critical issues, the project aims at ameliorating the quality of water public services in line with specific standards, implemented by the National Authority for the Standardization and Control of the Public Utility Services. The services providers are represented by heterogeneous operators, who are acting in line with the national and international rules, but do not have at their disposal mechanisms for measuring the consumers' satisfaction, according to quality management standards. The lack of the permanent observation, measurement and benchmarking tools has negative consequences for the consumers, especially for the citizens. The customers and their needs represent the main topic for the water supply companies, which focus not only on the number of the customers, but also on their satisfaction [28]. Consequently, the project offers an innovative solution, based on a virtual framework development, which could facilitate to obtain the feedback from the consumers and have an informative role for the population and authorities, and will stimulate the improvement of the water public utility services. This new approach is based on the online interaction of the actors involved in the

water public services as providers, quality monitors, end users, increasing the transparency by stimulating the pro-active behavior of the consumers. The end users are invited to fill in various online questionnaires in order to express their opinions and views in an objective way, without any political and subjective influences (including political preferences, personal frustrations, incidental events etc.), which can provide adequate information for the deep analysis and followed up by accurate decisional processes [6].

The proposed frame will represent a virtual water barometer which will indicate the real situation for water quality services, contributing through various tools to automatically provide some actions, such as: warning the population and the authorities in case of water system malfunctioning, generating alerts in case of accidents in normal water supply service etc., contributing to the decrease of certain risks referring to the health condition of the population and other negative consequences which can affect the life and/or the environment.

2. E-water Barometer Platform

The development of the virtual water barometer as a national portal providing important information for various stakeholders involved in the water public services meet the important actual requirements concerning the quality of the utility public services and the online interaction and networking between citizens and public authorities, in order to facilitate the access for certain public services and to improve their quality. It is important to highlight that this approach is needed especially in the water supply services, which represent a critical vital resource.

The development of an e-Water Barometer Platform is an innovative solution for an integrated national perspective and also for the local/regional administration. The new information and communication technologies have a significant contribution to the efficiency and the quality of the local authorities' activities. This approach integrates various dimensions of the water services framework to be applied in the design of the e-Water Barometer Platform, such as: the users' view, the processes perspective and the technical aspects.

The project is complex and has an interdisciplinary character. On one side is the technical approach focused on the development of advanced informatics systems for e-services [3] and services for the citizens (e-citizen), in line with the Information Society Advisory Group (ISTAG) vision of creating ambient, intelligent, virtual public services [23]. On the other side it is the social, safety, hygienic and comfort perspective as component of the quality of living. This perspective generate the idea of the design of a perception indicators package, obtained through statistical processing and measuring the citizens' satisfaction and non-satisfaction feelings related to the quality of the water supply and sewerage services, eliminating the subjective feelings. The objective indicators of the National Authority for the Standardization and Control of the Public Utility Services will be correlated with the results of the survey, in order to generate an important feedback for the providers, public authorities and end-users.

The statistic processing of the information will be an efficient tool of the quality management for the local administration and water services providers.

In spring 2007, the European Council highlighted the importance of the synergy between the research communities and those able to transform research results into innovating services and products ensuring the sharing of knowledge among all partners involved. One of the major goals of the project is to facilitate the cooperation between the academic environment, the business environment and the area of water public services providers (the Water Companies and their associative structure – Romanian Water Association - RWA), for the identification of certain innovative solutions in the benefit of the citizens, leading to the raise of the living standard. Romania, according to the Adherence Treaty signed in Luxemburg 2000, agreed to adopt the requirements stipulated in the European Union Directives, regarding the quality of drinking water used by the consumer, and the quality of the purified water from the overflow. Within the pre-accession process, our country adopted the EU acquis, implemented through Law No. 311/2004 for amendments and completion of Law No. 458/2002 regarding the quality of drinking water; HG No. 974/2004 for the approval of "The Norms for supervision, sanitary inspection and monitoring of the quality of drinking water and of the procedure for sanitary authorization of the production and distribution of the drinking water''; HG 352/2005 which modifies and completes HG/188/2002 for the approval of norms regarding the recycle conditions of the used waters, the norms regarding the dimension and the frequency of samples taken for analysis from surface waters representing drinking water (NTPA 014), in line with the European Directive No.98/83/EC regarding the quality of water used for human consumption and of the European Directive 91/271/EC concerning the purification of waters in urban areas.

