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Editorial

REICIS

Este primer número de REICIS en 2012 resulta especialmente importante para la trayectoria de esta revista porque, como indicamos en el anterior editorial, comenzamos con la publicación de contribuciones en inglés. En este caso, se trata de las versiones extendidas de dos trabajos, que abordan innovaciones en la calidad del software, seleccionados entre los presentados en el 3er congreso iberoamericano sobre Calidad y Accesibilidad de la Formación Virtual (CAFVIR2012). Como los lectores pueden apreciar, esta innovación conlleva también la actualización de los datos generales del número (portada, índice, etc.). También tendrá su reflejo en la web de la revista, donde ya existen las dos versiones, en español y en inglés, pero ahora las páginas en inglés incluirán más información y de mayor valor añadido. Por último, se creará también un comité científico internacional, adicional al comité científico actual, que proporcione su asistencia para realizar las necesarias labores de revisión y supervisión de originales así como la imprescindible labor de promoción y difusión de la revista y de sus artículos incluso más allá del inmenso mundo en lengua española.

The final goal of this new philosophy of REICIS is to overcome any possible limitations to provide our readers the best options to take advantage of the contributions of all type of authors without discarding any valuable work whose author is interested to share it with this journal and their readers. Of course, this possibility enables easier collaboration with international events and organisms. But this is especially beneficial for authors as a wider universe of readers can access to the contents of the journal because they understand the text of the articles or just because the journal is better known by non Spanish speakers due to the availability of certain articles in English. To ensure access to all types of readers, the key elements of all the articles (title, abstract and keywords) will be always available in both languages: Spanish and English. I have to say I am excited for the chances that this new stage of REICIS may yield to the journal and we hope you are too!

Luis Fernández Sanz
Director

Presentación

REICIS

Este número de REICIS publica, tras el proceso de revisión de nuestro comité editorial, dos contribuciones extendidas y revisadas, seleccionadas de entre las remitidas al 3er congreso iberoamericano sobre Calidad y Accesibilidad de la Formación Virtual (CAFVIR2012). Ambos contribuciones se escribieron en inglés y nosotros las publicamos con sus correspondientes título, resumen y palabras clave también en español. En este apartado de presentación, también incluiremos en inglés la descripción de los artículos escritos en este idioma.

The first article is titled "Requirements elicitation for designing an accessible chat " and has been written by several researchers from the Carlos III University of Madrid. The contribution by Rocío Calvo, Lourdes Moreno and Ana Iglesias is centered on techniques used to eliciting requirements for the design of an accessible chat as part of a synchronous computerized collaborative tool for mobile devices. The work pursues an approach inspired on the point of view of users and on a the philosophy of User Centered Design (UCD).

The second contribution is the result of the collaboration between experts from Finland and from Spain. The article " Accessibility and readability of university websites in Finland: present and future" has been authored by Markku Karhu, director of computing degrees at Metropolia University, and three experts in different fields of the topics of accessibility and readability in Spain: José R. Hilera and Carmen Cano from University of Alcala (UAH) and María José Rueda, and independent expert who has also taught in master programs at UAH. They have addressed, following standardized procedures already used in previous studies, the analysis of the accessibility and readability of English websites of the main seven universities in Finland according to the well-known ARWU ranking.

Para completar las contribuciones del congreso CAFVIR 2012, el copresidente de su comité organizador, el profesor Luis Bengochea de la Universidad de Alcalá, nos ofrece una reseña que resume las principales aportaciones del mismo y su proyección internacional.

Finally, in our invited section, Frank Mockler presents a practical overview of the European eCompetence Framework (ECF) and how the widespread EUCIP IT professional certification is intimately interlaced with the eCF.

