

A Knowledge-Based System for Support of Public Administration

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Abstract: *This paper describes requirements, expected benefits and current results of the EU-funded project Webocracy (IST-1999-20364 “Web Technologies Supporting Direct Participation in Democratic Processes”). From information technology point of view, within this project a system called WEBOCRAT is being developed. The WEBOCRAT system represents a rich set of communication supporting tools that will bring public administration closer to citizens, making it more accessible and more accountable. This will be shown on examples of already defined pilot applications.*

Keywords: *public administration, e-Democracy, knowledge-based system, ontology*

1. INTRODUCTION

The Webocracy project responds to an urgent need for establishment of efficient systems providing effective and secure user-friendly tools, working methods, and support mechanisms to ensure the efficient exchange of information between citizens and the administrations [3]. This project addresses the problem of providing new types of communication flows and services from public administration institutions to citizens, and improves the access of citizens to public administration (PA) services and information. The new types of services will increase the efficiency, transparency and accountability of PA institutions and will have impact on their policies toward citizens.

In [11] a three-phase strategy, for implementing e-democracy consisting of initiation, infusion and customisation phases, has been proposed. E-government and e-politics are there identified as elements of *e-Democracy*. *e-Government* informs citizens about their representatives and how they may be contacted. It also improves government efficiency by enabling citizens to make transactions online. *E-politics* is the use of Web technology to improve the effectiveness of political decision-making supporting participation of citizens in this process.

The first, *initiation phase*, starts with establishment of a portal that conveniently links citizens to (all levels of) government. Next, *infusion phase*, means restructuring the organisation in order to accommodate innovation. And, finally, *customisation phase* of e-democracy system implements a one-to-one relationship between citizen and government.

The WEBOCRAT system focuses on support of infusion and mainly customisation phases by various specialised modules. Customisation will enable citizens to finely focus on personally critical issues.

Our approach is focussed on the concept of *strong democracy* [2]. Unlike quick democracy that wants to speed up the decision-making processes, strong democracy wants to slow them down by involving people in discussion and deliberation processes [1]. One of the main novelties of our approach is the knowledge-based support [8]. Information of all kinds produced by various modules or segments of these documents is linked to a shared ontology representing a domain of public administration (local government). Such ontology serves as a means for structuring and organising knowledge. The advantage of clear structuring is more powerful search and retrieval engine, and more user-friendly content presentation [6].

In this paper, current status of the Webocracy project is presented. First, a hierarchy of criteria, which have been considered at the design of the WEBOCRAT system, are introduced in section 2. As next, the WEBOCRAT system functional overview as it has been proposed is described in section 3. Functionality intended to support customisation phase of e-Democracy implementation is described in section 4. Moreover, pilot applications defined by local authorities that are user partners of the Webocracy project are briefly described in section 5. Finally, section 6 provides a summary of the main conclusions of this paper.

2. REQUIREMENTS AND EXPECTED BENEFITS

2.1. REQUIREMENTS ON THE WEBOCRAT-LIKE SYSTEMS

The proposal of the Webocrat architecture is based on a set of criteria in order to guarantee its quality. Two kinds of criteria have been considered:

- User requirements ([10])
- General criteria (see Figure 1).

The former represent necessary conditions – minimal functionality which should be provided by the system in order to support users to comply with tasks they face during their activities (these requirements are defined in [5]). They define services, which should be offered by the final system. The latter represents additional requirements, which, although not expressed in an explicit way, increase the chance of the final system to be adopted by users (e.g. user-friendliness, speed, etc.).

2.2. EXPECTED BENEFITS FROM THE IMPLEMENTATION AND USAGE OF WEBOCRAT-LIKE SYSTEMS

Adoption of a system, which is focused on meeting the above-mentioned criteria, brings different kinds of benefits:

Benefits to local government (PA):

- Decrease of the costs of creating, processing, distributing, storing, and retrieving information
- Support of “reengineering” of intra-organisational and inter-organisational processes. By changing the processes the productivity of PAs, administrators, councillors can increase significantly.
- Improved services to citizens
- Improved image, increased flexibility
- Improved knowledge management, decision making in PAs
- Support of organisational learning

Benefits to citizens:

- Access to information and PA services (24 hours a day, all year round) from almost any location (anytime, anyplace)
- Increased speed of services

