

Collaborative citizen oriented informatics applications' development cycle

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***Abstract:** Citizen oriented informatics applications are presented. Classification criteria are defined for these applications. Citizen oriented applications' development cycle's stages are presented. Particularities of the development cycle's stages for the collaborative citizen oriented applications are analyzed. The functionalities of the collaborative application for structuring text entities are described. Future research directions are mentioned.*

***Keywords:** collaborative applications; citizen orientation; development cycle; text entities; online environment.*

1. Citizen oriented informatics applications

The knowledge based society is the new form of organizing and functioning of the society. The explosive development of the information and communication technologies made possible the evolution towards this new type of society. In the knowledge based society the main role returns to information under all its forms and to knowledge. The new society is characterized by [1]:

- a new product, software; software is designed to solve problems with the aid of calculus and communication techniques; the problems for which are created vary in difficulty and complexity and that leads to a great software diversity;
- the basic entity is represented by the individual and the community; in the online environment the virtual communities are developing continuously; the new technologies that facilitate the information exchange emerge continuously and the virtual communities are the ones that benefit the most; a software product accepted by a community has from the start a large number of users so it is necessary that software products fulfil the users' requirements;
- characteristic goods are calculus and communication equipments, software products, informatics and communication services; informatics products and services along with the infrastructure necessary for their functioning are the main creators of added value in the knowledge based society;
- the majority of the technologies are ecologic and have a low consumption of energy; in order to respect the principles of the durable development, the new technologies aim towards minimizing negative effects upon the environment and towards low energy consumption;
- remote work; the physical presence of the persons at the workplace is no longer necessary as through the high speed networks the working activities are made from home and the results are transferred real-time on the server the team works with;
- borders are eliminated, the activities taking place on the Internet [2]; both the working and the commercial activities develop massively in the online environment because the costs are very low and the covering range is very great.

In the knowledge based society the quality requirements are increasing. The new informatics applications cease to be the owning companies' instruments and are oriented towards the satisfaction of the user. Taking into consideration the fact that the geographic borders are eliminated from the point of view of the data fluxes in the new society, the new informatics applications must address a much wider segment of users with diverse characteristics and requirements.

With technology's development the number of services that migrates from the traditional form to the online one also increases. For these the adequate form of delivery in the online environment must be identified, the right technologies must be used, the access must be guaranteed for a group of users as large as possible and secure and quick payment methods must be implemented.

All these impose a reevaluation of the qualitative requirements of the informatics applications in the online environment. Developing an application after the old quality requirements makes it uncompetitive in the new society. The informatics applications corresponding to the new society are citizen oriented. They have as a central element the citizen. COIA – Citizen Oriented Informatics Applications, are developed for the citizens, to solve their problems as quick as possible and with the highest degree of satisfaction. Unlike the traditional ones, they are characterized by [3]:

- very large number of simultaneous users;
- compulsory updates to reflect the environment's changes;
- total adaptation to offer a high degree of satisfaction to the users;
- very low or inexistent costs of use;
- permanent access to online resources;
- the target group covers all the citizens that must solve a class of problems;
- problems are solved for the citizens, not for organizations;
- the direct mode of interaction with the untrained users.

In the new society the evolution of applications is vital because the bases of the knowledge society are the citizens and their communities while the organizations are on the second plan. It is necessary that the applications fulfil users' requirements.

Citizen oriented informatics applications are realized to solve their problems. Considering the very large and diverse target group the citizen oriented informatics applications are very diverse in order to solve the diversity of problems. These applications are classified depending on many criteria as it follows [4]:

Interaction criterion assumes the classification of the informatics applications depending on the degree of user interaction with the application. By this criterion the applications are:

- applications in which the user don't introduces data;
- applications in which the user selects data from preset lists;
- applications in which the user introduces data.

Content criterion realises the informatics applications classification depending on the modifications the content suffers. On the basis of this criterion the applications are divided in:

- preset content applications;
- applications for which the content modifies only by adding operations;
- applications for which the content changes with time;

- dynamic content applications; the content changes through additions, updates and deletions of content.

Number of actions criterion classifies the application depending on the number of actions that can be realized. According to this criterion the applications are divided in:

- one action informatics applications;
- many action informatics applications.

Complexity criterion concerns the number of sub-problems that are solved, the flexibility to offer different approaches, ways of generating selection criteria and the diversity of ways in which resources are allocated and payments are made. In this context are identified:

- applications for a single specialized problem;
- medium complexity problems;
- high complexity problems.