Luis Fernández Sanz

Captura de requisitos para el diseño de un chat accesible

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Resumen

El uso de dispositivos móviles (DM) forma parte de nuestra vida diaria. Las personas están acostumbradas a usar los DMs frecuentemente para comunicarse y colaborar con amigos o compañeros de trabajo utilizándolos como herramientas colaborativas. Este artículo está centrado en el uso de esta tecnología en entornos de aprendizaje colaborativo asistido por ordenador o Computer Supported Collaborative Learning (CSCL) para DMs. En la actualidad, existen diferentes herramientas de apoyo al CSCL como: blogs, wikis o chats. Sin embargo, muchas de estas herramientas de aprendizaje utilizadas en dichos entornos presentan barreras de accesibilidad que impiden que gran cantidad de personas no puedan utilizar estas herramientas. El principal objetivo de este trabajo es analizar cómo diseñar de forma accesible una herramienta colaborativa de aprendizaje síncrona para DMs. Se presenta como propuesta un conjunto de requisitos, a tener en cuenta en el diseño de un chat accesible, obtenidos siguiendo un enfoque de Diseño Centrado en el Usuario (DCU). Son el resultado de una captura de requisitos a través del uso de técnicas como Perfiles de Usuarios, Personas y Escenarios.

Palabras clave: m-learning, CSCL, accesibilidad, chat, síncrono.

Requirements elicitation for designing an accessible chat

Abstract

The use of Mobile Devices (MD) is part of our diary life. People are used to use the MDs almost every day to communicate and collaborate with friends or colleagues in different environments such as work or education among others. This paper is focused on the use of this technology for collaborative learning contexts or Computer Supported Collaborative Learning (CSCL) environments. There are different tools which support CSCL like blogs, wikis or chats. However, most of the CSCL tools used present accessibility barriers which provoke that many people cannot use these useful learning tools. In concrete, this paper is focused on eliciting requirements for the design of an accessible chat as a synchronous CSCL tool for MDs in an accessible way. To achieve it, some guidelines and standards are considered as a reference to determine the requirements that a chat should have to be accessible. Moreover, the Scenario and Personas techniques are used to elicit the requirements from the point of view of users and using a User Centered Design (UCD) approach.

Key words: m-learning, CSCL, accessibility, chat, synchronous.

Calvo, R., Moreno, L. y Iglesias, A., "Requirements elicitation for designing an accessible chat ", REICIS, vol. 8, no.1, 2012, pp. 7-21. Recibido: 20-2-2012; revisado:18-3-2012; aceptado: 18-4-2012.

1. Introduction

Nowadays, Mobile Devices (MDs) are used by everybody regardless of its social level, disability or country. There are many developing countries in which poor people have a MD, even if they do not have money to eat [1]. So, the use of MDs in learning environments can be a solution to reduce the gap and barriers that people have to face when they want to learn and they do not have enough resources [2]. Several laws in many countries try to solve these barriers protecting the students' rights like: DDA[3], LOE [4] or IDEA[5].

On the other hand, it is necessary to remark the importance of collaboration in learning environments [6]. Communication techniques are becoming nowadays powerful tools in Computer Supported Collaborative Learning (CSCL) environments. Due to it, collaboration is up-to-date because people are joined to environments like social networks or blogs where people collaborate with each other to share information and knowledge.

Previous researchers have shown the usefulness of MDs in CSCL environments (m-CSCL)[7]; however, many accessibility problems affect to: people with disabilities; users that use it in environments which limit users' capacities like hands-free or noisy environments; users without experience and so on [8].

Therefore, this study is focused on eliciting requirements for accessible chats in MDs from the point of view of user experiences.

This paper is structured as follows: the second section presents the state of art of m-CSCLs and their accessibility problems; next, the third section presents the requirements needed for accessible chats in MDs; finally, conclusion and future work are exposed.

2. Background

This section introduces m-CSCLSs and the accessibility problems that people have to face when they use them.

2.1. Collaborative Learning in Mobile Devices

Nowadays, MDs are used to support individual and collaborative learning. In concrete, the use of m-CSCL can be an important issue because students are able to study and collaborate with each other [9].

There are some projects that integrate m-CSCLs. For instance, the study provided by[10] implements it with primary school children. Another example is the project implemented in the Arizona University, which uses MDs to support a student group project. As a result, the students were able to improve their oral and written skills among other capabilities [11].

Moreover, due to the importance that MDs are taking in this environment, many learning content management systems (LCMSs) like Moodle[1] or Blackboard[2] have added mobile learning (m-learning) environments as a complement to their e-learning systems. Besides, these tools provide CSCL features like: chats, wikis, blogs and so on which allow students to collaborate with each other through their MDs.

