Online system for assessing the implementation of the Digital Agenda in Romania

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Abstract: In Romania, the Ministry of Communications and Information Society (MCSI) and the World Bank signed a Consultancy Services Agreement on to "Support for the Implementation of the National Strategy on the Digital Agenda for Romania 2014-2020". For a successful implementation of the Digital Agenda for Romania, the National Institute for Research Development in Informatics, supported by MCSI, developed an information management platform designed for collecting, evaluating and presenting data in intelligible format, in order to provide accurate and complete knowledge to support strategic decision making regarding the analyzed areas. For monitoring and assessing the implementation of the objectives in SNADR a set of indicators was specified, that are used for measuring the implementation of the national information society objectives. The platform shows series of user-friendly views, such as reports, charts, and graphs. The system can be used in the creation of advanced reports and statistics regarding the level of implementation of solutions pertaining to the information society, and to reflect objectively the degree to which the objectives set in the Digital Agenda for Romania are met. The paper presents the system objectives, the planning and development, main components, its architecture and the technology stack used in development.

Keywords: information society, digital agenda, SNADR, national strategy, information society evaluation, digital indicators system.

Sistem online de evaluare a implementării Agendei Digitale pentru România

Rezumat: În România, Ministerul Comunicațiilor și Societății Informaționale (MCSI) și Banca Mondială au semnat un acord de servicii de consultanță cu privire la „Sprijin pentru implementarea Strategiei naționale a Agendei digitale pentru România 2014-2020”. Pentru o implementare cu succes a Agendei Digitale pentru România, Institutul Național de Dezvoltare și Cercetare în Informatică, sprijinit de MCSI, a dezvoltat o platformă de gestionare a informațiilor în scopul colectării, evaluării și prezentării datelor în format inteligibil, pentru a oferi cunoștințe corecte și complete pentru a sprijini luarea deciziilor strategice cu privire la domeniile analizate. Pentru monitorizarea și evaluarea implementării obiectivelor din SNADR a fost specificat un set de indicatori care sunt folosiți pentru măsurarea implementării obiectivelor naționale ale societății informaționale. Platforma prezintă o serie de vizualizări ușor de utilizat, precum rapoarte, diagrame și grafice. Sistemul poate fi utilizat la crearea de rapoarte și statistici avansate privind nivelul de implementare a soluțiilor referitoare la societatea informațională și pentru a reflecta în mod obiectiv gradul în care sunt îndeplinite obiectivele stabilite în Agenda Digitală pentru România. Lucrarea de față prezintă obiectivele sistemului, planificarea și dezvoltarea acestuia, componentele principale, arhitectura sa și stiva tehnologică utilizată în dezvoltare.

Cuvinte cheie: societate informațională, Agenda Digitală, SNADR, strategia națională, evaluare societate informațională, sistem de indicatori digitali.

1. Introduction

The information society has evolved in just a few decades from an unclear idea of the future society to a reality in which we live, implemented in most life aspects. During this period, a brief time in the evolution of mankind, the world made remarkable progress in the field of information and communication technologies (ICT). Today's devices - smart devices, computers, TVs, home appliances or cars are impregnated with technology and tend to provide intelligent services to provide citizens with an optimal user experience. Currently, there is no universally accepted concept of the information society. In a broad sense, it can be defined as a ICT based society dominated by the production and consumption of information.

The global demand for information and communication technologies represents an estimated market worth over EUR 2 billion, with only a quarter of this value coming from European companies. Europe is also lagging behind in terms of high-speed internet, which affects its capacity for innovation, including in rural areas, as well as in online dissemination of knowledge and online distribution of goods and services.

Europe needs to act strongly in innovation, a chapter in which Research&Development spending is below 2%, compared to 2.6% in the US and 3.4% in Japan, mainly due to the low level of private investment. The data and computing power requirements of European scientists and industry do not currently correspond to the computational capabilities available in the European Union. No supercomputer in the EU is in the top 10 worldwide, and the existing ones depend on non-European technology, although in June 2015, 18 of the 50 most powerful supercomputers in the world were located in Europe. This brings an increasing risk to the European Union of lacking the strategic or technological know-how for innovation and competitiveness. In addition, Europe currently consumes about 29% of HPC resources worldwide, but the EU industry provides only about 5% of these resources. *(European high-performance computing joint undertaking, 2018)*.

