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FOREWORD

OVERVIEW

The development and implementation of e-government involves consideration of its effects including environmental, social, cultural, educational, consumer issues, among others. On one hand, e-Government software is mandated to follow very strict requirements in terms of evolving regulation, use of legacy technologies, confidentiality protection, and technical constraints related to the management. On the other hand, the design of e-Government applications must consider the impact on the diversity of users in terms of age, language skills, cultural diversity, literacy, and information technologies literacy. Bad design can have huge impact not only on the adoption of user interface by users but also compromise the validity of democratic processes. So that, accessibility had become a mandatory requirement for any e-Government initiative.

As governmental agencies increasingly move towards developing new way of improving the information exchange and services among citizens, businesses, and other arms of government, there is a strong need for inter-disciplinary empirical and theoretical research focused on Information and Communication Technologies and Computer-Human Interaction to guide the development of accessible and usable e-Government applications.

GOALS

The goal of this workshop is to bring researchers and practitioners together to explore the issues and challenges related to the development of usable and accessible user interfaces for e-Government applications using innovative Information and Communication Technology (ICT).

We wanted to facilitate discussion on the topics of identification and management of the diversity of users (e.g. citizens, stakeholders, etc), requirements and constraints for the development of e-Government applications, user experience with e-Government services, user involvement into the development process, universal access, policies for implementing accessibility and usability culture into government agencies.

TOPICS

This workshop was intended for anyone (researchers and practitioners) who is concerned about the design of interfaces that will be accessible and usable. This will include representatives from administrations, academia (e.g., lecturers in HCI), and policy-making organizations.

Workshop topics include:

- Identification of the diversity of users (e.g. citizens, stakeholders, etc)

- User Interface requirements and constraints for of e-Government applications
- User experience with e-Government services
- User involvement into the development process
- Accessibility and universal access design
- Public policies for implementing accessibility and usability culture into gov-ernmental and third party agencies developing e-government applications
- Quality models for measuring the quality of e-Government user interfaces
- Methods for user interfaces design for e-Government
- Successes and failures stories of e-Government user interfaces
- Recommendations for public Web sites
- Innovative use of ICT technologies including (but not limited to) instant mes-saging (e.g. MSN), GPRS, interactive TV, tracking systems, road traffic man-agement and regulatory enforcement, etc
- Personalization and multimodality issues for delivering eServices

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The City of São Paulo Healthcare Information System - A Case Report

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ABSTRACT

In Brazil, every citizen has the right to full healthcare, from primary care to complex procedures as heart transplants, for free, any place in the country. With a population of 180 million people, information is the key to better distribute resources and provide better healthcare.

Taking advantage of the concepts and infrastructure of the Brazilian National Health Card, in 2003 a huge project was started aiming to build an integrated web based application for the City of São Paulo to collect patient encounter information, to regulate complex procedures authorizations and to build an integrated patient scheduling system that would allow to schedule consultations and medical procedures in any health provider. This would reduce the waiting time, organize the flow of patients, and greatly improves the quality of care.

The challenge was to build a quality application in a short time frame for one of the biggest cities in the world with impressive numbers: 22 million inhabitants, 386 primary care units, 158 Polyclinics, 105 hospitals, 40.000 first consultations per day, 75.000 healthcare professionals and 7.000 computers that would access the information system. The information system had to be operated mostly by users with no computer training at all and, as such, should provide an user interface that was intuitive and easy to learn.

This presentation will share the experience of building such a system, showing how it was designed, the challenges, the problems, what changed in the health system once it was deployed and how it was possible to

build the system on the proposed time frame. From the time the first use case was specified to the time the information system was deployed, only four months had elapsed and 2.5 million lines of code were produced. After 3 years of production, the information system improved the public system efficiency by about 35%.

INVITED SPEAKER'S CV

Fabiane Bizinella Nardon has an MSc and a PhD in Computer Sciences. She is currently the CTO of ZILICS, a Brazilian Healthcare Information Systems provider, where she is responsible for all technical aspects of large distributed projects deployed in countries like Brazil and Angola/Africa. She was the architect of the Sao Paulo City Health Care Information System, a Duke's Choice Award winner in 2005. This project currently handles healthcare information of more than 14 million people in the public health system. Before joining ZILICS, she worked for several consulting companies and for the United Nations in the National Healthcare Information System Project of the Brazilian Ministry of Health, where she was responsible for designing information systems based on the JavaEE Platform. With extensive experience in standardization processes in Brazil and abroad, Fabiane was the chair of the Latin American Chapter of OMG Healthcare Domain Task Force and two times one of the directors of the Brazilian Healthcare Informatics Association. She is the java.net JavaTools Community Leader, was chosen a Java Champion by Sun Microsystems and currently is member of the Governance Board of the OpenJDK, the open source version of the Java platform.

Automation and E-government Services – A Widened Perspective

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ABSTRACT

This short paper questions the focus on *automation* of e-government processes, and *efficiency* in e-government, which is prevalent in both research and in practice in Swedish governments. We argue that this focus on automation and efficiency might cause unhealthy work for civil servants, and services that do not meet the demands or needs of the citizens. Hence, the role of the civil servant must be reconsidered, from a mere “overseer” of an automated process, to a highly skilled worker that provides complex services and works efficiently with information. Moreover, research on e-government should elaborate more on the changes that needs to be done in the services provided, as well as which services that are suitable for the Internet and other media.

Author Keywords

E-government, user involvement, healthy work.

ACM Classification Keywords

H.5.2. User Interfaces---User-centered design. General Terms: UCSD, Management, Design, Human Factors. Additional Key Words: Participatory Design, Studies of Organizations and Usability Studies

INTRODUCTION

This short paper addresses issues on automation and efficiency in e-government which is prevalent in both research (for example [1]), and in practice in Swedish governments.. Results presented in this article describe and reflect this focus on automation and efficiency in a case study made at three large government organisations in Sweden. The aim of this paper is to motivate a discussion where snapshots from reality are used as exemplifications to illuminate our position.

According to Grönlund [2], e-government is still an immature research area with a majority of papers on case stories and product descriptions, and few articles on theory building and theory testing. Furthermore Grönlund reports a high focus on IT, and the organization as such, and less on the role of the organization in society.

The maturity of e-government is a whole research area, and governments can be in different stages of maturity, as described by Layne and Lee [3]. Efficiency, effectiveness and meeting the citizens needs are

mentioned as a driving force, however, the authors do not describe how a service within a government should be changed to meet the need of the citizen, and which types of services are suitable for the Internet. In their model, the highest level of maturity is when there is a horizontal integration of government services, which means that services are integrated between governmental agencies. This is further elaborated in the article of Punia and Saxena [4] who has developed a framework for handling inter-organisational workflows.

The aim of the e-government is automation of existing services or processes, which we have experience in our research [5, 6]. This is further stretched by the study by Krokan and Midtbust [1] in which their aim was to understand why a governmental agency in Norway did not automate. Automation and inter-organizational services is also mentioned in an article by Arendsen and van Engers [7], they see the reduction of the administrative burden as one of the larger goals of e-government.

Another dominant discourse found in contemporary research concerns the user, and user involvement; however, they often have a high focus on the citizen. Følstad et al in their study [8] has interviewed project leaders in e-government projects, asking them about user involvement. Their result shows that the project leaders think they have good user involvement, although too little HCI-methods.

However, poor usability and a stressful work situation is still a significant problem in computer supported work, despite years of research efforts to increase focus on these issues [9]. We must not forget that the user of governmental services is both the citizens, and the civil servant, i.e. the civil servant that work within the government. e-Government applications risk causing even more health problems as the strong focus on the automation and efficiency results in applications with poor usability causing a bad work environment for civil servants. Moreover, the above-mentioned articles do not elaborate on the changing role of the users, neither have they elaborated on the change of the services.

This position paper aims at discussing and interpreting the high focus on automation, and the problems this focus might lead to. We claim that research within e-government must widen the perspective to include a

discussion about services and users and not only focus on different ways of integrating governmental systems or on the processes per se.

RESEARCH SETTING

We are involved in research projects together with three public authorities in Sweden. The projects are partly funded by the Swedish Development Council for the Public Sector (Utvecklingsrådet) where focus is at computer-supported administrative work and health factors. The project goal of the organization is to get better systems for their civil servants and by this healthy work and more healthy workers. All of the authorities are developing enhanced e-governance. The research goal is to understand how an organization understands user centered system design, implements the methods, and make use of them. We are also interested in understanding what are the obstacles and beneficial factors of the implementation process. Our research group has been involved in these projects, as researchers and to support the organizations' work.