2.2. Accessibility Problems in Collaborative Learning

Many users have to face difficulties when accessing and using current CSCL tools. Some typical accessibility barriers that are presented today in many CSCL tools are that the main information is not accessible through keyboard [12].

Particularly, regarding to the accessibility of synchronous communication tools, people usually find accessibility barriers when using some advanced functionalities of the tool or with the use of the MD's keyboard [13].

Specifically, the communication tool studied in this paper (the chat) usually presents problems of accessibility due to developers do not use the technology in an efficient way. For example, chats are created in Flash or Javascript or developers do not follow accessibility guidelines [14]. However, the main problem is related to follow the flow and rhythm of the communication. For instance, the convert of text-to-speech or speech-to-text in real time is complex depending on the velocity of writing of the emitter. Besides if one of the emitters is not able to write quickly, the other emitter will be bored or not able to follow the conversation [15]. Moreover, some chats do not provide support for text-to-speech or text-to-braille and use hierarchy navigation [12].

There are some previous works related to accessibility in this kind of tools. An example is AMobile, it is an online accessible m-CSCL [16] which main objective is to stimulate students to learn while collaborate with other colleagues. Specially, it provides a special attention for visually impaired students to allow them to use this tool through a vocal interface. Besides, one of the modules that this tool provides is the chat as a

[1] See http://moodle.org/ (29 April 2012)
[2] See http://www.blackboard.com (29 April 2012)

synchronous tool. Moreover, there are some previous chats approximations like Ichat[3] or Achat[4] which are centered in solving the accessibility problems related to technological aspects. Specifically, in MDs AssistiveChat[5] provides new features for people with speech disabilities. However, they are not centered in the main problems of interaction that users have to face when they use chats. Considering all these things, the main goal of this study is to elicit the requirements needed to solve these accessibility problems of interaction.

3. Theoretical Approach

The approach proposed explains how has been elicited the essential requirements needed to design an accessible synchronous and m-CSCL tool. In concrete, the selected m-CSCL tool for this paper is the Chat. Thus, the study is based on standards, guidelines, methods and techniques used to capture the requirements needed to make frequently accessible used mobile chats.

The structure of the proposal is divided as follows. Firstly, it represents the context of the proposal in a mobile Learning Management System (m-LMS). Secondly, the guidelines and standards needed to create a synchronous m-CSCL module are selected. Finally, the m-CSCL module chat is selected and the requirements needed to the design of an accessible chat are explained.

3.1 Context in a LMS environment

A LMS should have different modules which are needed to support a course. This study is based on the Jin's framework [17] which specifies different modules for a mobile LMS. A collaborative module is added to this framework [18], which is considered an important module in learning environments nowadays. There are different authors who specify the main components of a CSCL module [19][20][21] . This study is based on the IMS [21] specification which specifies how the CSCL tools should be to be accessible. In concrete, this specification identifies the requirements needed to create the synchronous tools (chat, audio-conferencing, video-conferencing, whiteboard, Multiuser domain object oriented environments) in an accessible way.

The figure 1 shows a structure of the Jin's business logic layer of a mobile LMS, the inclusion of a collaborative module and the synchronous tools specified by IMS.

[3] See http://www.apple.com/es/macosx/apps/all.html (29 April 2012)
[4] See http://atutor.ca/achat/ . (29 April 2012)
[5] See http://www.assistiveapps.com/ (29 April 2012)