- New quality of services
- New types of services, customisation of services

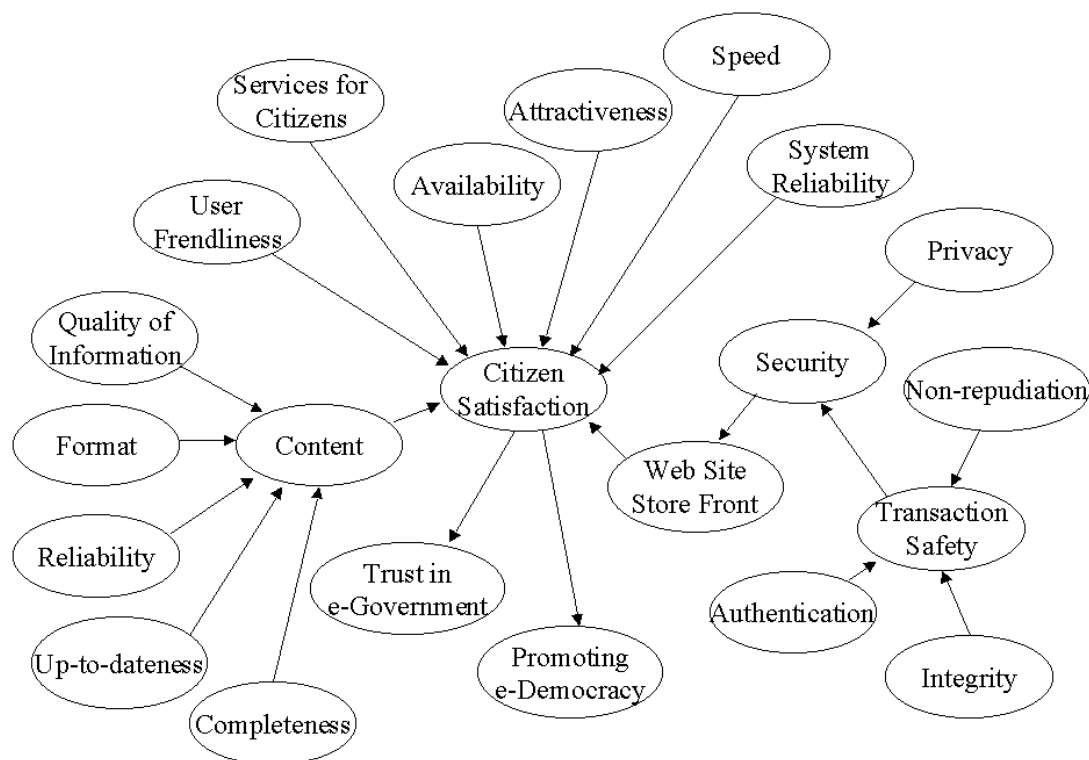


Figure 1: Comprehensive model of e-Government constituency satisfaction.

Benefits to society:

- Increased transparency of PA
- Improved services for citizens, entrepreneurs and other user groups will result in speed up of local economic development

3. WEBOCRAT SYSTEM FUNCTIONAL OVERVIEW

From the point of view of functionality of the *WEBOCRAT* system it is possible to break down the system into several parts and/or modules [9]. They can be represented in a layered sandwich-like structure, which is depicted in Figure 2.

A Knowledge Model module occupies the central part of this structure. This system component contains one or more ontological domain models providing a conceptual model of a domain. The purpose of this component is to index all information stored in the system in order to describe the context of this information (in terms of domain specific concepts). The central position symbolises that the knowledge model is the core (heart) of the system – all parts of the system use this module in order to deal with information stored in the system (both for organising this information and accessing it).

Information stored within the system has the form of documents of different types. Since three main document types will be processed by the system, a document space can be divided into three subspaces – publishing space, discussion space, and opinion polling space. These areas contain

published documents to be read by users, users' contributions to discussions on different topics of interest, and records of users' opinions about different issues, respectively.