Our research aims at influencing systems development in practice; hence research is carried out in real life settings with an action research methodology [10]. Data is gathered and analysed with a qualitative research approach with interview studies, meetings with stakeholders, analysis of documentation, observations and field studies.

Our research is based on a constructivist and interpretive perspective, where we create and understand our reality by using language through communication. Interpretations are flexible, situated, and socially constructed. Research based on case studies leads to contextual in-depth knowledge, and should not be generalized. We as researchers, the context, the organization and the conditions under which the research takes place, color the results. However, the organizations and the findings are not unique or unusual and therefore we hope that the reader will find the knowledge gained applicable in other settings, and as a background to create a discussion about the focus of e-government research.

SNAPSHOTS FROM REALITY

In our research we have found that some stakeholders to systems development, as for example the unions, and the human resource department discuss the future work of civil servants in terms of it being more complicated and complex due to automation of services and processes. From their perspective the role of the civil servants in the future e-government where processes are automated will be to take care of complicated cases and to "support" the computer when it fails to process a case.

However, there is also a discussion where the civil servants are seen as less skilled workers that can be replaced by an automated system. An example is the view of the future organisation described by several managers in one of the organisations. In this vision of the future, there are no civil servants and the only

people working in the organisation monitor computers that process all the case handling work.

"My vision of the future is three men in a bunker inside a mountain."

Even though the manager cited above have an extreme view of the level of automation, there is indeed a strong focus on automation of case handling in all authorities participating in our research projects. Automation is seen as a way of increasing efficiency in the organization. Increased automation of case handling has top priority, and all the authorities but one have implemented electronic case handling at least to some extent. Visions about the future are based on the idea that citizens (customers) fill out and send forms and applications, etc, electronically, the main part of the case handling will be done automatically and computers will "make" the decisions. When deciding on what aspects to automate in the computer systems, the work situation is seldom considered and consequently consists of what is left when the computer has done its best:

"We automate things, and the rest is a bunch of tasks for users. And these are closely connected to how we have developed the automatic process. And what is left there is something I feel we have no control of"

One of the systems development projects that we have followed as a part of our action research project has the aim to improve the decision process with a better GUI for texts and decisions sent to the customers. The main reason for this is to make the process more efficient, as it has been quite time consuming with the old system. The project also aims at automating parts of the case handling. However, as the project manager is very interested in usability, and a good work environment, it has been important to include civil servants in the system development project. After the first iteration, where the new decision text system was tested with users we had a meeting with the project manager. The civil servants testing the system had spent minutes reading and controlling the automated decisions made by the computers. They did not trust the computer, and were not willing to send decisions to customers without reading and understanding them first.

Furthermore, our studies have revealed that there is a gap between the civil servants' work and work situation, and the way this work is described in the systems development. In the systems development projects, the civil servants' work is frequently discussed in terms of simple steps and operations, that may be predefined and automated in accordance with clearly defined rules and regulations this is also discussed by Boivie [11]. Little attention is being paid to such issues as routinisation and repetitiveness of work tasks, control over work situation, control over pace and order of tasks, social support and deskilling, all of which are well-known risk factors for occupational health complaints.

It was seen as a problem that civil servants have to make decisions in complex cases where the computer

fails to generate a decision and where “human” judgement is required. These “human” decisions were seen as subjective and open to interpretations – which is the reason that the computer fails to make them in the first place – and the civil servants making the decisions were seen as incompetent.

The design and development of computer systems are based on information flow models the case handling process in the organisations that we have studied. This results in IT systems that do not support the situated nature of work. One example of this is that the system does not support that the civil servant works with several cases at once, and there is no possibility to save the work done so far in a case if you want to move on to another case or if the telephone rings. Moreover, this perspective may lead to inflexible and rigid computer systems that shape and confine work situations, as is illustrated by this comment:

“The new computer system forces you to do things in a specific way. Previously we had different alternatives”

CONCLUDING REMARKS

In the previous section we have described a few snapshots from our research projects, and in this section we would like to direct the reader to a couple of interpretations and implications of this focus on automation of e-Government services.

One of the basic values underpinning automation of work in the governments included in our studies is the notion that human decisions are objective and based on facts. This means they believe that decisions can be translated into computer code based on computer logic with if- and else-statements etc. There is little recognition that decisions may involve judgements, and that case handling might include subjective and contextual elements that will be impossible to transfer to computers. It seems that the thoughts of Lucy Suchman have not yet reached these governments [6]. In the perspective on work and automation presented in the results section, humans and their work are often thought of as rational and predictable. Our studies indicate that there is a tendency to elevate the rational and structural dimensions of work, as in Morgan’s machine metaphor [12]. The official and structured way of representing work in the organisations in our studies is through explicit models, such as described by [13]. This perspective on work obscures human aspects of work as a complex, situated and social process [14].

However, work is more than procedures that can be defined and fully understood. Work is also a complex social process, and civil servants constantly communicate and interact with each other to solve problems and to make decisions. From the engineering oriented perspective these aspects are blurred and ignored. Instead computer supported work is seen almost as a flow of information between the computer

and the user, as in use-cases¹ for example. However, work has a purpose and is driven by goals or intentions and that work is specific to the context and shaped by circumstances of the situation as it evolves – i.e. it is situated and contextual [14]. Thus the engineering-oriented perspective on users’ work and work practices as well-defined models ignores the situated and social nature of work. The engineering-oriented perspective does not address users’ practical knowledge about their work, their understanding about “what-to-do” as well as “how-to” in a specific situation [16].

It is essential to understand users’ current work practices, and how these practices may be affected and improved by new technology. A fragmentary understanding of the work situation, and the perspective on work as procedures and sequential steps or operations, may result in IT systems that are poorly adapted to the users’ needs, causing frustration and strain in the work situation. The system built does not support the situated, contextual nature of the work. In our studies, we have seen that systems development is often based on an engineering-oriented view of problem solving, where the system forces the users through a workflow divided into a number of windows on the screen. Each window containing only what is believed to be relevant information for the specific task, and with no possibility to go backwards or forwards or to save or pause. This engineering-perspective is closely related to the systems theoretical perspective, which places emphasis on technical and formal aspects of the relationship between man and machine [17, 18]. In an engineering-oriented perspective, users are primarily defined by their relation to a technical system.

What will be the role of the civil servant when more and more services will be automated? Layne and Lee [3] describe a situation where systems are integrated and automated the “government employees are now becoming more an overseer of the process than a simple task-oriented assembly-line worker”. In our experience it is of utmost importance to include the users in the change of an IT-system, and consider the work that will be the result of the new IT-system.

Another problem is that the user in the form of citizens, are not making decisions or using the service in a way that the government anticipated, as in one of the examples mentioned above. When automating, or putting a service on the Internet, the behaviour of the user might change, and they might pose different, or new demands on the government. This can already be seen in other e-service markets, for example banking and travel agencies as shown in the work of Värlander [19]. Värlander shows in her work that there is an overflow from e-services that affect the physical world

¹ **use case** is a technique for capturing requirements of systems that is used in Rational Unified Process 15. Kruchten, P., *The Rational Unified Process: An Introduction*. 2003: Addison-Wesley Professional.

in that face-to-face meetings become more important. E-government research can learn something from this research, and try to find out which kind of services are more suitable for virtualisation, and which should be kept in the physical world. Moreover, the role of the civil servant will change and the work will not merely be “overseeing” the automated process, rather it will be focused on meeting the new kinds of demands from the citizen, where efficiency regarding time will be less important, and information efficiency more important [19].

AUTHORS EXPERIENCE IN THE FIELD

Åsa Cajander and Elina Eriksson are PhD-students at Uppsala University, with Jan Gulliksen as supervisor. Both authors are involved in a research project with three Swedish governments as partners. The aim of the research project is improving usability and health in computer-supported administrative work.

The HCI-group at Uppsala University has been involved with e-government related research for the past decade. One major concern is that too much emphasis is put on the user experience of citizens using e-services, before the civil servants and their changing work. When moving more services to the Internet, the work of civil servants will also change. The issues around healthy work and civil servants are important and perhaps not that prevalent in e-government research. Even though the aim of the project is not first and foremost e-governance, the presented perspective plays an important role for all research in the area.