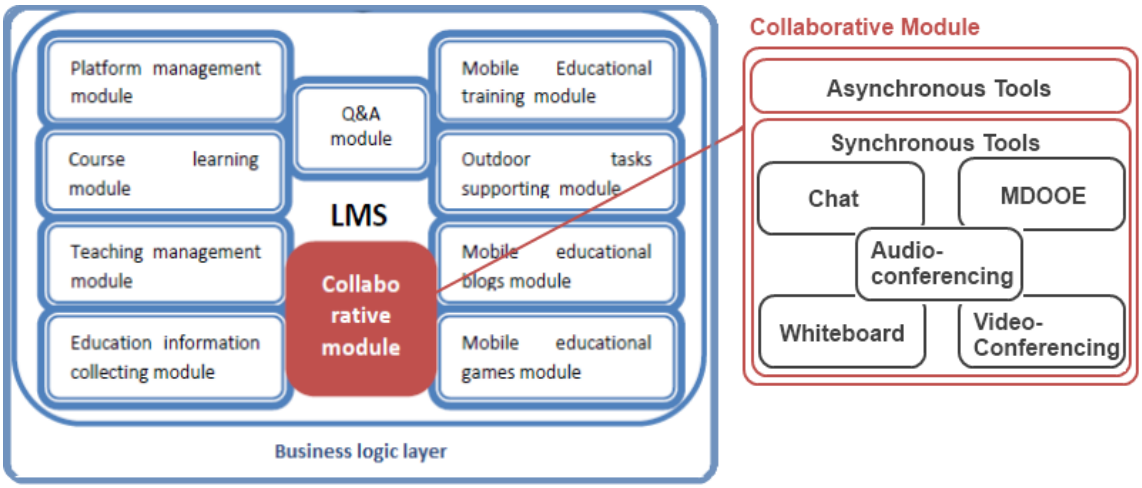

Figura 1. Context of Collaborative Module and its Asynchronous and Synchronous Tools.

3.2 Standards and Guidelines

The main objective of this study is to elicit the essential requirements needed to design an accessible chat for everybody. To achieve it, our research work is based on the standards and guidelines showed in figure 2.

Regarding to accessibility standards, the WCAG 2.0 guidelines [22], which specify how to create accessible Web content, are considered. Moreover, the developer should consider the guidelines MWABP [23] and MWBP 1.0 [24] which are related to the creation of accessible Web page and applications in MDs.

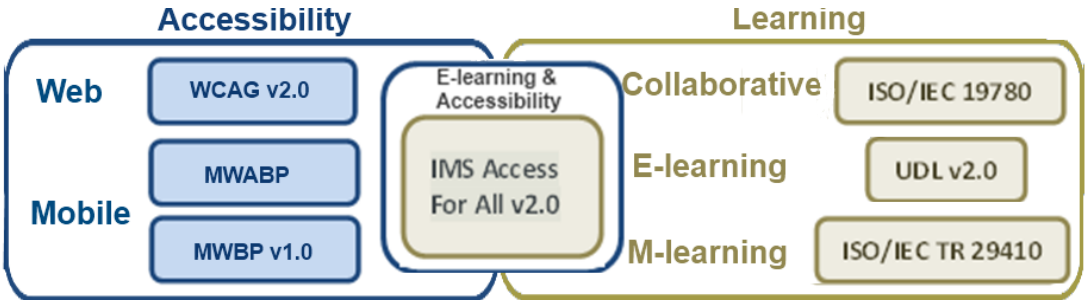

Figure 2. Standards and guidelines followed to the development of a m-CSCL.

On the other hand, a learning tool should accomplish with some standards and guidelines to be more usable and comprehensible. It has been considered the standard ISO/IEC 19780[25] to create a CSCL environment and the standard ISO/IEC TR 29410[26] for m-learning. Moreover, the guidelines UDL v2.0 [27]explains how to reduce barriers to access the learning content.

Finally, there are other specifications which are centered in the creation of CSCL and accessible tools. The IMS guideline [21] specifies some recommendations to

develop an accessible collaborative learning tool; specifically it proposes some guidelines to create a chat in an accessible way.

3.3 Requirements Elicitation for an Accessible Chat

There are many definitions of chat; however, there are not many definitions which include accessibility on it. The research work [28] defines a chat and the accessibility problems that it usually presents:

> "Text chat is a synchronous tool, which allows several users to communicate via typed text in real time."... "There are two basic issues related to accessibility of chat applications: fast-paced conversation and the need to track multiple simultaneous threads present problems for users with difficulties reading, composing, or typing under time constraints; and, confusing interfaces and inconsistent navigation can be difficult and frustrating for users with cognitive or mobility disabilities."