The development of the surveys concerning the consumers' satisfaction related to various public services is a constant approach of the European Commission, which develops on regular basis the Euro- Barometer survey for the evaluation of the end-users opinion towards the utility public services [9], [10], [18].

All over the world such surveys were organized in order to estimate the customers' satisfaction toward water services. In France, Eau de Paris, has created a customer network, involved in a bimonthly survey, concerning the quality of the drinking tap water in Paris [29]. In the USA, the Environmental Protection Agency (EPA) performs regular surveys concerning the drinking water, being responsible for the safety of the water system. EPA and water systems must provide customers with relevant information about the safety of their drinking water empowering citizens to make informed choices. Focus groups, public comment periods, and surveys are some of the many tools the Agency uses to understand public attitudes, trends, and assess consumer awareness of drinking water issues [30].

There is a wide range of quality indicators (organoleptical, biological and physical & chemical) which can be measured within the specialized laboratories, the water companies and the Ministry of Health, based on specific standards and procedures conferring them a high level of objectivity. The indicators reflecting the quality of the public services for water supply, sewerage and purification (service facility access, the service providers' speed reaction, the quality of the intervention, the ratio price quality and the transparency level) are not settled and the procedures of monitoring them are not yet defined and implemented on a regular basis. The standard ISO 9001 regarding the quality management, which is under implementation at the main operators for public services for water supply and sewerage public services, is requesting new instruments for achieving a feedback from the end-users (measuring the customer satisfaction). However, for the moment, there are few instruments and places, where analysis and evaluation of this kind are performed and concrete results achieved. The core of the project is to offer an efficient solution for the lack of information concerning the end users' opinion, to calculate significant indicators illustrating the consumers' view on a regular basis in a virtual environment, and to share information among the main actors involved in the field. The information flows from and to citizens will determine the local authorities and operators with tasks and responsibilities in water services, to proceed to a re-engineering of the management processes focused on e-citizen paradigm.

3. General Context for the Quality of the Water Services Evaluation

The consumers' satisfaction in the water supply field is a main concern of the international specialized organizations. Therefore, efforts are being made to improve the operators' performances (water companies), in order to reduce exploitation costs and mainly to increase the qualitative level of the provided services. To this end, the number of publications taking, processing and publishing information in this field is increasing. The international community involved in this area is interested in extending the networking process, in order to increase the research potential and to develop benchmarking tools. Thus, Customer Satisfaction Measurement Association™ belonging to Water Utility Benchmarking Association is going to develop the study "Customer Satisfaction Measurement Benchmarking", related to good practices of the top water companies, in the international perspective. The objectives of this study are to identify the most used research techniques, the characteristics of the research process and the possible ways to improve the information management, through computerized tools involved in the selection, sampling, processing, and evaluation of the data.

International Water Association (IWA) accomplishes an annual benchmarking study, which also includes some indicators related to consumers' satisfaction. In 2003 the European Commission started a pilot research: "The development of indicators regarding the consumers' satisfaction", finished in 2005. The intention of the European Commission is to use this methodology for implementing surveys on consumers' satisfaction in the European Union [9], [10].

A relevant positive experience is represented by the Environmental Protection Agency (EPA, USA) which develops the set of health-based standards (over 80 contaminants). These contaminants are regulated in public drinking water systems. The synergy between the political and technical approach contributes in the USA to the increase of the drinking water quality.