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An e-gov service for retirement applying by illiterate and disabled people

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ABSTRACT

This paper describes an e-gov service that provides a mean to require urban or rural retirement benefits. It also discusses its usability and accessibility in order to assist disabled and illiterate people. The conception of such service has been motivated by the identification of the major needs among the portion of Brazilian people who is digitally excluded and whose functional or plain illiteracy levels are significantly high. Furthermore, the percentage of people with visual or hearing impairments at retirement age is higher than overall population average. Such characteristics should be taken into account when designing interfaces which can be easily used by people with low literacy levels or visual or hearing impairment. This paper also describes the mechanisms for user identification and the assistive technologies employed in the design for providing autonomy to its target public.

Author Keywords

User Interface, e-gov Service, Illiterate People, Elderly People, Sensory Disabilities, Digital Divide, Retirement.

ACM Classification Keywords

Graphical User Interface, Screen Design, User-centered design.

INTRODUCTION

We present a new electronic government service, which integrates in one place, only, the majority of information and forms required for retirement request [1]. Those forms together with personal documents will be delivered at the Brazilian Social Security System office (INSS – Instituto Nacional de Seguro Social). Such e-gov service may reduce the number of visits to the INSS office by people eligible for retirement, making those procedures simpler, specially for those who live in towns without INSS office.

The target public for the service is composed by rural and urban workers who need to obtain their retirement through Social Security System. These workers are mostly elderly people and may be completely or partially illiterate, have some visual or hearing disabilities or even just be digitally illiterate.

Two factors motivated the creation of such service: 1) the identification of the target public needs which are those concerning mainly illiterate elderly people, and 2)

the socio-economic importance of Brazilian Social Security System.

The digital divide, or the constraints to access the information and communication technologies (ICT), due to educational, psychological or socio-economic barriers is the current condition of a great amount of Brazilians. Furthermore, visual or hearing impairments and complete or partial literacy deficiencies limit the access to technology, thus comprising some of the main barriers to the use of computers and Internet [2]. These characteristics are more usual among people over 60 years old, which is the average age to request for retirement benefits.

Within rural population, which corresponds to 19% of total Brazilian population, or 32 millions of people in 2004², around 55% of the rural households had a monthly income of approximately just two minimum wages³. In 2005, for the approximately 96 millions of Brazilian workers, 19 millions worked in the agricultural sector.

Due to the low income of the majority of Brazilian workers, the income received from retirement benefits has an important impact on the families, especially those who live in rural areas, where the retired citizen is the main provider. In Northeast, a poor Brazilian region, the main source of income is from retirement payments to the workers, whose benefit represents 50% of the total income of almost all households [3]. For those reasons, the retirement payments plays an important role for reducing the poverty and the income inequality in Brazil [4].

The development of an electronic service for solicitation of retirement must take into account the profile of the majority of its target market. The illiteracy rate among people who live in urban areas is 10% and for people who live in rural area it increases to 28%. In addition, about 20% of the population is partially illiterate. This number rises to 54% if we consider only people in retirement age, the target public of the service

² The data related to Brazilian population mentioned in this article were extracted from IBGE (Instituto Brasileiro de Geografia e Estatística).

³ Nowadays the Brazilian minimum wage is around US\$ 190,00.

proposed. Furthermore, in this group, 34% has visual and 18% some hearing impairments. Additionally, the portion of Brazilian population whose level of instruction is lower than three years of study reaches 32%. Considering only workers at retirement age, that portion goes to 54%. In the case of rural workers eligible for retirement, this parcel increases even more, reaching 81%.

In association with the socio-economic importance of retirement benefits, the evidences on Brazilian population needs impose a great challenge to the conception and development of this e-gov service: to create an interface with high usability and accessibility to its target public. It is important that such interface enables any illiterate or people with visual or hearing impairments to use the service without assistance. This service counts on its features to make it possible and that should be its great differential when compared to similar services.

CURRENT PROCEDURES FOR THE ACQUISITION OF A RETIREMENT BENEFITS

In order to obtain any kind of retirement benefit from Brazilian Social Security System in present days, the workers should go to an INSS office and ask for information and the required forms. Then, they must return to the INSS office in order to deliver the filled forms and a set of documents that prove their identification and fulfillment of all the requirements to receive the benefit. After delivering all documents, the worker has to wait about 40 days for the process conclusion.

The main barrier of a retirement applying is the understanding of the information presented by the INSS. There is a great number of persons with low literacy or some sensory impairment and the style of the written information is highly technical. In addition, in a considerable number of cases, it is difficult to collect documents with evidences of the number of working-years requested for retirement, especially for rural workers, usually not registered. Besides, until all required documents are complete and correct, it is possible that the worker has to return to the INSS office several times.

The effort of the worker to deliver all required documents may be expensive, specially if there is no INSS office in the city where he lives. It is known that only 20% of the Brazilian cities have an INSS office.

At the INSS Internet site it is possible to obtain information about many social security services as well as to download forms and track the processes status. However, as the case mentioned above, the excess of formal and technical language imposes a barrier for understanding those information, especially for those with low literacy.

SERVICE FEATURES

The service purpose is to support both, urban and rural workers, offering them automatic tools to simplify the Social Security retirement applying.

Most of the information about retirement application procedures is available in official government Internet sites but it is spread across different sites and use a complex language to be understood by most of people, even by literate persons. Furthermore, sometimes it presents contradictory information.

Our e-gov service offers an integrated information system that supports the workers during requirement and tracking processes.

It innovates in presenting information using a language and interaction models appropriated for illiterate people or people with visual or hearing impairment. Depending on the user, appropriated interfaces will be presented considering his profile, by using assistive technologies such as screen readers, touch screen, command voice, audio and sign language videos for people with hearing impairment.

Through this service, the user will be able to access information about different kinds of retirement, eligibility rules, documentation required and institutions responsible for issuing such documents. That information will be available in a understandable language for the user.

Many documents are demanded by the retirement request and the system will provide support for getting them by offering an electronic documents check list, giving information on how to obtain them and, also, communication tools for contacting the institutions responsible for issuing them. Sometimes, special forms are required for applying the retirement benefits. In that case, the service will help the user providing the necessary forms and supporting him to fill them.

After reaching the eligibility rules and gathering the documentation, the user must go to a social security office to apply for retirement benefits. The service will allow the user to track the progress of his process and to update his data, for example an address change.

PROCEDURES FOR APPLYING FOR RETIREMENT BENEFITS USING THE SERVICE

In order to use this service, the user must go to a telecenter (Internet access point) or kiosk, located in public places easily accessible for the target audience, such as rural schools and commercial areas, thus reducing the distance and time travel from and to his house.

The user will access the service after an automatic identification of his profile by the system, which includes the identification of type and degree of user's sensory disability or level of literacy. Furthermore, the user may register himself in the system. In such case, the authentication will be made by means of biometric data. Figure1 illustrates the main functionalities of the service.

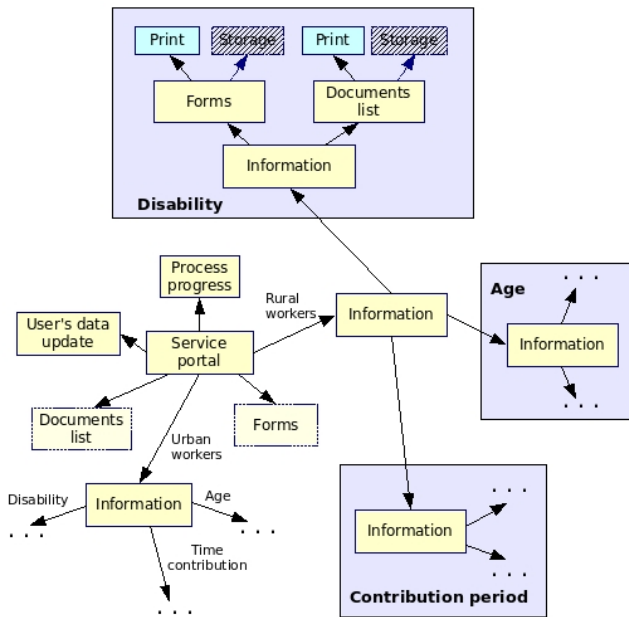


Figure 1 – Retirement service diagram.

Through the service, the user will be able to get all the information about the procedures for applying for retirement benefits without going to a social security office, usually not present in all cities, as mentioned before.