These barriers are mainly interaction problems that people have to face when they interact with a chat through a MD. The main objective of this paper is to elicit the requirements needed to design an accessible chat for MDs, this process is explained in the next section.

3.3.1. Requirements elicitation process

In order to solve the accessibility barriers, the requirements elicitation process consists on a User Centered Design (UCD) approach [28] to elicit the requirements needed to design an accessible chat for MDs. Taking into account it, usability techniques like User Profile technique [30] Personas technique [31] and Scenarios technique [32] have been used.

In the user modeling tasks, several user groups have been taken into account in order to analyze their necessities in an accessible chat. These groups have been defined under the consideration of common attributes among users according to their access characteristics such as chat experience, mobile experience, type of disability, etc. These common attributes which enable to model groups that have been obtained through investigation, interviews with users, etc. Once these attributes and values have been established, we have an approximation to all the users we want to reach to, and some User profiles considering common attributes (see table 1).

The personas technique has been used to categorize the users that use chats in MDs. With the personas technique groups of people that represent shared behavior

patterns, objectives and necessities. People are fictitious users, but the patterns have characteristics based on the investigation over the real audience.

Characteristic	Values
Speech disability	Yes or No
Visual disability	Blindness (B), Low vision (LV), Color Blindness (CB)
Physical disability	Motor disabilities (MD)
Hearing disability	Deafness (D), Hard of hearing (HH)
Cognitive and neural disability	No, Dyslexia and dyscalculia (DD), Attention deficit disorder (ADD), Intellectual disabilities (ID), Memory impairments (MI), Mental health disabilities (MHD), Seizure disorders (SD)
Mobile experience	Low (L), Medium (M), High (H)
Web experience	Low (L), Medium (M), High (H)
Assistive software experience	Low (L), Medium (M), High (H)
Chat experience	Low (L), Medium (M), High (H)
Age	Young Adulthood [19-49]; Middle Adulthood[40-65]; Maturity[65-end]
Sex	Female (F), Male (M)
Native speaker	Spanish(Yes), No
Place of birth	Name of the country

Table 1. User profiles considering common attributes and values

Considering common attributes of the modeled users (see table 1) some people of personas techniques are "created" to make an instance of these characteristics. These personas are represented in the table 2, which specifies the personas with their values of each attribute.

	Speech disabilities	Visual disabilities	Physical disabilities	Hearing disabilities	C. and N. disabilities	Mobile experience	Web experience	Assistive SW experience	Chat experience	Age	Sex	Native Speaker	Place of Birth
Rosa	No	No	No	No	No	H	H	No	H	21	F	Yes	Spain
Shannon	No	LV	No	No	No	L	L	No	L	22	F	No	USA
Felipe	No	No	No	HH	No	H	H	H	H	19	M	Yes	Spain
David	Yes	No	No	No	MI	L	L	No	L	41	M	Yes	Spain
Antonio	No	LV	MD	No	No	M	M	No	M	67	M	Yes	Spain

Table 2. Characteristics of created personas

And finally, Scenarios technique is used to obtain information related to how the personas created previously interact with chats in MDs. The scenarios selected are some of the main tasks that users can execute in a chat. These scenarios are: create a conversation, create a chat sentence, send a file, add interlocutor, previous conversation, select written language. Moreover, the guidelines and standards selected in section 3.2 are taking into account to design a chat that accomplishes them.

3.3.2. Requirements elicitation results

The results obtained after using the combination of User Profiles, Scenarios and Personas techniques show chat presents accessibility problems in MDs. The Appendix A shows a summary of the persona-scenarios results and this section shows a minimum example of the scenarios used to obtain the requirements for the accessible chat is explained in natural language next. Moreover, it is important to remark that this scenario mixes some of the scenarios used:

> A student, Antonio, has bought, a tactile MD, but he is not used to tactile keyboards. Moreover, he has decided to use a chat to communicate with his classmates because he has some doubts related to an exam. Antonio logs into the application chat and creates a conversation with Rosa, his colleague. So, he selected Rosa and pressed "Create a conversation". Then, Antonio writes a message and presses "Send". Rosa is much more quickly than Antonio writing messages in a tactile keyboard. As a result, Antonio is not able to follow the conversation and feels uncomfortable with it. Latter, Antonio writes a message and attaches a file. Rosa receives the image; however, she has decided previously not to show images in her MD to reduce her download limit, so she cannot see the image and understand the whole message. Moreover, Rosa is on the move so she cannot read it well and follow the conversation. Finally, Antonio decides to leave the conversation and presses "Leave conversation".