At the national level, the greatest operators (ex: AquaTim) started to show interest in the consumers' satisfaction concerning the services provided. Important providers of various water services took part in international programs focused on the research activities concerning the customer satisfaction, which are not unfortunately performed on regular basis. Some surveys were performed in various regions of Romania, such as the Pilot study in Cluj county (Salaj), Pilot Study in Botosani county (under the Small and Medium Towns Infrastructure Development Program, October 2003), the survey concerning the

"Customers' satisfaction in Ploiesti county", 2002 (coordinator: ApaNova), the survey concerning the "Customers' satisfaction in Iasi city", 2006 (coordinator: RAJAC Iasi). Nevertheless, there is no steady consumers' satisfaction evaluation in Romania, and there is no research study to identify the real situation in the field at a national level. Despite the great interest there are not efficient ways for collecting and processing data. This is the reason for developing the e-Water Barometer, at the national level in order to integrate the views of the stakeholders and to offer valuable information for improving the quality of the water services.

4. Main Obectives and the Methodological Approach

The general objective of the project is to improve the quality of the water supply and purification-sewerage services by implementing new information and communication technologies, based on the e-citizen paradigm, enabling the centralized steady monitoring and evaluation, in order to measure the citizen's degree of satisfaction, as main beneficiaries of these public utility services.

The specific objectives are:

1. Stimulating the pro-active participation of the citizens in the administration and control process of the public service for water supply and sewerage, in order to create a pressure for the service providers to improve and maintain the quality of the services;

2. Improvement of the citizens' online access to specialized information;

3. Improvement of the management systems dealing with the crisis situations, and increasing the security, hygiene and comfort of living;

4. Optimization of resources used related to the quality of living.

The development of the proposed network and the functional water quality barometer requires specific research activities, structured on phases. The research methodology of the first phase consists in organizing the survey; identifying the factors and statistic variables, the stability of the general community, which will represent the sample, the sampling techniques applied on a wide number of subjects selected from the citizens participating to the survey, in order to determine the observation and survey unit, for obtaining significant results.

Within the second phase of the research the questionnaire will be drawn up. This will be tested through a survey developed in a virtual environment, previously to identify some aspects and issues which could influence the results of the research and after that in order to exploit the innovative approach and techniques. Simultaneously, a permanent framework for measuring the customer water services satisfaction will be established (standards, indicators, main actors involved, procedures) and the standard logistics will be defined at the level of the organizations providing water services supply.

The most important aspects of the research consist in: identifying the factors influencing the quality of services (statistical variables) and the quality of the water; implementing a system of permanent pursuing of the quantitative and qualitative aspects generating the consumers' satisfaction. This will be achieved at national level using selective methods of heterogeneous communities, as well as specific tools for centralizing, processing, analyzing and presenting data.

The last phase will consist in the development of the web portal including the questionnaire and supporting the permanent online survey (the sample will be representative, rewarding the participants, and not representative, collecting the information from the service providers, such as citizens' complaints and warnings).

The research will be developed in 5 communities in order to identify the opinions and perceptions concerning the water services and the association level between the variables analyzed. This will lead to the identification of the short-medium- and long-term trends and to the improvement of the management efficiency of the water services providers, through a better understanding of the cause-effect relation. A very significant contribution will be represented by the identification of the negative factors and the ways of eliminating their action. The information obtained through the web portal could be integrated in the corporate memory of the water service companies (Brooking A. 2005).

The results concerning the measurement of the consumers' satisfaction related to the water services, i.e. the assessment tools developed, represent a model which could be used to evaluate other similar services.

The model, having as main characteristics: the transparency, the national approach, the standardization of the sociometrics indicators, could be implemented at all the actors involved in water industry.

5. Generic Architecture for the e-water Barometer

The actual use of the ICT technology involves the development of various efficient web based systems for the developing, storing, analyzing, reporting data on drinking water, as part of the water safety plan, which focuses on records concerning the water quality, pressure, security of supply and also on the customers' satisfaction [31]. The Environmental Protection Agency (EPA) has developed a web based system for providing the customers with relevant information about the safety of their drinking water empowering citizens to make informed choices by using the comprehensive geographic information system (GIS) interface that allows users to have accurate information in the area of interest.