The service supports the user to get the required documents by instructing him on how to contact the institution responsible for the document emission (person of contact, e-mail, telephone and address) and, on how to obtain the document. Furthermore, if necessary, the service provides communication tools based on text or voice so that the user can contact different institutions and ask for more information related to the documents.

In the particular case of rural people who have worked in more than one city, this service may be especially helpful because they must get a declaration from the rural labor union of each city confirming their rural activities during an specific period of time. This new service could avoid a journey to each city to obtain a declaration from its rural labor union.

USER IDENTIFICATION

The user interfaces play a crucial role for the acceptance of the service by its target public. Whilst the access terminals are the equipment employed by the users to access the system, the interfaces offer the capability of an effective interaction by exchanging visual, audio or tactile information.

Beyond technical aspects, the interfaces enclose social, cultural, cognitive and subjective aspects of the user. They will employ a language and a model of interaction that favor the establishment of a communication between the system and its users. They are being adapted to the level of knowledge and abilities of its target public and use elements (such as expressions, concepts, images, figures and words) of its knowledge

and assistive technologies for people with visual or hearing impairments. This way, the service should overcome the effect of those impairments and also the limitations caused by illiteracy.

The interfaces are being designed in a way to break the resistance of the user in face of the ICTs and to make him interested in the service by offering an independent, efficient and pleasant use of the service.

The service will provide an application with interactive interface, which is automatically adapted to the user characteristics and limitations. For that to happen, at the initial moment of the interaction between the user and the application, the system will have to identify his profile, for example, type and degree of sensory disability, level of literacy, etc. This profile will be classified and associated to interfaces set that will be provided by the service.

The rural or urban worker, optionally, will be able to supply personal information, for example, rural or urban inhabitant, age and sex. The information and the profile will be stored with a biometric identity and used on his register for defining the more adequate interface for the user in his next login sessions in that application.

The access to the application will be carried out through a customized portal, constructed from the characteristics, limitations and preferences of the user. If the user is registered, that is, he has a profile associated with a biometric identity, the portal will contain its preferential applications, such as tools of communication, browsers, text editor and the service proposed; alternatively, the portal will contain applications of more general use.

For non-registered users, the system will have to identify their profiles and to configure automatically the most adequate interface each time they use the system. For the registered ones, the system will only have to recognize the user, through his biometric identity, and to recover his interface and gateway in the system.

If he wishes, the user will be able to configure his profile in accordance with his preferences and needs, being allowed to configure the interface and to add or to remove applications easily.

Sets of interfaces are being specified and developed, each one directed to a group of users in accordance with their characteristics, such as, low vision or blind people, full or partial hearing impaired people, plain or functional illiterates, and users without disability. The sets referring to partial impaired users and functional illiterates will be composed by more than one type of interface, depending on the degree of the sensory impairment or on the level of illiteracy.

Different medias will be used depending on the type of impairment, for example, in the case of blind people, the sound will be privileged for the communication, whereas for the illiterates, the images, sounds and figures will prevail.

The communication language will be of easy interpretation for people with low level of literacy in a way that the majority of population can understand the information provided by the Social Security System Internet site.

CONCLUSION

In this article, an electronic assistant for the retirement applying process for rural and urban workers was presented. The importance of such service can be conferred in the projections of retirements to be granted in the future and in the social function of the Brazilian Social Security System, responsible for a significant amount of retirements and the social protection of elderly people. Another important aspect is the availability on Internet site of all the information and procedures required for the processes for applying the retirement benefits for the rural and urban workers.

The main contribution of our work is the development of a universal communication language and interfaces with a universal design for the attendance of all the types of workers, not only those without deficiencies.

All the functional and technical specifications have been already carried through and currently we are testing different assistive tools for the most appropriate choice, choosing the places for field trials and initiating the software codification. Also, the developments of the interfaces and studies to find the more appropriate communication languages for our target public have been initiated.

Initially conceived to the rural and urban retirements, this service could be extended in the future for the attainment of other social benefits as aid for illness and maternity-aid.

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Towards Metrics for Web Accessibility Evaluation

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ABSTRACT

Nowadays, accessibility is a crucial factor for Web site development and use, and yet, people with visual disabilities face many accessibility barriers that hinder the adequate understanding of Web contents. In Brazil, the Federal Government published a law that formalizes the mandatory accessibility to Governmental Web sites' content. In this context, it is necessary to define ways to evaluate accessibility to guarantee the quality of these sites in this respect. Therefore, this article proposes a means of Web accessibility evaluation through metrics.

Author Keywords

Web accessibility, Metrics.

ACM Classification Keywords

K.5.2 [Legal Aspects of Computing]: Governmental Issues – Regulation; K.4.2 [Computers and Society]: Social Issues; D.2.8 [Metrics].

INTRODUCTION

Organizations use Web technology to make products and services available to potential clients. In this context, Web content accessibility is an important component of quality that must be observed among services offered by Web site providers. In Brazil, the Law Decree 5.296 explicitly states this importance, by compelling Governmental Web site contents to be in accordance with Web accessibility guidelines.

Therefore, it is crucial to define a means of evaluating accessibility in order to allow the elaboration of better software contracts between clients and providers. In this aspect, Service Level Agreements (SLAs) are used to establish minimum quality patterns pertaining to services supplied by providers to their clients [10]. The SLA's main component is a service catalog where one

can define, among other things, measurable factors, or indicators that will permit visibility as to the specified service levels that were either violated or respected.

The present work proposes the use of software metrics to evaluate the accessibility that can be used to define service level indicators for Web accessibility SLAs. The following sections present Web accessibility concepts, our approach to Web accessibility evaluation and the work in progress.

WEB ACCESSIBILITY

Web accessibility means that people with visual, physical, speech, cognitive or neurological disabilities are given the opportunity to perceive, understand, navigate and interact with the Web [7]. According to [12], to perceive is "to become aware of something via the senses"; to understand is to grasp the meaning of something; and to interact is "to have and effect on each other".

According to W3C [1], evaluating Web sites for accessibility can be done using approaches such as: preliminary review, conformance evaluation using accessibility tools to determine if a Web site meets accessibility standards such as the Web Content Accessibility Guidelines (WCAG) and involving users in the evaluation.

The WCAG [4] proposes 14 general guidelines which are composed of checkpoints that explain specific accessibility aspects and techniques to use them; and of priorities that show how critical their implementation is. The current version of WCAG recommendations is 1.0. In the 2.0 WCAG Working Drafts [5], verification points and priorities have changed to 'success criteria' and 'conformance levels'. Furthermore, the guidelines were regrouped into four basic principles: "(i) Content

must be perceivable, (ii) Interface components in the content must be operable, (iii) Content and controls must be understandable, (iv) Content should be robust enough to work with current and future user agents (including assistive technologies)". Each principle contains general guidelines organized into levels and success criteria. The W3C Consortium describes the relationship between the two versions [3].

Other methods to evaluate Web accessibility can be found in the literature [6][11]. One of these methods, called participatory observation [11], proposes the evaluation of interactive sessions with disabled users and an observer, in an effort to identify barriers in Web access and strategies found by the user to try to overcome them.

OUR APPROACH TO EVALUATE WEB ACCESSIBILITY

In this research, the Goal-Question-Metric (GQM) approach [2] was used to define what was going to be evaluated. The main idea of GQM is that measurement should be goal-oriented. Initially, an explicit measurement goal is defined. Subsequently this goal is refined into several questions that break it down into its major components. Then, each question is refined into metrics that, when measured, will provide information to answer these questions. By answering the questions we will be able to analyze if the goal has been attained. The GQM goal for this work is:

To analyze Web sites,
for the purpose of evaluating,
with respect to accessibility,
from the view points of users with disabilities,
in the context of Brazilian Federal Government.

According to the definitions presented in the previous section, it was possible to identify that accessibility evaluation means, mainly, to evaluate the user's capacity to perceive, operate and understand Web site content. Furthermore, there is a concern, associated with accessibility, with respect to user capacity to reach the desired objective with an acceptable effort in a satisfactory manner. This aspect is explored by ISO/IEC 9126 [8] with respect to quality in use, i.e., the software product's capacity to guarantee that users will reach their specific goals with efficacy, productivity, security and satisfaction, in specific contexts of use. Based on these premises, the following questions were elaborated to evaluate accessibility:

Q1. What is the degree of perception with respect to Web site contents?

Q2. What is the degree of ease of operation of Web site contents?

Q3. What is the degree of understanding of Web site contents?

Q4. What is the user's efficacy in specific task execution while interacting with the Web sites?