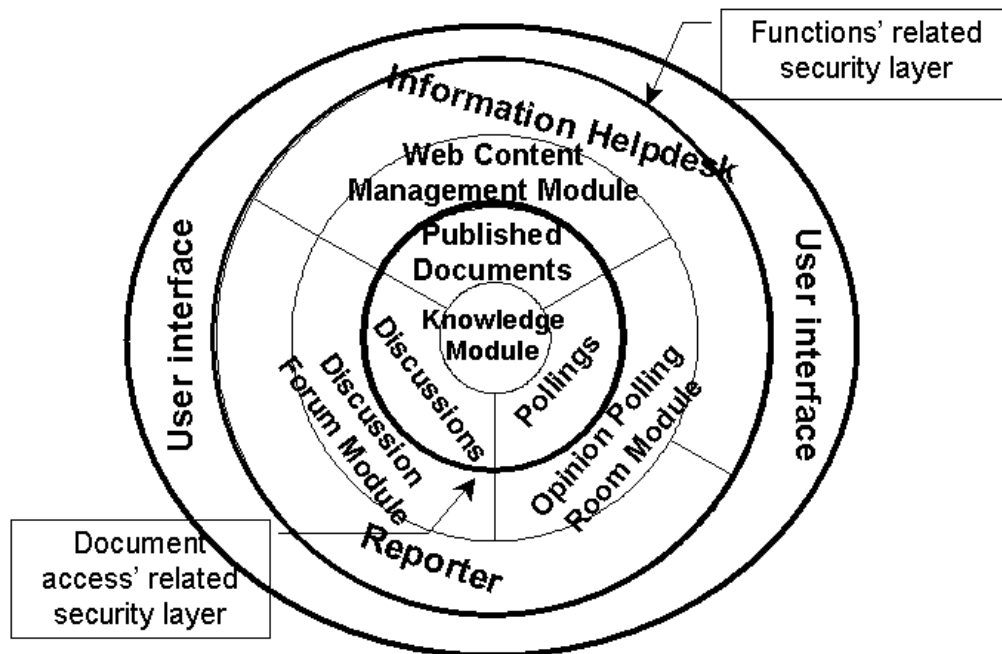


Figure 2: WEBOCRAT system structure from the system's functionality point of view

Documents stored in these three document subspaces can be inter-connected with hyper-textual links – they can contain links to other documents – to documents stored in the same subspace, to documents located in another subspace, and to documents from outside of the system. Thus, documents within the system are organised using net-like structure. Moreover, documents located in these subspaces should contain links to elements of a domain model.

Since each document subspace expects different way of manipulating with documents, three system's modules are dedicated to them. Web Content Management module (WCM) offers means to manage the publishing space. It enables to prepare documents in order to be published (e.g. to link them to elements of a domain model), to publish them, and to access them after they are published. Discussion space is managed by Discussion Forum module (DF). The module enables users to contribute to discussions they are interested in and/or to read contributions submitted by other users. Opinion Polling Room module (OPR) represents a tool for performing opinion polling on different topics. Users can express their opinions in the form of polling – selecting those alternatives they prefer.

In order to navigate among information stored in the system in an easy and effective way, one more layer has been added to the system. This layer is focused on retrieving relevant information from the system in various ways. Two modules represent it, each enabling easy access to the stored information in a different way. Citizens' Information Helpdesk module (CIH) is dedicated to search. It represents a search engine based on the indexing of stored documents. Its purpose is to find all those documents, which match user's requirements expressed in the form of a query.

The other module performing information retrieval is the Reporter module (REP). This module is dedicated to providing information of two types. The first type represents information in an aggregated form. It enables to define and generate different reports concerning information stored in

the system. The other type is focused on providing particular documents – but unlike the CIH module it is oriented on off-line mode of operation. It monitors content of the document space on behalf of the user and if information the user may be interested in appears in the system, it sends an alert to him/her.

The upper layer of the presented functional structure of the system is represented by a user interface. It integrates functionality of all the modules accessible to a particular user into one coherent portal to the system and provides access to all functions of the system in a uniform way. In order for the system to be able to provide required functionality in a real setting, several security issues must be solved. This is the aim of the Communication, Security, Authentication and Privacy module (CSAP) [7].

The system enables to define, open, and use many communication channels between citizens and a local authority. The purpose of these channels can vary from one-to-one communication (e.g. between a citizen and a representative) to many-to-many mode of operation (e.g. informing all citizens about upcoming events). They enable citizens to submit their ideas and proposals to municipalities, ask anything about the municipality, obtain information about services of local government and events, communicate with representatives and departments of the institution, join public discussions on various local and non-local issues, etc.