The difficulties found in this scenario are relative to: the conversation flow, the attached files and the messages format. To solve these problems, some new features, which are represented in figure 3, have been included in the requirements of an accessible chat in MDs. Next, these new features are explained and related to each problem.

1. **The conversation flow: "**Antonio cannot follow the conversation because he is not used to tactile keyboards". It means that the time that he needs to answer is

higher than usual. This problem is similar to the problems that people with motor impairments or older people, for instance, have when they try to use this kind of keyboards. To solve it IMS [21] expresses that people could be able to refresh messages manually and help people who communicate slowly. So, a new functionality to stop the auto refresh conversation is added, "Stop auto refresh conversation" in Figure 3. It consists on stopping the instant messages until the person considers it. In the previous example the situation will change as follows:

> "… Antonio writes a message and presses 'Send'. Rosa replies to it quickly. As a result, Antonio is not able to follow the conversation and feels uncomfortable with it; so he presses 'stop the auto refresh'. The system informs Rosa about it with the message 'Antonio is busy'. Rosa waits. Antonio presses 'send' message, 'Refresh conversation' and the conversation is refreshed…"

2. **The attached files:** "Rosa receives the image; however, she has decided previously not to show images in her MD to reduce her download limit, so she cannot see the image and understand the whole message". In this situation the user is not able to understand the message because she cannot access to the image. This problem is similar to the problems that people with visual impairments have to face when someone sends them an image. Basing on the guidelines [22][23][24] , it is necessary to provide alternative content to the non-textual content. Thus, the functionality "Add file" can improve it because it asks the user for an alternative content to the images uploaded just in case the other person was not able to access to the content. Then the previous example will be:

> "… Antonio writes a message and attaches a file. The system shows the message: 'Some people could not access to the file. You can provide an alternative text to the image to avoid it'. Then Antonio writes a description of the image. Finally, Rosa receives the image and an explanation of the image; so she can understand the whole message…"