Q5. What is the percentage of user productivity in specific task execution while interacting with the Web sites?

Q6. What is the degree of user satisfaction in specific task execution while interacting with the Web sites?

Based on the comparison between the two WCAG versions, metrics were defined to answer these questions (Table 1). The data was obtained in two ways: using a questionnaire filled out during participatory observation sessions and using an automatic tool called TAW [14]. The tool was chosen, among other reasons, because of its capacity to evaluate pages of arbitrary depth in a Web site and generating HTML reports with quantity of violations per page.

Three Brazilian Federal Government Web sites were chosen on which to apply these metrics (www.receita.fazenda.gov.br, www.previdencia.gov.br, and www.ibge.gov.br). The choices were based on the results of a Brazilian contest named iBEST Contest, where the best Brazilian sites, divided into different categories, receive prizes annually. The three sites above received the best prizes for the Government category.

One task was defined for each site. The first task was to find out whether a person is going to receive income tax returns, by filling out two fields: a number similar to a Social Security Number and a dynamically generated image shown as a captcha field (a code shown as a distorted image for security purposes). The second task was to identify the necessary documents to apply for a Social Security application. The third task was to find the Contact part of the site and identify the subjects that can be dealt with by email.

During participatory observation sessions, the tasks were executed by ten users with varying degrees of visual disability and different Web use expertise. All the sessions were conducted in environments with personal computers with keyboard, mouse, speakers, Web browsers (Internet Explorer or Firefox Mozilla) and screen reader software (Jaws or Virtual Vision).

Our approach was presented to the Brazilian scientific community in previous events related to multimedia and Web [9] and software quality [10]. These papers show some of the preliminary results. The current results (Table 1) show that the Web content levels of perception and understanding increase whenever the quantity of violations to the WCAG 1.0 checkpoints decreases. Analyzing the results of questions 1, 2 and 3, one can conclude that task 1 had the lowest degree of perception, operation and understanding, while task 3 obtained the best levels of the accessibility principles.

Question	Metric	Value	Task 1	Task 2	Task 3
Q1	M1. Degree of content perception	From 0 (completely imperceptible) to 7 (completely perceptible)	2,9	5,5	6
Q1	M2. Quantity of violations to the perception principle in each task	Integer ($X \geq 0$)	15	59	22
Q2	M3. Degree of operation related to keyboard use	From 0 (completely inoperable) to 7 (completely operable)	5,4	5,8	6,2
Q2	M4. Degree of operation related to time for execution	From 0 (completely unsatisfactory) to 7 (completely satisfactory)	2,3	5,1	5,8
Q2	M5. Degree of operation related to navigation complexity	From 0 (very complex) to 7 (very simple)	5	5,8	6
Q2	M6. Degree of operation related to anchor existence	From 0 (very difficult) to 7 (very easy)	5,2	6	5,8
Q2	M7. Quantity of violations to the operation principle in each task	Integer ($X \geq 0$)	2	0	0
Q3	M8. Degree of understanding and comprehension	From 0 (completely not understood) to 7 (completely understood)	3,3	5,6	6
Q3	M9. Quantity of violations to the understanding principle in each task	Integer ($X \geq 0$)	5	4	0
Q4	M10. Percentage of Efficacy	Percentage = (number of users that concluded the task) / (number of users that executed the task)	10%	100%	100%
Q5	M11. Percentage of productivity (up to 10 min.)	Percentage = (number of users that concluded the task in 10 minutes or less) / (number of users that executed the task)	10%	80%	90%
Q6	M12. Degree of satisfaction	From 0 (completely dissatisfied) to 7 (completely satisfied)	1	5,6	5,7

Table 1. Metrics defined for Accessibility Evaluation and their application

WORK IN PROGRESS

Through the analysis of metrics and obtained data, it was possible to define a preliminary parallel that indicates the following: the lower the degree of perception, operation and understanding of web content, the lower will be the efficacy, the productivity, and the satisfaction of the users, during task execution with those contents.

The next steps aim to improve the analysis of the metrics, in order to produce indicators that can be used to compose a service catalog for a Web accessibility SLA. Accessibility SLAs will be useful by contributing to accessibility initiatives, in the future, as formal instruments, between Web content developers and clients.

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Study of conditions of use of E-services accessible to visually disabled persons

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ABSTRACT

The aim of this paper is to determine the expectations that French-speaking disabled persons have for electronic administrative sites (utility). At the same time, it is a matter of identifying the difficulties of use that the manipulation of these E-services poses concretely for blind people (usability) and of evaluating the psychosocial impacts on the way of life of these people with specific needs. We show that the lack of numerical accessibility is likely to accentuate the social exclusion of which these people are victim by establishing a numerical glass ceiling.

ACM Classification Keywords

Accessibility, Visually disabled persons, E-Government.

INTRODUCTION & CONTEXT

The development of new technologies may prove to be a tremendous springboard for the integration of disabled persons (DP) provided that these environments are accessible, usable, and useful; in other words that they take into consideration the various characteristics of the activity and the needs and particularities (cognitive, perceptive, or motive) related to the disability of the users (7, 9).

This question is even more pertinent in the context of quasi-generalized media coverage of the service relationship (E-administration, E-banking, E-commerce, etc.). Various studies worldwide have shown the very weak respect of accessibility criteria despite the numerous standards (section 508 in the USA, the law concerning digital accessibility of administrative services in France, etc.) or labels (*Blindsurfeur* in Belgium, *See it Right* in England, *Accessiweb* in France, etc.) required during the conception of these online services [5]: more than 75% of the assessed sites present level 1 WAI guideline accessibility flaws [9], meaning that accessibility to these sites is impossible for DP [2, 3, 4].

This is becoming a serious problem insomuch as accessibility seems to be one of the social and political levers playing a role in the amelioration of the quality of life of people with disabilities [6, 8, 10]. Indeed, if on the one hand, accessible Internet sites can allow DP greater autonomy by giving them the possibility to complete various activities by themselves; on the other hand, these technologies are also the source of a new

type of social stigmatism because of their lack of technological accessibility. The DP must first ask for help to use the system and perform the act.

The objective of our communication is to determine the real contributions of accessible E-services for visually disabled persons as well as evaluate the repercussions of the lack of digital accessibility to these E-services on this population⁴. This is based on the hypothesis that inaccessible technologies will only confirm the inequalities of access to information and services between able-bodied persons and disabled persons, and could even reinforce and intensify them.

In this perspective, we studied the conditions of use of accessible electronic services.

In this perspective, we propose an original approach to study the conditions of use of electronic services accessible to disabled persons. The methodological approach is indeed both:

- Multidimensional: by diagnosing their utility (adaptation to user expectations), usability (ease of use), accessibility (respect of standards and principles), and acceptability (meaning and stakes attributed to the technologies).
- And comparative: since carried out on two user samples (able-bodied and visually impaired) with various levels of E-service experience (novice to expert).

METHODS

Our approach draws on three complementary studies:

- The utility of the sites was studied using an online questionnaire on 439 DP with motive, perceptive, and cognitive disabilities in order to determine what the E-services bring to the DP and what the DP expect from them.
- The usability and accessibility of the sites was

⁴ These results are extracted from research on the digital accessibility of electronic administration (ADELA project) financed by the Minister of Research and New Technology (Ministère Délégué à la Recherche et aux Nouvelles Technologies) (Nov. 2004 to Dec. 2005).

evaluated⁵ with user tests based on 3 scenarios (specified below) and two populations: 10 visually disabled participants (VDP) and 10 sighted participants. The participants had comparable sociobiographical characteristics (age, sex, education, etc.), only the mastery of the Internet varied equally in each group (5 novices and 5 experts). For this confrontation, we wanted to know if the problems encountered by the blind were the same as those of the sighted (general problems of usability), or if the problems were amplified by a choice of technology incompatible with their perceptive limits (problems of accessibility). The data collection tools used were simultaneous verbalisation, observations and a satisfaction questionnaire (adapted from the Wammi grid⁶). The indicators measured were the efficiency (time, frequency and nature of errors, omissions, number of selections/strategies to perform a scenario), satisfaction (score out of 5 on the Wammi scale) and efficacy (pass/fail test).

- The acceptability of E-services was analysed using semi-directive interviews of 8 blind participants. The objective was to determine to what extent these services could transform the practices, contacts, and status of the blind. These interviews were recorded and entirely transcribed. A thematic content analysis was performed on this corpus.