Completeness criterion concerns the degree of application's coverage of the users' requirements. There are:

- applications with partial degree of coverage;
- integral flux applications.

Immediate results criterion classifies the informatics applications depending on the necessary time to return the user's result. There are applications with immediate results and applications with delayed results.

The security criterion divides the applications in secure and unsecure applications [5].

The cost criterion concerns the costs implied by the use of the informatics applications. Depending on this criterion the following are identified:

- applications with no costs;
- pay as you go applications;
- subscription applications;
- paid applications.

The clearer the application is classified using the defined criteria, the quicker the citizen chooses an application from the set of applications. Not all criteria are as important for the user. Every user searches for an application that fulfils a certain level of quality from a point of view. Having many classification criteria facilitates users' search.

2. Collaborative COIA' development cycle

The development cycle of software products is divided in stages. Each stage has its inputs and outputs. According to [1] the software development cycle leads to a high quality software product if all stages are performed in a proper manner. For the collaborative citizen oriented informatics applications the development cycle's stages are altered in order to fulfil users' requirements.

Planning is the stage of the development cycle when users' requirements are defined. The future users of the application form the target group. As citizen oriented informatics

applications must be used without training, it is necessary that the target group is studied in detail. The problem the application must solve when in current use is studied so that all situations are covered. If the citizens encounter situations that the application can't solve they orient towards another application that solves that situation. The target group's members are very heterogeneous and are characterized by different levels of education, wealth and computer proficiency. Application's requirements must be determined so that the target group is totally covered. The users' requirements are materialized in the application's specifications as a result of the design stage. Specifications must detail the requirements so that the programmers can develop clean and clear source code. Well designed specifications also lead to fewer errors detected in the testing process. This stage determines users' requirements and also key characteristics of the target group's members.

Design is the stage where the application takes shape. The problem's domain is analyzed and all actions necessary for the problem's solving are detailed. In this stage the specifications are created based on the analysis of the problem, users' requirements and target group members' characteristics. Application's specifications are the basis on which the application is built on. If the basis is not solid, the whole construction will fail in the future. Specifications must detail all steps necessary for the problem's solving. Specifications define the operations that affect input data, the output, security requirements, types of interfaces, communication facilities. Specifications must be:

- precise; imprecise specifications lead to confusing applications, incorrect operations, missing results, high resource allocation, redundant source code; precise specifications guide the programmers on a straight path towards high quality results;
- concise; specifications that are not concise confuse programmers and this leads to incorrect source code elaboration and waste of resources;
- clear; unclear specifications leaves the programmers the liberty of choice and inexperienced ones don't usually make the best choices;
- constant; the specifications must not change during the development process; once finalized, the specifications don't change; if major issues were omitted, the application is updated and the process is a different project.

Design is also the stage of the development cycle when the application's architecture is defined. Citizen oriented informatics applications are usually using the distributed architecture as they must operate in the online environment. The most common model is the client-server model that divides the application in two parts. The processing part of the application resides on a web server. The application's interface consists of web pages that are accessed by users. Data is exchanged between the server and users, operations are made on the input data and results are returned.

Implementation is the stage of the development cycle when programmers edit source code. Programmers edit the source code following the specifications. Usually source code is edited using an IDE – Integrated Development Environment. The IDE allows the programmers to be efficient by providing many tools and facilities.

Testing is the stage of the development cycle that is responsible for detecting the application's errors. A detailed testing process detects many of the errors leading to a high quality application. As citizen oriented informatics applications are used by a large number of users no errors are allowed to happen so the testing process is very important.

Documenting is done for the further ease of maintenance and updating process. Source code commenting aids programmers in future improvements and application integration.

Deployment is the development cycle's stage that finalises the initial development process. After this stage the application is exploited by users.

Maintenance is a stage of development cycle that lies from the deployment of the application to the removal from use. At this stage updates are done in order to fulfil the users' requirements that arise during the current use of the application.

The perfect linking between the stages of the development cycle leads to quality informatics products that respect the project's deadlines. The product's quality decreases with every stage of the development cycle that is not performed as it should be.