The EU strategy for high-performance computers has been debated within the Euro HPC - EuroHPC Joint Undertaking, a joint initiative between the European Union and European countries worth $1billion to develop a world-class supercomputing ecosystem in Europe. Thus, EuroHPC will enable the participating countries and the European Union to coordinate their efforts and share resources with the objective of implementing a world-class infrastructure and a competitive innovation ecosystem in technologies, applications and supercomputing skills in Europe. Therefore, EU acted by investing in an ambitious supercomputing infrastructure strategy, with the ambition to become one of the world leaders in the field of supercomputing *(EuroHPC, 2019)*. The study "SMART 2014/0021" *(SMART 2014/0021)*, which analyzes the evolution of the European HPC strategy to ensure a European leadership position in the supply and use of HPC systems and services, estimates that public and private investments for Europe to reach its leading position by 2020, they are worth an additional 500 million euros to 750 million euros per year, including the 1 billion euros needed to purchase pre-exascale and exascale supercomputers at a globally competitive level.

Europe is also facing a significant shortage of qualified people to fit into existing or newly created jobs that require existing digital skills. According to European Commission estimates, more than 150,000 IT experts are needed in Europe every year. It should also be noted that the number of recent graduates in information technology cannot not keep up with the demand on the labor market *(Uptake of Cloud in Europe, 2014)*. In Germany alone, SMEs could create 670,000 new jobs through the efficient use of technology *(Digital Transformation of European Industry and Enterprises, 2015).* "Digital jobs" contribute to the creation of jobs outside the technical industry, so that for each high-tech job in the local economy, up to four non-technical jobs are created *(High Technology Employment in European Union, 2013)*. Cloud Computing is an important factor in the development of eGovernment services, with the potential to play a major role in addressing inefficiencies and to improve the way the services are delivered *(Dumitrache, 2014)*. In recent years, the number of jobs in the ICT field has increased faster than any other category of jobs. Thus, in the current decade, the employment of ICT professionals has increased by over 3% per year.

In Romania, The National Strategy for the Digital Agenda for Romania (SNADR) is the strategic framework setting the objectives for digital growth aimed at stimulating public and private ICT-based services, accessible as a price, of high quality and interoperable.

In order to reach the objectives, it is necessary to analyze and follow the objectives of SNADR, which sets a number of priorities grouped around four major fields of action:

- Field of action I - e-Government, Interoperability, Cyber Security, Cloud Computing, Open Data, Big Data and Social Media;
- Field of action II - ICT in Education, Health, Culture and e-Inclusion;
- Field of action III - e-Commerce, Research, Development and Innovation in the ICT field;

- Field of action IV - Broadband and digital services infrastructure.

The Ministry of Communications and the Information Society is the main institution involved in the implementation of the SNADR, which is why in 2015, the Ministry of Communications and Information Society and the World Bank signed a Consultancy Services Agreement on to "Support for the Implementation of the National Strategy on the Digital Agenda for Romania 2014-2020".

In order to ensure the successful implementation of the Digital Agenda Strategy for Romania, the National Institute for Research Development in Informatics and the Ministry of Communications and Information Society have developed an information management platform aimed at collecting, evaluating and presenting data in intelligible format, in order to improve the level of correct and as complete as possible knowledge to support strategic decision making regarding the analyzed area.

2. Indicators for monitoring the implementation of SNADR objectives

For monitoring and assessing the implementation of the objectives in SNADR a set of indicators was specified. The indicators can be regarded as the elements that measure the degree of ICT development.

The list of indicators was developed in close collaboration with the relevant Ministries / Agencies / Authorities to test the validity of each proposed indicator and its compliance with the set of objectives for each field of action *(The Monitoring and Evaluation Manual of the National Strategy on the Digital Agenda for Romania, 2016)*. As a result, the indicators in this system are representative for the information society in Romania.

For maintaining an overview of the development status in SNADR objectives, a system was required to gather data from each institution involved in SNADR.

2.1. Institutions responsible for data collection

The data is gathered by public institutions which are responsible in their own area of expertise, as established in the SNADR domains. Data gathering is performed by various means, from online questionnaires to direct reporting. Each institution owns their account in the platform for managing strictly the indicators that are assigned to them.

The main administrator is the Ministry of Communications and the Information Society, responsible also for establishing the protocols with the institutions established by the Digital Agenda for Romania.