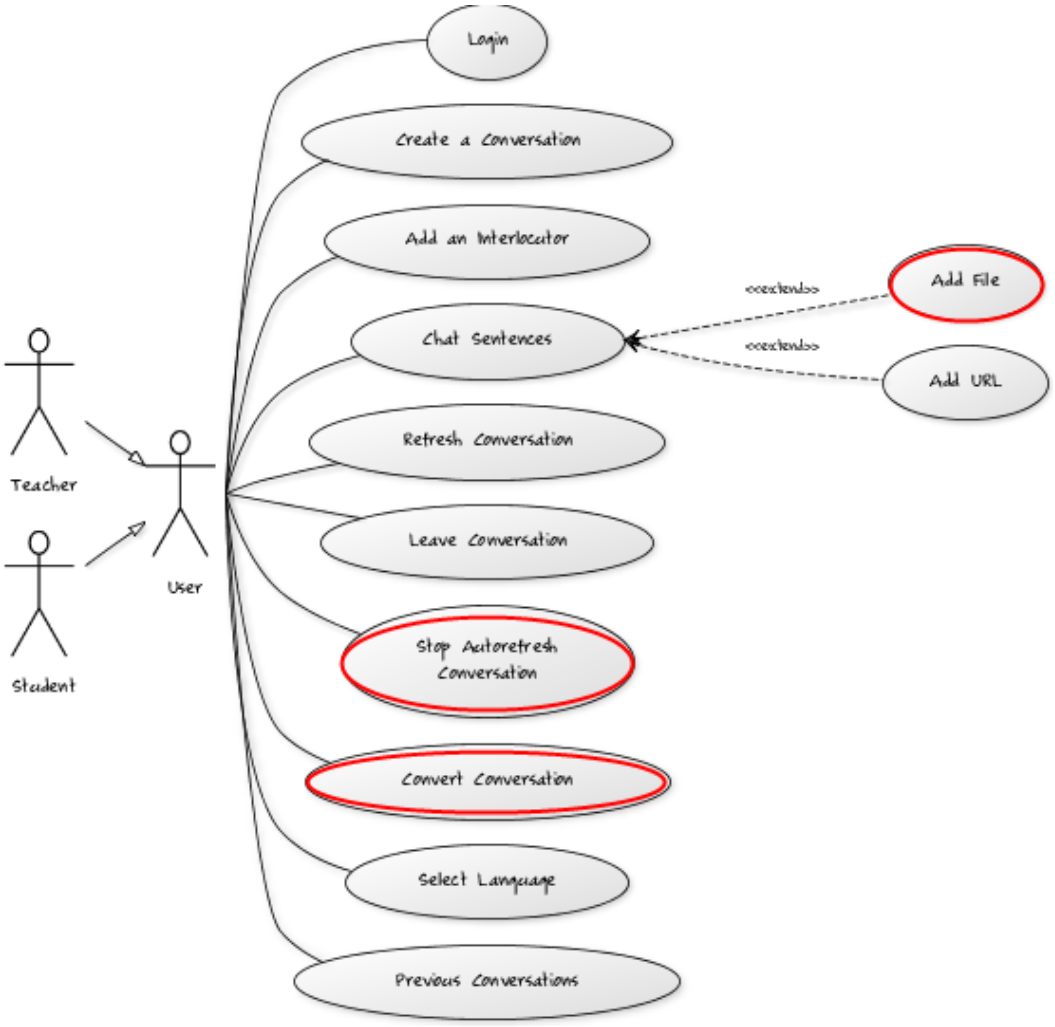

Figure 3. Chat Use Case Diagram UML

3. **The messages format:** "Rosa is on the move so she cannot read it well and follow the conversation". It means that Rosa cannot read the messages because she is moving. Visual impaired people can have the same problems because sometimes they cannot read the text because they can see the text moved, blurred or they cannot see anything. The study [9] specifies that a typical problem in chats is that they do not usually provide (text-to-speech or text-to-braille) to adapt it to his necessities and circumstances. Thus, a new functionality is added "Convert conversation" in Figure 3 which includes it. Then the previous example will be:

> "… Rosa is on the move so she decides to use the functionality 'Convert conversation' and selects 'text-to-speech'. Then, she receives voice messages…"

3.3.3. Strengths and weaknesses of the proposal

The recommendations explained previously pretend to solve the problems of interaction found after applying the User Profiles Personas and Scenario techniques. Our proposal considers user experience and real-time as essential factors; as a result, some recommendations are proposed to design an accessible chat for MDs. The flow of the conversation could be stopped and users with problems to follow it would be able to understand the whole conversation; Moreover, alternatives to the content sent should be provided in order to follow the conversation properly. And finally, the information should be showed in different ways to adapt it to the user's necessities.

Taking into account these situations and the recommendations provided, the users could communicate with each other through a chat and the problems of interaction can be minimized. These recommendations improve the user experience especially for users who cannot follow the rhythm of the conversation because they can communicate with each other in the way that they chose. For instance, if they consider that they cannot write fluently then they can stop the conversation until they want. Also, if they cannot write on the MD then the user can communicate using other format like text-to-speech. Moreover, people who cannot see the files sent through MDs can understand the whole message because they can read an explanation of the image.

However, it is important to remark that these approximations could not be the whole requirements that an accessible chat should have. Currently, the research group is capturing the whole requirements needed to create an accessible chat for MDs; so, it is a preliminary study which captures some of the requirements needed to create an accessible chat in MDs. This means, that the complete study should consider real users and experts to evaluate the requirements elicited.

4. Conclusions and future work

Many people have to face with different accessibility problems when use a chat in MDs. These accessibility problems are not faced only by people with disabilities, but it also depends on the context of use of the tools, as the scenario in section 3 shows. To solve them, this study elicits the requirements needed to design an accessible chat in MDs for everybody following the UCD approach. Besides, it proposes solutions to the problems: the flow of the conversation; impossibility of access to files sent; and the messages format. As a result, the accessibility barriers of chats can be removed and the user experience would be improved. Moreover, people could get a profit of it in m-CSCL

because they could learn while they are collaborating with each other without any barrier and wherever they want.