3. Particularities

Citizen oriented informatics applications differ from the traditional ones by many aspects. The development cycle of these applications is also different in order to ensure the high quality for fulfilling users' requirements. For the collaborative citizen oriented informatics applications there are some particularities in the development cycle:

- extended analysis of the target group; this must be done in order to ensure a detailed knowledge of the problem and of the target group's members; target group members' characteristics determine the development of the application regarding functionalities, interfaces, results and inputs;
- disabled persons in the target group; statistics regarding disabled persons must be realized and components that ensure their access to the application's resources must be integrated in the citizen oriented informatics application; there are many open source components that offer support for disabled persons and their integration with the application is easily done;
- collaborative development work; citizen oriented informatics applications are usually very large applications that offer extended functionality to a very large number of users so the development process would be very long if a serial development process is adopted; for the shortening of the development cycle a parallel process must be adopted by the project; different members of the team develop in parallel application's components and in the end, when all components are finalized, they are assembled and the complete application results; the testing process is also done in parallel by team members for the assigned modules; the complete application is also tested to ensure the communication between modules is flawless;
- application modularity; taking into account the size of the application, it is difficult to manage it as a single piece; the application is broken in modules by functional and logical principles; usually an application is divided in three parts: the application logic, the user interface and the database support; the application logic is the part that does all processing using data from the database and parameters and commands given by the user through the user interface; the user interface is a graphical tool designed to facilitate the communication between the user and the informatics system; database support consists of database servers and tools that ensure correct and secure functionality;
- collaboration facilities; for the collaborative citizen oriented informatics applications it is very important to provide users with collaborative tools; as citizen oriented informatics applications are available online, the existence of an Internet connection is compulsory; the availability of an Internet connection orients the communications facilities to the online environment; collaborative citizen oriented informatics

applications must provide users means of communication as e-mail, instant messaging, voice over IP calls, video conferences; tools as electronic calendars, document sharing, document versioning, data sharing, revision control, workflow systems, knowledge management, online spreadsheets and cost and time management;

Taken into account these particularities in the development process leads to qualitative products that serve well the users it was designed for. If these particularities are ignored, the obtained products are not used by citizens as they fail to fulfil their requirements.

4. Collaborative application for structuring text entities

The collaborative application for structuring text entities is designed to aid users structure papers in a desired format. The application's functionalities are:

- detects paper's structure; the paper must have title, abstract, keywords, chapters and conclusions; if not all are detected, the user is instructed how to improve his paper;
- creates statistical reports regarding keywords in paper; paper's keywords must be encountered in the paper's body; if they are not found it means that the paper is aimed to discuss one problem and it treats another one;
- checks references; in order to be solid, the paper must be based on the domain's works from the last years; if reference entries older that five years are detected the user is warned about this;
- allows users to save their results for further comparisons;
- allows users to communicate; communication is very important as papers are usually created by work teams not by individuals; a good communication within the work team leads to good results;

The figure shows a user interface for structuring text entities. It consists of a vertical list of labels on the left side, each corresponding to a form field on the right. The labels are: Title, Abstract, Keywords, Number of chapters, and References. The form fields are: a single-line text input for Title; a large multi-line text area for Abstract; a single-line text input for Keywords; a dropdown menu for Number of chapters; and another large multi-line text area for References. At the bottom left of the form area, there is a button labeled 'Analyze'.

Fig. 1. User interface sample of the collaborative application for structuring text entities

In (Fig. 1) the user interface for data entry in the application is exemplified. The user inputs some identification elements like paper's title and keywords.

5. Conclusions

Citizen oriented informatics applications represent a new category of informatics applications. Their existence is based on satisfying the requirements of the target group's members. The development process for citizen oriented informatics applications differs significantly from the classic applications' development as these must fulfil additional quality requirements. The high diversity of the problems the citizens confront with leads to a high diversity of citizen oriented informatics applications and also to multiple classification criteria. For developing this type of applications many types of structures are possible. The proper structure is chosen based on the application's complexity and the functionalities it must offer.

The development cycle of these applications must lead to a high quality application that ensures a raised users' satisfaction level. The development cycle's stages are modified in order to ensure the target group's requirements are identified and analysed in detail.

The collaborative work imposes new activities in the development cycle so that the resulting applications offer facilities and tools to increase users' efficiency. For these types of applications a collaborative style of work is imposed in the development process as the size and complexity of development projects overwhelm a single person. The collaborative application for structuring text entities offers functionalities and tools so that users have their paper analysed and can communicate the results to each other.

Future research aims on identifying more particularities of the collaborative citizen oriented informatics applications and also tools and facilities that raise users' efficiency. Future developments of the collaborative citizen oriented application for structuring of text entities aim in implementing electronic calendars for time management. Also document versioning is aimed as a future facility of the application.

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