MAIN RESULTS

Study of utility of the sites

Of the 439 DP who answered the online questionnaire, 52% indicated having help with their classic administrative processes. This is due to difficulties in mobility (33.5%) physical accessibility to the building or administrative hours (30.5%), the complexity of forms (23%), or difficult contact with agents (feelings of “being different”) (13%). E-administration thus seems like an alternative solution that, incidentally, 52.4% of participants declared to have already used and 32.4% would like to use. These users benefited from them. The role of these E-services as a facilitating tool (finding information, avoiding going out to fill out forms, etc.) is thus confirmed by 90%. The fact that these electronic services allow the DP to avoid requesting someone’s help to perform tasks that are often intimate and personal and that they favour the social integration of the DP by providing the same access as an able-bodied person is underlined by, respectively, 90% and 96% of participants.

For the 40% who refuse to use E-services, this position is principally due to technical and ergonomic causes (*lack of reliability and accessibility of environments, data protection, delay of data processing, etc.*)

⁵ Ergonomic inspections of accessibility were also performed during the research but won’t be presented here due to lack of room.

⁶ <http://www.wammi.com/using.html>

informational causes (*services not complying with the users’ needs, unawareness of services offered*) and personal reasons (*preference for classic modes of access, fear of social isolation, entry errors, etc.*). DP support (*sensitisation, education, etc.*) in the acquisition of E-services would certainly help breakdown these barriers at least in part. Finally, even though 46% were opposed to transforming classic services into E-services, and this despite the benefits indicated above, this position should not be seen as a rejection of innovation, but rather as concern and worry, shared by 60% of participants that their specific needs and profiles would not be sufficiently taken into account in the conception of these technologies.

Evaluation of the usability and accessibility

Three scenarios were used for these tests: information retrieval from the ANPE (French national employment agency) site (Scenario 1: informational), participation in a public forum (Scenario 2: interactive) and filling out an online form on the Nancy les Vandoeuvre municipal site (Scenario 3: transactional).

	Efficacy (% of success in the scenario)		Satisfaction (mean score / 5)		Efficiency					
					Mean exploration time (sec)		Mean number of strategies deployed		Mean number of selections per scenario	
	Sighted (S)	Blind (B)	S	B	S	B	S	B	S	B
Scen. 1	100%	60%	4.17	3.42	105	814	1.38	3.40	4.38	8.20
Scen. 2	62.5%	20%	2.84	2.86	230	1134	2.29	3.70	6.43	7.30
Scen. 3	66 %	10%	2.84	2.86	334	1176	3.00	3.44	10.83	8.22

Table 1: Main results of user tests

From these analyses (Cf. Table 1), large divergences between the two populations emerge concerning the usability of E-services, as would be expected. The efficacy and efficiency are thus lower for the blind participants than for the sighted participants (with the performances, notably the time, that are up to seven times superior to those of the sighted). However, the satisfaction is globally the same for both groups. We even note a surprising result concerning scenario 3 where the efficiency (for the strategy and selection) is almost advantageous for the blind participants. This piece of data could be explained by a learning effect since the users performed scenarios 2 and 3 on the same site. So, it is the blind expert participants who exploited this learning the best, undoubtedly being used to taking advantage of each action to compensate for their disability.

We note moreover that the usage difficulties penalize mainly the blind the least habituated. The novice blind users seem, in fact, extremely resourceless in dealing with the problem of accessibility of the interface whereas the expert blind users, from their practice and their experience, solicit mental models to compensate for the ergonomic deficiencies of the tool. We can therefore observe a recourse to such schemas when

certain blind users anticipate the display of information or interpret inexplicit or polysemous wording by calling on their navigation habits: “Normally, we should find this information by clicking here...” On the level of navigation strategies, we can observe that novices opted more often to use search engines to enter the key words of the scenarios to perform (on average 4 of 5 novices) whereas the experts preferred going to the home page to systematically read the proposed links with a voice synthesiser (3 experts of 5). The results show that the failures are more frequent for novices because the key words entered in the search engine are often vague and imprecise. This strategy, which we could qualify as heuristic, is less efficient than the experts’ more systematic and general strategy: their mastery of the Jaws system allowed them indeed to consult different the different links very quickly and their experience with E-services also gives them the possibility to promptly locate the most pertinent elements to reach their goal.

These usage problems come specifically from the choice of conception that does not take into account the perceptive limits of the level of participants, and more generally the principles of accessibility: for example, we can cite newly opening contextual menus remaining unsignalled the appearance of contextual menus not signalled, the density of information presented (over 84 links on a single opening page of a municipal site), the absence of textual alternatives to images, the incoherent structure of pages organised in table format, the use of javascript which makes the screen reader used (Jaws) obsolete, insufficiently explicit links (with do not consider the remaining text content), the opening of new windows not signalled, etc.

Other difficulties common to both groups show, instead, a lack of ergonomics of the sites (according to [1]). It is mainly a matter of certain polysemic terms (*Téléprocédures~Téléservices*), of confusing visited and non-visited links, of the non-deactivation of links on the current page, of unclear error messages, of the dynamic reorganisation of the menus from one page to another, etc. In the end, these results prove that these sites do not take into consideration the inabilities of VDP, and specifically for E-services novices. The accessibility to certain content is very difficult, short of impossible; but moreover, the use of E-services generates a greater mental load that hinders all involvement in the process (shown by the mediocre level of efficiency and by the efforts made to overcome the obstacles to use).

Analysis of acceptability

The thematic analysis performed on these data brought out several themes grouped into contributions and risks related to the use of E-services (cf. Table 2 below).

Impact of E-services on the lives of VDP	References to the theme in interviews	E-services perceived more as a source of improvement	E-services perceived more as a source of deterioration
<i>Social dimension</i>	21	13 (62%) Autonomy, social integration (<i>through equal access</i>), Social recognition (<i>acting without help like able-bodied persons</i>)	8 (38%) Disembodied relation to machines (<i>absence of personalised attention and consideration</i>) Risk of social isolation and fear of social exclusion brought on by a digital exclusion
<i>Psychological dimension</i>	12	7 (58%) Self-esteem, evaluation (<i>being able to fend for oneself</i>) Conservation of confidentiality and privacy of personal information	5 (42%) Loss of “know-how” of mobility Fear of losing control of information transmitted (<i>hacking</i>), or increased control (<i>cross referencing of information.</i>) Feeling of helplessness when confronted with an environment perceived as complex
<i>Cognitive dimension</i>	11	8 (73%) Ability to read, classify and collect information in a virtual environment "Demystification" of the administrative process through a simplified access Acquisition of an administrative culture	3 (27%) Entropy phenomena: Sorting through the mass of information presented Standardised content of E-services and inadequacies to the needs and profiles of the VDP
<i>Instrumental and operational dimension</i>	13	8 (61%) Comfort of life: more mobility Possibility for tenfold increase in action, interaction, and information	5 (39%) Insufficient digital accessibility
Total	57	36 (63%)	21 (37%)

Table 2: Main results of thematic analyses of acceptability interviews

Overall, the visually disabled persons questioned felt that the benefits of the E-services far outweighed the difficulties posed (63% to 37%). E-services thus open “spaces of possibility” that allow DP not only to avoid the cognitive and operative constraints (spatial and temporal) due to their disability, but also to regain a certain autonomy and freedom of action.

These new perspectives contribute to their psychological stability and personal fulfilment (self-esteem). Nevertheless, these people do not idealise these new services either since they are well aware of the stakes linked to the lack of accessibility. Therefore, if administrations are not able to better organize their electronic services, there is a great risk of marginalizing people with specific needs even further. From this point of view, the lack of accessibility represents an

additional factor of exclusion and an obstacle to the integration of disabled persons.

Conversely, an exclusive and excessive use of these tools could also turn out to be dangerous since leading to a social isolation (*doing everything remotely from home*) and the loss of a know-how of physical mobility combined with a loss of autonomy of the VDP. “*The problem is that staying home, not moving much, that can create a certain isolation but also a small decline in my mobility comfort level. If I stay at home for a long time and do everything on the Internet, at a certain point, there will be certain things I wouldn't have the courage to do anymore*”.

CONCLUSION AND DISCUSSION

Our study enables us to show that the conditions of use of E-services depend on three principal factors:

Utility factors in such that the proposed E-services must meet the expectations of the visually disabled persons and bring them a real added value through their use (by augmenting their ability to act, interact, and be informed).

Ergonomic factors (usability and accessibility) in which the specificities of visually disabled persons as well as their level of expertise (with the internet and screen readers) are taken into consideration from the conception.