Technical achievements comprise a system designed to provide automatic routing of messages from citizens to the appropriate person within the public administration; tools for easy access to public administration information and to competitive tendering; discussion forums involving citizens and government representatives; on-line opinion polling on defined issues of public interest; tools for identification, authentication and security built into the system; tools for navigation and browsing through a 'pool' of information, documents, and emails at territorial levels.

4. WEBOCRAT SYSTEM FUNCTIONAL OVERVIEW

4.1. USER'S PROFILE DEFINITION

Since the system can contain a lot of information in different formats (published information, discussion contributions), it may not be easy to find exactly the information user is looking for. Therefore he/she has the possibility to create his/her profile in which he/she can define his/her interests and/or preferred way of interacting with the system.

When defining an area of interest, user can do it in two ways (or to combine both these approaches). One possibility is to select elements from a domain model (or subparts of this model). In this way user declares that he/she is interested in topics defined by the selected part of the domain model. The other possibility is to select one or more documents which are located within the system in order to define an area of user's interest in an implicit way. The selected documents play the role of patterns. This approach means that the user is interested in documents related to topics which are 'reasonably close' to topics of the pattern/sample documents.

4.2. ALERTING – A WAY HOW TO MAKE THE SYSTEM ACT ACTIVELY

The definition of user's area of interest enables alerting – user can be alerted, e.g. on changes of the domain model, a new opinion polling, publishing new documents, opening new discussions, etc. User has the possibility to set alerting policy in detail on which kind of information he/she wants to be alerted in what way (including extreme settings for no alerting or alerting on each event taking place in the system). The system compares each event (e.g. submission of a discussion contribution, publishing a document, etc.) to users' profiles. If result of this comparison is positive, i.e. the user may be interested in the event, then the user is alerted.

Alerting can have two basic forms. The first alternative is represented with notification using e-mail services. User can be notified on event-per-event basis, i.e. he/she receives an e-mail message for each

event he/she is alerted on. Alternatively, it is possible to use an e-mail digest format – user receives e-mail message, which informs him/her about several events. The way of packaging several alerts into one e-mail message depends on user's setting. Basically, it can be based on time intervals and/or the size of e-mail messages.

The other alternative is a 'personal newsletter'. This does not disturb user at unpredictable time – user simply can access his/her newsletter when he/she desires to be informed what is on in the system. Moreover, he/she can access it from arbitrary gadget connected to the Internet. The personal newsletter has the form of a document published in the publishing space. This document is generated by the system and contains links to all those documents, which may be of interest for the user. Since the document is generated when user logs in, it can cover all information submitted and/or published since the last user's visit.

If a user prefers a web based form of alerting to e-mail notification, then he/she can access not only current issue of his/her personal newsletter but previous issues as well.

4.3. PERSONALISATION

User registered in the system as an individual entity (i.e. not anonymous user) is provided with a personal access page ensuring him/her an individual access to the system. This page is built in an automatic way and can consist of several parts. Some of them can be general and the others are user-specific.

The former can serve as a starting point for browsing all published documents accessible to the user, all conferences he/she is allowed to participate in (in passive or active way), all running polls for which he/she is eligible, using search facilities of the system, read hot information, etc. The latter parts are devoted to user's personal newsletter, links to documents and conferences topics of which match the user's area of interest.

User can use his/her personal access page in an active way. For example he/she can make notes which documents from those offered by the system he/she intends to read and/or in which he/she is not interested. Or he/she can store links to those documents he/she has found exceptionally interesting, or to which he/she would like to return later.

It is possible to use personal access page for anonymous users as well – but only in a reduced form. It means that all users of this class will be provided with the same page, the page itself contains only general parts, and users are not allowed to use it in an active way.

The personal access page hides division of the system into modules. Terms 'publishing space', 'discussion space', and opinion polling space' do not confuse users. The personal access page enables user to access all functionality of the system, which he/she is allowed to access in a uniform and coherent way.

5. PILOT APPLICATIONS

Within this project, a special attention is paid to the process of integrating *WEBOCRAT* tools into practical applications. Rather than separating phases of development followed by the deployment of pilot applications, the process of *WEBOCRAT* tool and methodology development will be intertwined with deployment from early beginning (all pilot applications are splitted into two trial phases). Early deployment will provide important feedback and will drive their further development.