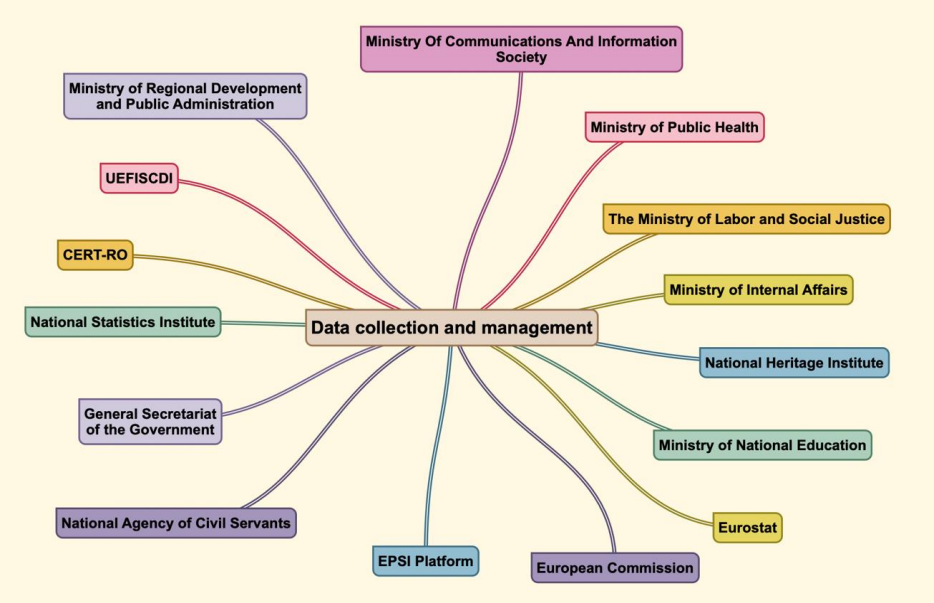

Figure 1. Institutions responsible for data gathering and reporting

The institutions responsible for collecting and making data available to the interested public and in particular to the decision-making forums of the Romanian State and the European Commission will act in this regard and will provide data within the system, thus facilitating subsequent reports.

2.2. Functions of the monitoring and evaluation system

The system's main purpose is to provide the monitoring and evaluation framework for the implementation of the SNADR.

The main functions of the monitoring and evaluation system:

- data collection on the development status of the information society;
- data evaluation to assess the degree in which objectives have been implemented;
- reporting and dissemination of data.

3. System's architecture

The system represents an information management platform designed to collect, evaluate and present data in intelligible format, in order to improve the level of accurate and complete knowledge to support strategic decision-making regarding the analyzed areas.