Psychosocial factors of acceptability where the proposed E-services offer the possibility to truly compensate, assist, and valorise visually disabled persons.

These technologies can, in fact, give value to the individual and confirm/reinforce his place in society by providing him autonomy. The mastery of these ICT could therefore result in the modification of his own perception, the redefinition of his relationship with his entourage and the amelioration of his capacity for social integration. However, these contributions could be limited by the choice of conception. We have, in fact, shown that the quality of ergonomics and the insufficient level of accessibility of the interfaces risk frustrating the user's interaction with the administrative sites and in the end hindering their appropriation and acceptance.

Also, in opting for environments that do not take into account the specific needs and aptitudes of disabled persons, the site creators risk establishing a sort of "technological glass ceiling" that prevents their disabled users from using the E-services offered naturally, whereas able-bodied persons do so with no apparent difficulty. This digital exclusion would be amplified by a social exclusion if the services could only be accessed by the technological channel -- as is planned in the law concerning administrative modernisation.

In sum, the digital chasm resulting from the lack of technological accessibility can be addressed as an additional dimension that adds to the social chasms that

disabled persons are subjected to and as a factor contributing to their exclusion and their social isolation.

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Accessibility Legislation and Codes of Practice: an Accessibility Study of Web Sites of French and Belgium Local Administrations

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ABSTRACT

This paper presents a case study of accessibility evaluation which reports the main drawbacks concerning the accessibility of Web sites of French and Belgium local administrations. We measure the accessibility of information published on Web pages, acceptance of standards of accessibility (i.e. W3C's WAI) and availability of services provided on-line. Our results allow the identification of the most frequent accessibility problems on these Web sites and measure the maturity concerning the accessibility by local administrations in France and Belgium.

Author Keywords

Accessibility, automated evaluation, e-government, local administration.

INTRODUCTION

In more recent years Accessibility became a legal requirement as many countries have enacted for Accessibility responsibility of content published on the Web. Despite important improvements on accessibility legislation (both Europeans and Nationals spheres) and incentives to make e-government Web sites accessible, there is a slow progress on the design practice of administration Web sites. In Europe, the European Council encourage state members to enact laws for accessibility of public Web sites at all levels of government. Many member states such as France [8], Germany [2], Portugal [4], and UK [7], among many others, have created laws for the accessibility of digital content. However, according to the most recent Capgemini [3] survey of EU member's e-government Web sites, there are still slightly differences on the maturity of service offered to citizens. A more remarkable effort to provide accessible content is visible at higher administration spheres (e.g. related to ministry and national agencies) even though local administrations offer a greater variety of services (e.g. inscriptions on schools, reporting problems on traffic, declaration of birth/death, request of identity card and passport, and so on) which have a huge impact on daily life of citizens.

In this paper we focus on Web sites of French and Belgium public administrations. We review the current regulations and regulation mechanisms (i.e. recognized standards) in France and Belgium. By the means of a

case study of accessibility evaluation we compare the maturity level concerning the accessibility of local administration Web sites in these countries. In particular, we measure the accessibility of information published on Web pages, acceptance of standards of accessibility (i.e. W3C's WAI) and availability of services provided on-line.

OVERVIEW OF LEGISLATION ON ACCESSIBILITY

One of the five priorities for the new i2010 EU e-Government Action [3] concerns the "advancing inclusion through eGovernment so that by 2010 all citizens benefit from trusted, innovative services and easy access for all" (i.e. *no citizen left behind*). By this priority the EU Council emphasizes the importance of accessibility of content and services provided by administrations. Despite EU recommendations, EU country members implement their own regulation and mechanisms for promoting accessible Web sites. Hereafter we examine the case of France and Belgium regulations.

French legislation on accessibility

In France it started slowly in 1999 with an internal recommendation based on W3C/WAI standards and stipulating that "people in charge of Web sites should pay attention to provide accessible content for all users, in particular for impaired users". This recommendation was not voted earlier than February 11th 2005, law number 2005-102 ("for equal rights and equal opportunities, participation and citizenship of impaired people" ⁷). It is important to notice that it legislates on both physical accessibility and electronic accessibility. The original proposal stated that all public Web sites should be fully accessible within 3 years. Several decrees have been published since then but the parts concerning the electronic accessibility (articles 47 and 78) have not yet been officially published and still now they are subject of revisions! The most recent decree of the law (December 13th 2006) extends the deadline for making e-government Web sites to conform with 'international standards' of accessibility (2 years for

⁷ Law N° 2005-102: "*pour l'égalité des droits et des chances, la participation et la citoyenneté des personnes handicapées*".

communication agencies, 3 years for administrative Web sites).

Belgium legislation on accessibility

In Belgium, a law of February 2003 prevents “any kind of discrimination based on physical handicap”. This regulation clearly addresses furniture and services offered by public sites. However, there is no legislation addressing specifically the accessibility of electronic content. In April 2003, the Walloon government (one of the 3 major regions in Belgium) adopted a series of actions to make public Web sites accessible in the Wallonia region. It also has been stated that some Web sites considered critical should be accessible before 2006⁸ according to the priorities below:

- Priority 1: public Web sites devoted to social action involving any kind of impaired users;
- Priority 2: Web sites devoted to information of citizens at the large or Web sites of Walloon government;
- Priority 3: Web sites devoted to job search.

Local administration is not addressed by these priorities.

ACCESSIBILITY STANDARDS AND CERTIFICATION

One of the drawbacks of current legislation is the lack of official referential for accessibility. W3C/WAI is the most recognizable standard for accessibility worldwide but different EU countries have proposed their own standards. Figure 1 present the logo used to identify currently used standards in this survey. Hereafter we provide a view at glance of these standards



Figure 2. Logos of some accessibility standards.

W3C/WAI

The World Wide Web Consortium (W3C) is at the origin of the Web Content Accessibility Guidelines (WCAG 1.0) [11]. The recommendations published on May 5th 1999 contained 14 guidelines and 65 checkpoints having 3 levels of priorities. The level of conformance with these priorities levels (known under the labels A, AA and AAA) have been widely followed by other standards. WAI certification is often associated to technology compliance certification (e.g. XHTML and CSS) which can ensure cross-platform accessibility. The certification at some level is free of charges using automated tools developed for this purpose.

The WAI have been working on the development of the WCAG 2.0. However, this second version has been largely criticized by the community mostly because it introduced directives which cannot be automatically inspected (e.g. all content should be perceivable, content should be understandable, content should support current and future technologies). In some aspects these new directives are ambiguous and difficult to apply even by experts. So as far the WCAG 2.0 is under revision, only WCAG 1.0 remains the most universally recognized standard of accessibility.

AccessiWeb and RGAA

The AccessiWeb label (<http://www.accessiweb.org>) was created by the association BrailleNet⁹ in France. In addition to the certification, the working group on accessibility proposes training for Web developers. AccessiWeb is based on WAI recommendations but it extends the evaluation to 92 checkpoints. Similarly to W3C/WAI, AccessiWeb certification includes three levels named *Gold*, *Silver* and *Bronze*. The certification process consists in 2 steps: a pre-audit performed by the applicant and an evaluation performed by AccessiWeb experts. The cost of the certification ranges from 1900 € (*Bronze*) to 2600 € (*Silver* and *Gold*). Although the certification is not free AccessiWeb provides tools and guidelines in order to help obtaining the certification. These resources are freely available from AccessiWeb Web site.

Recently, another initiative called RGAA (Référentiel Général d’Accessibilité pour les Administrations) has arisen from french accessibility experts and local administrations’ users. This set of guidelines is based on WCAG 1.0 guidelines and the Unified Web Evaluation Methodology (UWEM 1.0) [9, 10] which aim is to provide a set of guidelines and a standard procedure for manual and/or automated accessibility inspections. The particularity of RGAA 1.0 is that each guideline is associated with unit tests. These tests are easier to verify even for non experts and solve the problems of some high level guidelines in other existing set of guidelines. However, as this is a recent initiative the RGAA 1.0 document is still a working draft.

AnySurfer and BlindSurfer

The label AnySurfer (<http://www.anysurfer.be/>) is awarded by the Belgium association “Oeuvre National des Aveugles” (ONA) after audition by certified experts on accessibility. The costs of AnySurfer certification varies according to the size of the Web site (e.g. 120 € for a Web site of 100 pages). Both French-spoken and Flemish-spoken communities of Belgium agreed to this label. From a technical point of view, AnySurfer is strongly based on the W3C/WAI recommendations. Since July 1st 2006 the label AnySurfer replaces the label BlindSurfer conceived for the same purposes.