For our country, the development of a web platform, which will include the adequate sociometrics analysis [6] and the specific tools for the results processing and interpretation will represent an innovative tool for the assessment of the drinking water quality. These will take into account various investigation methods, including the classic survey, based on representative demographic samples, surveys developed at the end of an incidental operation, web surveys without demographic representative samples or with induced demographic representatively (the computer selects on a random basis a number of consumers corresponding to the diagrams of representation). The open access to the measurements results represents an innovative approach, facilitating the control of the citizen upon the public service.

Other important finding of the project is represented by the efficient networking method of the water services stakeholders. The project has a holistic approach of the water services quality, supporting the development of an integrated view of all actors' contribution in the field, as illustrated in the figure no. 1. The scheme highlights the interconnectivity among the standardization and control organizations (National Authority for Standardization and Control of Public Utility Services – NASCPUS), customer protection organization (Customer Protection Office – CPO), services providers, public local authorities and citizens, in order to measure on a realistic basis the quality of the water services.

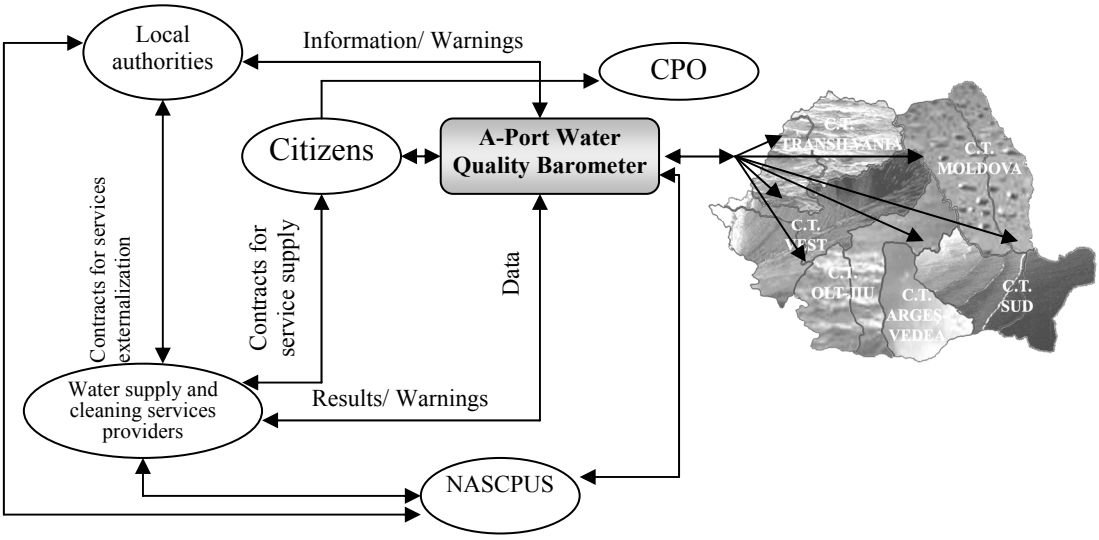

Figure 1. Water Quality Networking

The water barometer [12] has as main goal to improve the communication flows from the services providers to the citizens and vice-versa, in order to increase the operational efficiency through a better decisional process and the transparency in this sector. A main concern is represented by the identification of the best ways to prevent and react in crisis situation.

According with the framework for the evaluation of the water services and the quality of the water, the generic architecture of the e-Water Barometer is represented in the figure 2.