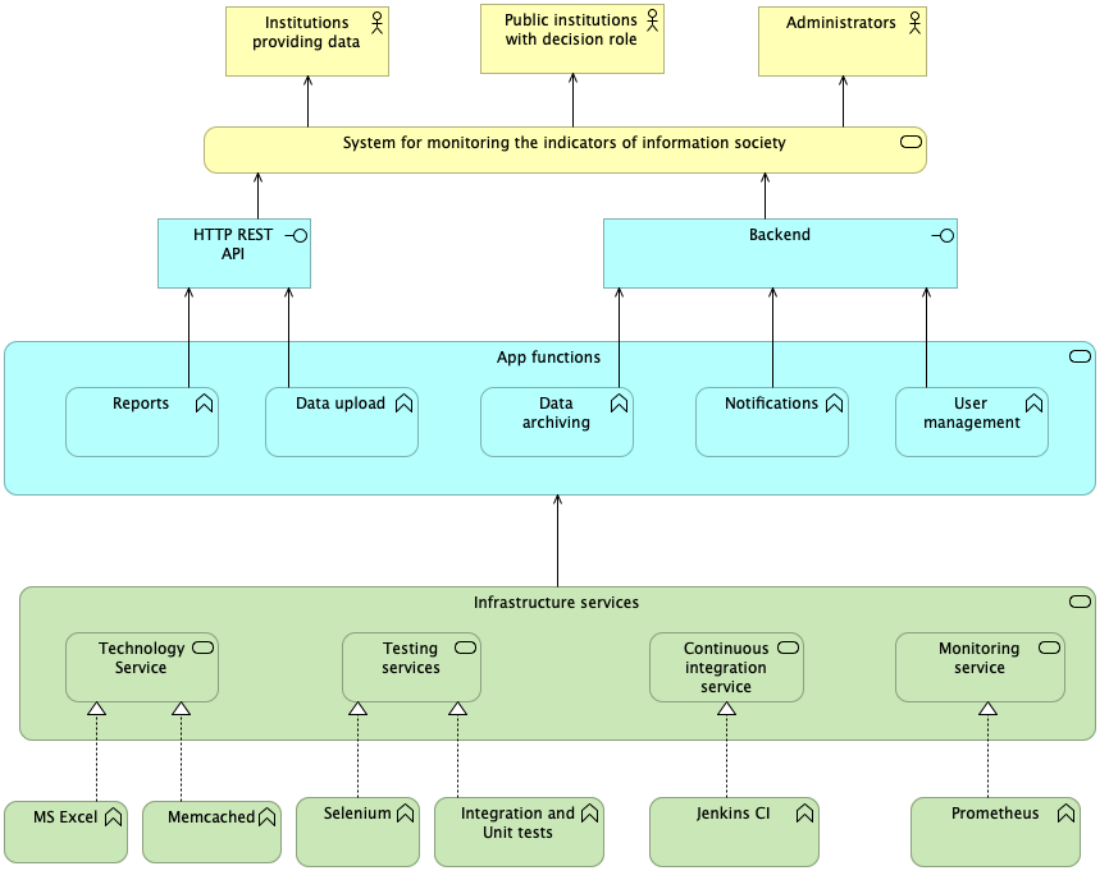

Figure 2. System's architecture

The system development began with the analysis of the national strategy and the set of indicators defined to monitor the degree of implementation of the strategy. Thus, the requirements necessary to build the online system for information society indicators were identified.

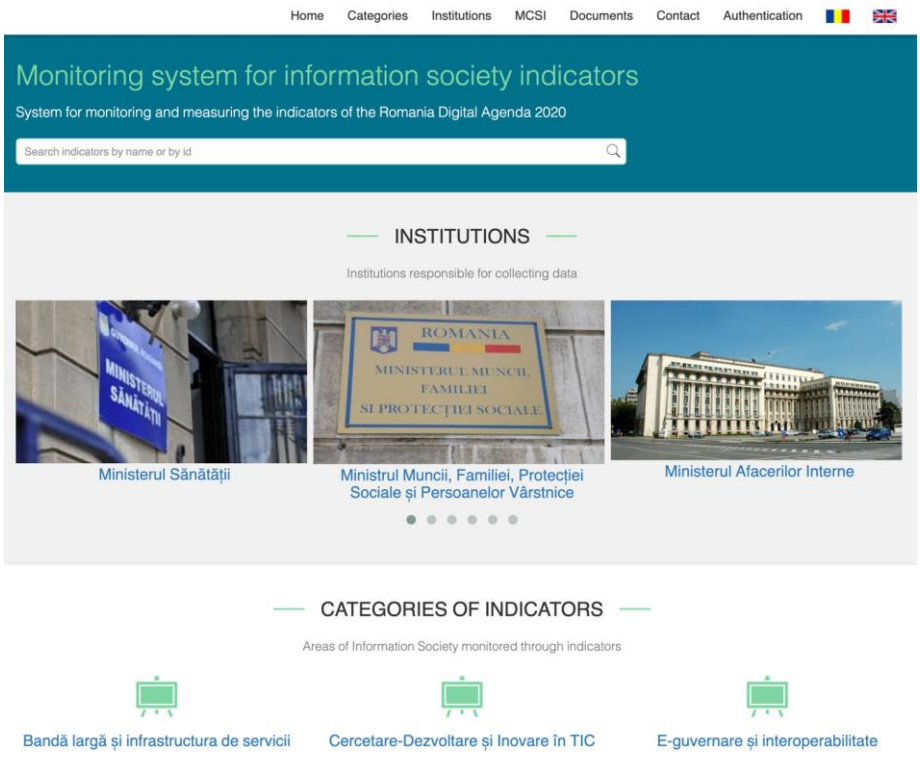

Figure 3. System main page (http://indicatori.comunicatii.gov.ro)

The administrators of the institutions registered in the system will be authenticated by user ID and password and will not be able to alter information outside the rights offered by their accounts.