⁸ At: <http://egov.wallonie.be/accessibilite/>

⁹ Available at: <http://brailletnet.org/> (in French)

EuraCert

The Euracert label (<http://www.euracert.org/>) is an initiative of the European Council initiatives for promoting the accessibility in EU countries [4]. Web site can be awarded the Euracert label in addition to a label issued locally in a European country. ONA and Blindenzorg Licht en Liefde (Belgium, AnySurfer label), Association BrailleNet (France, AccessiWeb label) and Fundosa Teleservicios (Spain, Sello de Accesibilidad) are authorised to issue the Euracert label. To be eligible, Web sites should follow the UWEM 1.0. Whilst UWEM 1.0 and EuraCert represent important steps forward measurement and certification of Web sites in EU, from a technological point of view they are similar to W3C's Web Accessibility Initiatives [2]. The cost of EuraCert certification differs according to EuraCert partners in the EU countries (e.g. AccessiWeb which is the EuraCert partner in France sets the price to 1000 €).

EVALUATING LOCAL ADMINISTRATION WEB SITES

Local administrations offer a great variety of services which have a huge impact on daily life of citizens. For example inscriptions on schools, reporting problems with traffic, declaration of birth/death, request of identity card and passport, and so on. In addition to these sources local administration could be considered primary sources of information about tourism, social activities, demographic data, and general public services provided to the community. Currently there is a lack of information concerning local administrations Web sites. On one hand there are few studies assessing the maturity level of online services such as information, one-way interaction (i.e. download all forms), two-way interaction (i.e. online forms), and transaction (i.e. full electronic case handling). On the other hand we don't know how accessible these services are. Hereafter we present the preliminary results of two studies of assessment of local administration Web sites in France and in Belgium. Although the instruments used for the survey are different, both highlight the maturity level of these Web sites.

Evaluation of French local administration Web sites

Sixty-four (64) local administration Web sites were inspected by master students on Human-Computer Interaction. Both manual inspection (i.e. human judgment of Web sites) and automated inspection by tools (i.e. CSS and HTML validator¹⁰) were employed. The inspection was limited to 10 different Web pages of each Web site, which in most case covers all the major sections available. The checklist is composed of the following main sections: i) General questions, ii) Conformance with W3C/WAI guidelines, iii) Cognitive legibility of information, iv) Adoption of labels and v) Availability of online public services.

Checkpoints	N. of sites	%
General questions		
Is the language clearly stated in the main page?	6	9,4
Is the Web site multilingual?	5	7,8
Does the Web site propose different presentations?	1	1,6
Is there human assistance proposed to deaf users?	1	1,6
Conformance with W3C/WAI		
Are CSS style sheets employed for presentation?	32	50,0
Do CSS style sheets follow W3C guidelines? *	5	7,8
Are (X)HTML pages in conformance with W3C guidelines?*	2	3,1
Is alternative text provided for all images? *	6	9,4
Are tables misused for the layout?	24	37,5
Are pages equally visible with different navigators? *	54	84,4
Cognitive legibility of information		
Are summaries provided for long texts?	27	42,2
Does layout group similar/related information?	47	73,4
Do paragraphs present a single idea?	49	76,6
Are keywords clearly visible?	35	54,7
Is it possible to zoom in complex graphics?	16	25,0
Does links' label reflect the content of referred page?	50	78,1
Adoption of labels		
Is the Web site awarded by a label? Which one?	0	0,0
Are W3C guidelines respected but not referred?*	0	0,0
Are there other standards taken into account?	3	4,7
Availability of online public services		
Does the Web site provide some kind of online interaction?	10	15,6
Is the number of steps in transactions always informed?	4	6,3
Do labels provide meaningful information to fill in form fields?	16	25,0
Are the form fields automatically checked?	7	10,9

* Checked with help of automated tools.

Table 1. Checklist used on the survey of 64 French Web sites.

The results of the survey demonstrate a huge lack of accessibility of Web sites. Half of Web sites use CSS style sheet for presentation and only 5 of them (7,8%) follow the corresponding W3C recommendations. One of the most basic guidelines concerning the use of alternative text for images is strictly (all pages on the Web site) respected by no more than 9,4%. The results are even worst when looking at Web sites that do not provide meaning labels for links (78,1% don't).

It is noteworthy that none of 64 Web sites was awarded by a label but 2 of them follow optimize the design for technology-oriented standards (i.e. FireFox and Internet Explorer 6.0) and a third one implement language of signal standards for deaf users (i.e. WebSourd LSF).

One can notice a small but meaning number of Web sites moving towards providing an online service (15,6%). Some ergonomic guidelines are taken into account such as providing meaningful labels to form fields (25%) but it is clear it is not enough for Web sites intended to a very large public.

Evaluation of Belgium local administration Web sites

The Wallonia's agency of Telecommunications (AWT) in Belgium started in 2004 to evaluate the 262 Web sites of Wallonia local administration. Their results

¹⁰ <http://validator.w3.org/> and <http://jigsaw.w3.org/css-validator/>

shown that less than 5% of Web sites could be considered accessible¹¹.

Different techniques were employed in the present survey, such as: i) Ergonomic inspection with the WAI set of guidelines, ii) Visualization of Web sites using the browser Lynx (for checking legibility for blind users), iii) Automated inspection using free available tools for accessibility inspection such as DESTINE [1] and tools made available by the label AnySurfer. The combination of manual and automated inspection allows covering both problems related to syntactic defects on HTML code and problems related to the meaning of content. Fifteen Web sites in Wallonia region have been inspected from April 15th 2007 to May 15th 2007 by master students.

The general accessibility of these Web sites is very disappointing. We have found serious problems with many labels on links not referring to the proper page. In most cases it is impossible to navigate using just the keyboard, which is a main requirement for blind users. The extensive use of JavaScript and Adobe Flash technologies only accentuates the accessibility problems with links. Surprisingly, only a few Web sites provide extensive use of multimedia documents and only 1 Web site could not be properly read using different browsers. The main results are presented in Table 2 and show the main defects found on Web sites.

Checkpoints	Number of sites
Size of Web site in number of pages	7 small 6 medium 2 large
Number of sites supporting online interaction	6
Web sites presenting problems with labels on links	10
Content presentation in different languages	13
Inaccessible forms	7
Inaccessible tables	8
Lack of support for navigation based on keyboard only	11
Lack of alternative text for images or dynamic objects (e.g. Applets)	13
Web sites judged quite accessible	1

Table 2. Survey of 15 Belgium Web sites.

Only 1¹² of 15 Web sites provides an average accessibility but it presents too many links on pages which reduce the legibility of content and the navigation using the keyboard. It is noteworthy that quality of the Web site has no relationship with the size of the city. Web sites of big cities such as Liege and Brussels have many serious defects.

The results of the survey demonstrate that most of Web sites (6 of 15 sites in the survey) provide at least one online service to citizens. The number of online services ranging from 1 to 14 per city. Most of the services, however, are limited to the download of forms. The main problem identified is that such forms are difficult to find in the hierarchy of the Web site.

¹¹ By an informal communication, the AWT said that another survey is in progress but by the time of submitting this paper the results have not been published yet.

¹² Sambreville, available at: <http://www.sambreville.be/>

DISCUSSION

The survey presented is a first step towards a comprehensive study of accessibility and maturity of online services provided by local administration in France and in Belgium. Even if Web sites are including more and more online services, the lack of accessibility is evident in most visited Web site.

None of the Web sites of local administrations in Wallonia are awarded by the label AnySurfer. The absence of labels are also remarkable on French Web sites. The poor accessibility of Web sites is an strong evidence of the lack of training of Web developers on Accessibility and Ergonomic matters.

It is also clear that current legislation and official labels for accessibility have a minor (or none) impact on the design of Web sites. French regulation is more detailed compared to Belgium but no different impact has been observed on the Web sites in terms of conformance with labels.

However, the absence of a label does not mean lack of accessibility. On the other way round, the presence of a label does not itself ensure the accessibility of the Web site as labels are awarded over a short period of time when the site is audited. Inappropriate updates on content might include defects affecting the accessibility. Although labels give a good picture of the quality of the Web site its validity is limited to a short period of time. A more detailed study should be carried out to determine why designers are so few concerned by labels.

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