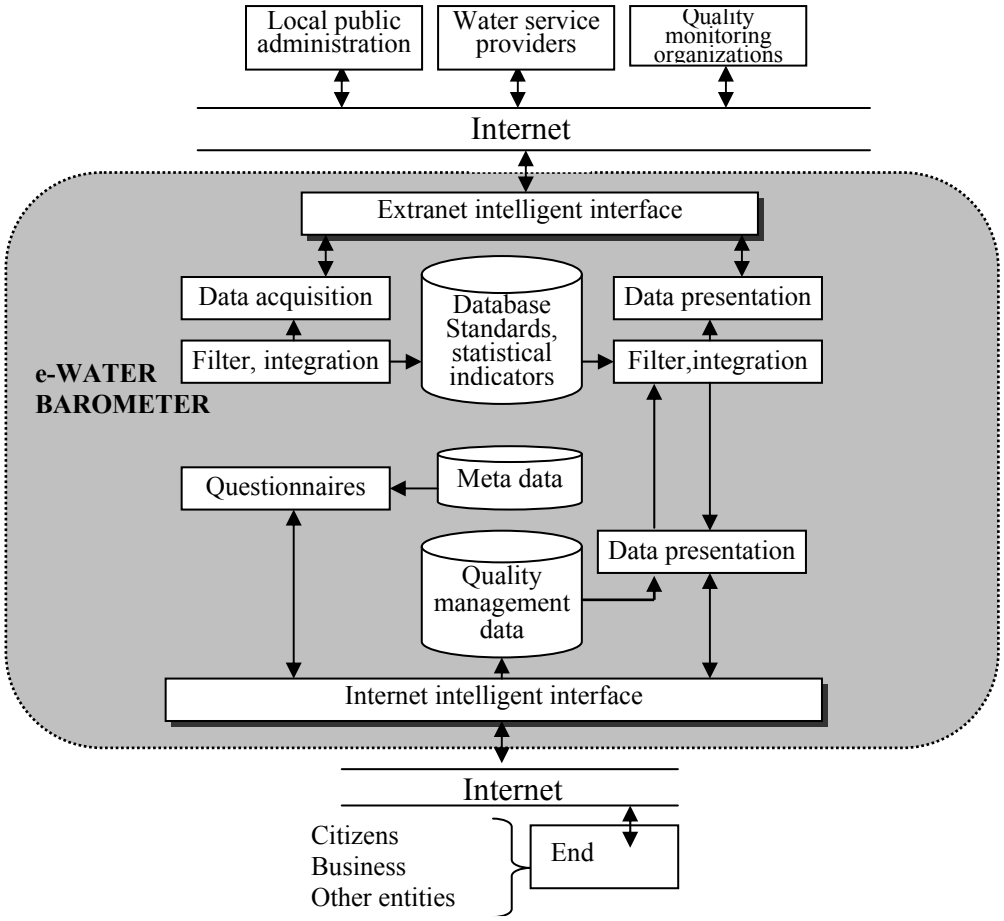

Figure 2. Public water utility services Barometer

The virtual portal will have two main interfaces: one for the link with the specialists in the water services and the other for the access of the end-users. One of the main functions of the water service quality platform is represented by the administration of the data gathered from the water service providers, distributed on geographic areas and activity areas. The portal will put at their disposal a system of online signing up, loading and updating the particular data and a validation system thanks to which the information registered will be validated and accepted to be published by the portal administration. The citizens will have at their disposal an interactive map for accessing the information delivered by the operators, on geographic areas.

Other specific function of the e-Water Barometer is to store significant information concerning the legislation, standards and the best practices in the field of the water quality. This knowledge base offers an open access for the citizens and experts in order to be informed and to better understand the objective perspective in the area. The digital content of the knowledge base will be used in the various benchmarking analysis performed on regular basis.

A very important functionality of the portal is represented by the evaluation of the water quality from the point of view of the consumers. The information collected from the end-users (business entities or citizens), through various questionnaires, will be processed in order to measure the citizens' satisfaction concerning the quality of the water and the services supplied by the operators. Other forms will be dedicated to track down in real time a critical situation.