The users, both the public and the administrators of the institutions, will have access to the web interface of the system. Administrators will use dedicated forms to update indicator values in the system.

3.1. Major components of the system

Public component - the main online resource for informing citizens and the wider community of interested persons about the implementation of SNADR. The component will present a series of user-friendly views, such as reports, charts, and graphs, which can be accessed publicly. This component serves any user who wishes to obtain information from the system. It includes a searching module for fast data retrieving. To access the public component, user authentication is not required.

Institutional component - realizes the management of the monitored domains / categories and indicators. The institutional component introduces updated data regarding the indicators. Each institution has access rights for managing the values of the indicators. The access of the institution is based on a user code and an encrypted password. After authentication, any of the indicators related to the institution can be updated with new data and reports.

Administrative component - allows a series of administrative actions aimed at managing the entire system, its users or their roles in the system.

3.2. MVC paradigm: Model-View-Controller

The Model-View-Controller (MVC) architectural model divides an interactive application into three components. The model contains the functionality and the basic data. Views display information to users. Controllers manipulate user input. The views and controllers include the user interface.

A change-propagation mechanism ensures coherence between the user interface and the model.

Model - represents the data of an application and contains the logic for accessing and manipulating that data. Any data that is part of the persistent state of the application should be in the model objects. The model interface exposes methods for accessing and updating the model state and for executing complex processes encapsulated within the model. Model services are accessed by the controller for querying or modifying the model status. The model notifies the view when a status change occurs in the model.

View - visualization - is responsible for rendering the model state. The presentation semantics is encapsulated in the view, so the model data can be adapted for several different types of clients. The view changes when a change of model is communicated to the view. A view transmits the input from the user to the controller.

Controller - is responsible for intercepting and translating user entries into actions that must be performed by the model. The controller is responsible for selecting the view based on the user input and the result of the model operations.

3.3. Technology stack

OpenKM is a Document Management System, dedicated to store, manage and track electronic documents and electronic images of paper-based information captured through the use of a document scanner. OpenKM has features for controlling the production, storage, management and distribution of electronic documents, yielding greater effectiveness and the ability to reuse information and to control the flow of the documents. The system also includes administration tools to define the roles of various users, access control, user quota, level of document security, detailed logs of activity and an advanced search functionality *(OpenKM Knowledge Center, 2019)*.

Angularjs is an open source JavaScript framework for web applications that are presented as a single dynamic page. It extends HTML DOM with additional attributes to make it more scalable and responsive to user actions.

AngularJS is packed with some important features, such as:

- modules for building a CRUD app in a cohesive set: data-binding, basic templating directives, form validation, routing, deep-linking, reusable components and dependency injection;
- testability story: unit-testing, end-to-end testing, mocks and test harnesses;
- seed application with directory layout and test scripts.

Node.js is an open-source, multi-platform runtime environment that allows developers to create various tools and applications in JavaScript. The runtime environment is intended for use outside the context of a browser, running directly on a computer or server.

The Node Package Manager provides access to a multitude of reusable packages for writing code either for the browser or the server.

ExpressJS is the most used Node web framework, and is the underlying library for several other Node web frameworks. It provides mechanisms to:

- write handlers for requests with different HTTP verbs at different routes (URL paths);
- integrate with "view" rendering engines in order to generate responses by inserting data into templates;
- define web application settings such as the port to use for connecting or the location of templates that are used for rendering the response;
- add additional middleware for requests processing at any point within the handling pipeline.

3.4. Middleware - binding the technological stack

The platform was designed around a protected core where information resides. Within this area, referred as Middleware, the information is protected from direct interaction with the public

user of the application, conferring a higher level of security and avoiding a major part of the classic attacks that can affect a database. Security means integrity, reliability, and confidentiality of the system *(Cîrnu et al, 2018)*.

Middleware should be regarded as the binder of a software solution. In this case it is the infrastructure that facilitates the creation of the business application and provides basic services such as concurrency, transactions, threads, execution processes. In addition, it provides security to the application and allows high availability functionality. Middleware includes Web server, application server, content management system that supports application development and content delivery.