Roughly speaking, the supplier partners are divided roughly into three categories, to those (mostly) responsible for:

- a) Technology development: Technical University of Kosice (Slovakia) – coordinator, University of Wolverhampton (UK), University of Essen (Germany), Juvier, Ltd. (Slovakia);

- b) Methodology and organizational policies development: University of Wolverhampton, Juvier Ltd. and CITEC Information Oy Ab (Finland); and
- c) Marketing, bringing the product to the market: Juvier Ltd. and CITEC Information Oy Ab.
- d) The user partners are responsible for design, testing and evaluation of the pilot applications. The proper management of the project, good collaboration and communication between all project partners should create a synergy – an application of a holistic approach covering both “hard” and “soft” sides of the problem.

The Webocracy project will use a case centered and user-driven approach. The pilot applications will be designed, tested and assessed. The pilot applications will provide the context for all the implementation and evaluation activities. Each case will provide a specific test-bed for the technology and methodology enabling on-line (Web-based) support to services and operation of PAs. Each case will be configured according to the needs and “public context” of the particular user partner.

The first trials will be devoted to basic features of discussion, publishing and polling spaces [Bocock et al, 2001]. The second trials will involve all features on knowledge modelling technology, alerting and personalization.

The two trial phases will provide the context for all implementation and evaluation activities. In each phase, each of the user partners will conduct trials concurrently. Wolverhampton City Council (WCC) is responsible for the design, specification and evaluation of the trials in the UK. The Local Authority Kosice - City ward Tahanovce (LATA) and The Local Authority Kosice - City ward Dargovskych hrdinov (LAFU) are responsible for pilot applications and trials in Slovak Republic.

The first trial in WCC would make use of all three available modules (DF, WCM, OPR) and involves partner agencies and citizens. It has the advantage of taking place in small, local areas and addressing local issues, which makes things easier for marketing purposes and promoting local usage. As the issues are ones which are of direct interest to local citizens and partner agencies, it is hoped for a higher than average response [4].

First trial in LATA will make use of WCM and OPR modules. LATA wants to focus their pilot application on web publishing and content management, in order to effectively inform citizens and all other users [4]. This is one of the form how to access information as defined in valid law of the National Parliament of the Slovak Republic number 211/2000 of the Code of Laws, The Free Information Access Law. They want to make the matters of public administration clearer and easier for the citizens and support them by expressing their opinions.

In LAFU the trial will be focused on a special use of DF plus OPR for evaluation purposes [4]. At present state no citizen can check on the processing status of his/her document(s) submitted to the Local Authority. User knows just the processing deadline, which is 30 days after document entry date. The proposed *WEBOCRAT* pilot application should enable the user to check the processing status of his/her submitted document(s). After positive authorization any citizen will be able to see how his/her document has been handled. Moreover, the *WEBOCRAT* system will enable easy electronic submission of documents to the Local Authority.

5. CONCLUSIONS

In this paper the main ideas of the Webocracy project and basic motivation for the design of the *WEBOCRAT* system as well as its functional overview have been presented.

The Knowledge Module [Mach et al, 2000] represents the core of the system on which the other components are built. This system will provide automatic routing of messages from citizens to the appropriate person within the PA; tracking of processing citizens requests/complaints within PA; tools for easy access to PA information and to competitive tendering; discussion forums involving citizens and government representatives (DF); on-line opinion polling on defined issues of public interest

(OPR); tools for publication of documents on the Internet, browsing and navigation (WCM); tools for identification, authentication and security built into the system (CSAP); intelligent retrieval (CIH), calculation of summary statistics, alerting services (REP) and convenient access to information based on individual needs (personalized User Web-interface).

The *WEBOCRAT* system will bring PA closer to citizens, making it more accessible and easier to understand. The system will encourage more citizens' participation in democratic processes as well as making administration more efficient. This proposition should be approved by various pilot applications, which have been designed by user partners of the Webocracy project. First trials of these pilot applications have been also sketched here.

ACKNOWLEDGMENTS

We would like to thank our project partners for helpful comments and stimulating discussions. This work is done within the Webocracy project, which is supported by European Commission DG INFSO under the IST program, contract No. IST-1999-20364 and within the VEGA project 1/8131/01 "Knowledge Technologies for Information Acquisition and Retrieval" of Scientific Grant Agency of Ministry of Education of the Slovak Republic.

The content of this publication is the sole responsibility of the authors, and in no way represents the view of the European Commission or its services.

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