The intelligent interface will develop various reactions according to the specific interpretation of the data received from the citizens. The most important automatically performed functions are: processing and integration of the data collected through the portal and supplied by the operators and end-users; statistical processing of the data; generating reports that should distinguish both the existent correlation and the evolution trends in the field; supplying statistical information and graphs with public character; generating alerts and warnings in order to allow notification in real time, using the email and/or phone (mobile phone) calls, computer various signals etc.

Various presentation tools will be used in order to display and transfer the significant information and knowledge acquired as important platform resources. The automatically dissemination of the information will be another important function of the web platform.

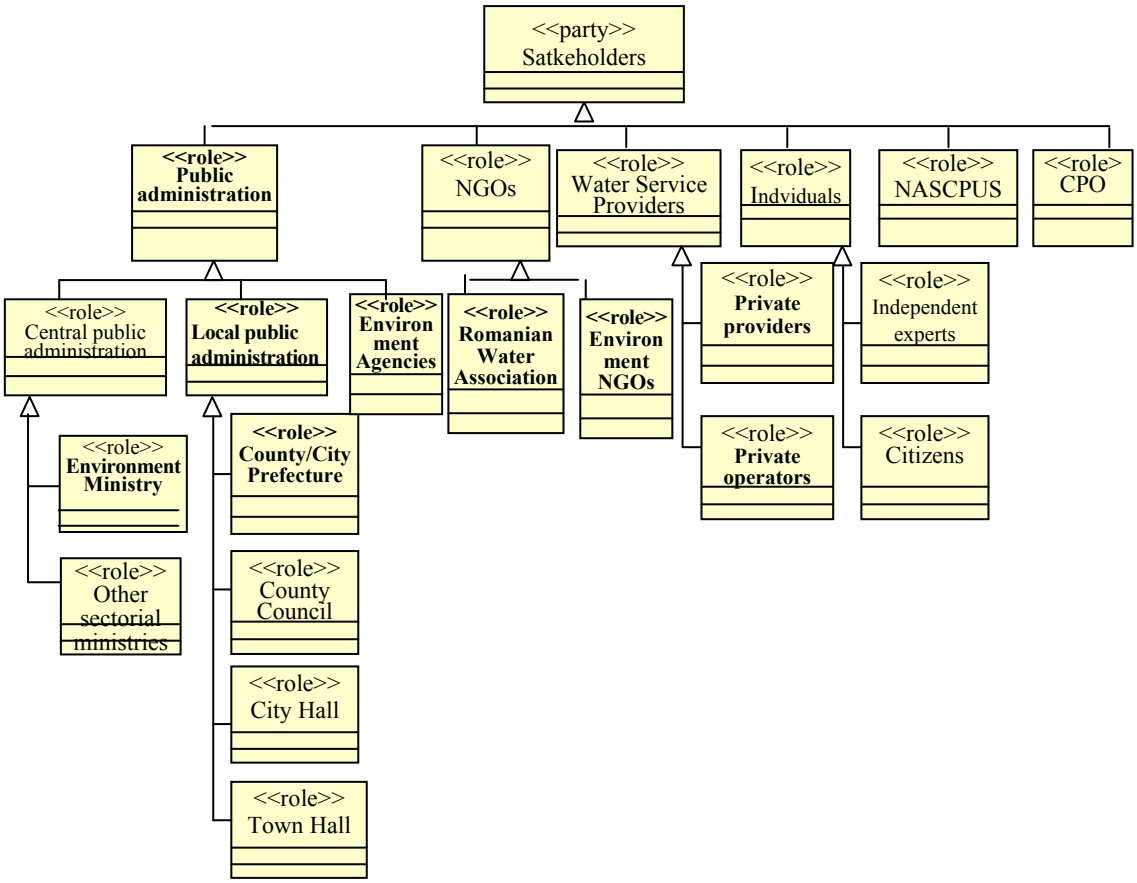

Figure 3. Generic stakeholders in the water quality and water services evaluation

The platform will support the direct interaction through discussions forum with a structured hierarchical set of issues or free comments or opinion expression. Other debates or focus groups will be generated with a moderator in order to find solutions for specific issues related to water quality and water services quality, as well as for improving the management of the portal and of the knowledge and information involved. The open access to the portal and to the discussions forum will be provided only for those users who will provide identification data and consequently will be registered as users of the portal.