The main functions performed by the middleware are:

- Hiding the distributed nature of the application. The platform can be viewed as a collection of interconnected components that are operational and can be distributed in distributed locations;
- Hiding the heterogeneity of the platform, including the hardware used, the operating systems on the server or the communication protocols;
- Providing a high standardized, uniform interface for application developers and integrators, so that the platform can be easily reused and interoperable;
- Providing a set of common services to perform various general-purpose functions, to avoid duplication of development efforts, and to facilitate possible collaboration with other web applications or services.

The middleware mediates the interactions between the system's components. Middleware allows different modes of interaction (synchronous invocations, asynchronous message passing, shared object coordination) embedded in different models.

3.5. Tasks and activities management

In order to manage the proper development of the system, the team adopted an Agile methodology. By using this approach, the software is developed in short cycles, thus ensuring reliability for timely releases. This results in faster, more frequent software building, testing and releasing.

To meet the current demands of accelerating the time for software launch, most developers have switched from traditional development models to continuous delivery based on Agile development methods *(Lianping, 2016; Saleh et al., 2017)*.

Task management is performed in the Trello platform (Trello Board, 2019):

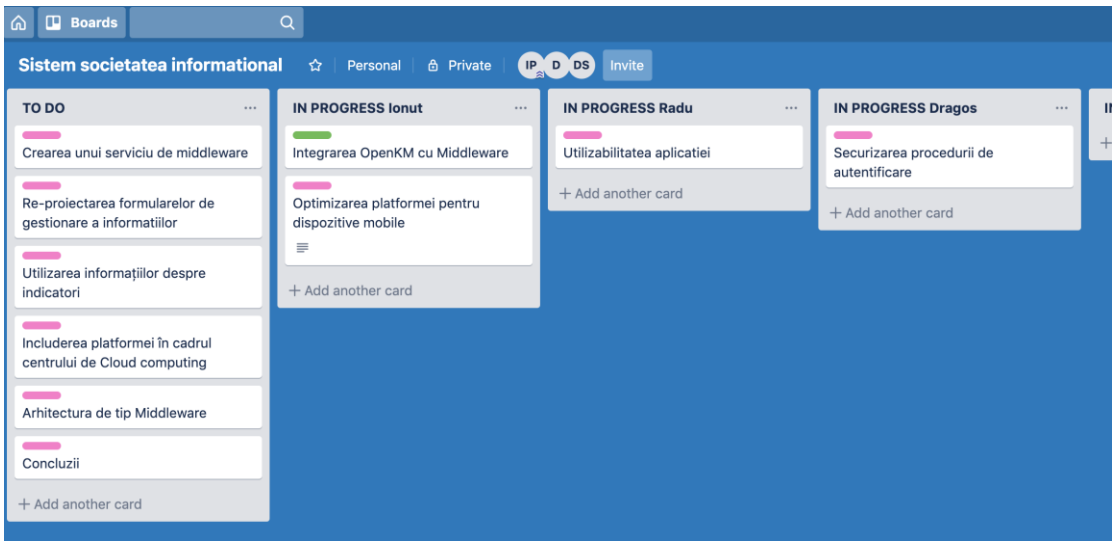

Figure 4. Tasks and activities management

The management technique during the development of the system was based on Scrum, which is a subset of Agile. Scrum is an iterative software development model used to manage and develop complex software.

The iteration period is set at two weeks. Briefing sessions are held daily. At the end of each iteration, a meeting is held with all team members and the technical tasks and tasks for each developer are outlined.

4. Conclusions

The system is mainly aimed at standardization of the data collection mode and evaluation of the progress in developing services specific to information society, increasing the availability and accessibility of public data, and decreasing the data trading time between the state's institutions.

It is expected that the system can be used as a useful tool in the creation of reports and statistics regarding the level of implementation of solutions pertaining to the information society, and to reflect objectively the degree to which the objectives set in the Digital Agenda for Romania are met.

The system has been designed to cope with the changes and evolutions in the digital environment. To allow scalability, the internal structure of the system is accessible and can be expanded with new features.

Although there is a large number of reluctant people towards information developments, most citizens are convinced of both the usefulness and the strength offered by new technologies. Adapting citizens to the existing technological challenges is intrinsic in most cases; mankind adapts to the environment and quickly learns the benefits offered. As long as the use of technologies brings an advantage or a gain, regardless of its nature, the citizen will accept the technological innovation. As a result, it is very important that the information society develops in accordance with the needs of its citizens.

Confirmare

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