The implementation of this generic architecture involves technical solutions for the development of the infrastructure supporting the various virtual processes, the information management, as well as communication techniques according to the open communication standards (flexible access from various platforms, including mobile devices).

The new democratic-centric view represents a real challenge for the public administration, which is directly responsible for the delivery of the utility public services.

The benchmarking tools could operate comparing the standards, the providers' indicators and the end users' satisfaction, contributing to the improvement of the services' quality. This approach aims at developing virtual iterative processes in order to increase the quality of the water services and the public administration activity.

The generic stakeholders' model for the water quality assessment and the evaluation of the quality of the water services, using the archetype concept, is presented in the figure 3.

6. Conclusions

The project will contribute to the development of knowledge in the socioeconomic and ICT fields, focusing on the social and economic value of drinking water. In the ICT field the project aims at

developing a web portal with an intelligent interface, which will support the interconnectivity of all actors involved in water services and the improvement of their quality. In the socio-economic field the project will contribute to the development of the citizens' behavior models and the improvement of the efficiency of the water public services and their quality. In the field of statistics the project will contribute with new methods and research instruments for the consumers' degree of satisfaction. The complex software product will administrate all the instruments, methodologies, results, interpretations tools, access levels, updating data mechanisms. The software product will support the storage of the information in the database, the current update of the information and the complex data processing, in order to offer an accurate interpretation of the data. The interface will provide data graphic presentations of the indicators analyzed correlated with the demographical structures. It will also ensure a free online access to information in the benefit of the citizens and of the local authorities responsible for providing public services of water supply and treatment of the wastewaters.

The main results of the project are:

1. The national web portal to ensure the online access of the citizens to specialized water services information;

2. The automatically acquisition, storage and processing of the requirements and complaints of the citizens through the web portal aiming at measuring the quality of the services, identifying the possible crisis situations and warning the public authorities;

3. Citizens' behavior models in order to improve the interaction of the various actors involved in water services;

4. New methods and techniques used in the survey and evaluation of the collected data, using a virtual environment;

5. Efficient procedures for the management of the quality of the water services and crisis situations;

6. Models for optimizing the allocation of resources by the local authorities.

The potential beneficiaries of the project are the citizens, the more than 1500 local authorities, the water services providers (approximately 100 licensed operators). The dissemination of the results will be an important pillar of the project and it will cover all the phases of the research. The transparency of the citizens' perception regarding the quality of the specific water services could be a pressure factor for the effectiveness and the efficiency of the local public administration towards the management of a vital resource. The citizen becomes an active and permanent participant in measuring the efficiency of local management in the field mentioned above. The development of the citizens' pro-active behavior leads to the development of the civil society, and of the civic spirit in general. On the other hand, because of the growth of purification expenses (sometimes also for treatment) and the inadequate behavior of the end-user, the service providers are rushing for the development of educational programs. This is an important positive impact on the environment. The satisfaction degree expressed by the end-users regarding the water supply and the sewerage-purification are strictly connected to the environment quality, as it appears as a consequence of the activities for collecting and treating residual waters.

We also try to improve the quality of the online conducted surveys, by using effective weighting systems that would bring the results of on-line surveys into line with other large scale random surveys, avoiding the disturbing subjective factors in the web-based approach [27]. We take advantage of the effectiveness of the online surveys approach, as an alternative to traditional methods, by performing the surveys yearly and by motivating the people to have a more responsible civic behavior.

This project aims at developing a concrete tool to support the consumer policies, which need to be supported by relevant information and data in order to adjust policies and set the appropriate priorities. In order to successfully implement the proposed system a set of political measures will be needed to develop the organizational frame and to support the improvement of the water systems.

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