In future trends, an implementation of this approach is taking to end, with the aim of validating the solutions proposed to solve the accessibility problems founded. Besides, this implementation is being validated by users and by experts using heuristical techniques.

Acknowledgements

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Appendix A. Scenario Results

The results obtained after the use of the scenario usability technique shows some accessibility problems. These accessibility problems are presented in table 3 which is divided into six different columns. The first column represents the different scenarios in which each persona (column 2) executed the task of this scenario. After that, some accessibility problems are detected by the personas in each scenario (column 3). Moreover, the column 4 represents the guidelines followed for each scenario. Each guideline is categorized by a code which is represented by Guideline_version_code_type. The guideline can be: WCAG, if it is from W3C WCAG guidelines [22]; MWBP, if it is from W3C guidelines [23][24]; UDL, if it is from [25]; ISO, if it is from ISO 29140 [26] or IMS , if it is from IMS [21]. Besides adding to the guideline code, the type of the guideline is added: IR if it is an interaction guideline and CR if it is a content guideline. Our proposal explains some solutions to transform each task into an accessible task for everybody (column 5). Finally, the column 6 shows the people who get a profit of the proposed solutions.

Scenario	Persona	Problem	Guidelines	Solution	People who get a profit
Create Conversation	Antonio	Antonio is not able to distinguish if Rosa is connected or not because it is used the color green to show if she is connected or not	WCAG_2.0_2.2.1_IR, WCAG_2.0_2.2.1_IR, WCAG_2.0_1.1.1_CR, MWBP_1.0_36_CR, UDL_2.0_1.3_CR	Users could stop the autorefresh of the users that are logged in the application. Chat users are divided into three different categories: connected, idle or disconnected. Moreover, these categories are separated without use colors or shapes	Visual impairments Interact with the MD in sunny places
Chat sentences and Add File	Rosa	Rosa is not able to see the image because she cannot download it; she has reached the limit connection.	WCAG_2.0_1.1.1_CR, MWBP_1.0_36_CR, UDL_2.0_1.3_CR, MWBP_1.0_25_CR	Guide the user to provide alternative content for the users that cannot access to all the sent content. Inform both users about the weight of the image.	People with visual impairments. Small screens
Chat sentences	Antonio	Antonio is not able to follow the rhythm of the conversation and feels really uncomfortable	WCAG_2.0_2.2.1_IR, WCAG_2.0_2.2.2_IR, MWBP_1.0_14_IR, IMS_v2_5_IR, IMS_v2_6_IR, IMS_v2_7_IR,	The user could stop the autorefresh of the conversation whenever s/he wants. Even if the user stops the flow of the conversation,	People with motor disabilities. Mobile, web and chat experience.

Scenario	Persona	Problem	Guidelines	Solution	People who get a profit
		because of this.	WCAG_2.0_1.3.2_CR, WCAG_2.0_1.3.1_CR	the user should be able to read the conversation in the real sequence.	People with learning problems. Foreign people
Add interlocutor	Antonio	Unable to distinguish which users are connected or not. The user is not able to follow the rhythm of the conversation	WCAG_2.0_2.2.1_IR, WCAG_2.0_2.2.2_IR, MWBP_1.0_14_IR, IMS_v2_5_IR, IMS_v2_6_IR, IMS_v2_7_IR, WCAG_2.0_1.1.1_CR, MWBP_1.0_36_CR, UDL_2.0_1.3_CR, WCAG_2.0_1.3.1_CR, WCAG_2.0_1.3.2_CR	All users should have the possibility to stop the addition of an interlocutor. The user should be able to stop the autorefresh of the users that are connected or not to the application The conversation could be stopped by the user whenever s/he wants. Chat users are divided into three different categories: connected, idle or disconnected. Each one of these categories are separated without use colors or shapes The messages should be sent in the real sequence.	People with visual impairments People who interact with the MD in sunny places People with motor disabilities. Mobile, Web and chat experience. People with learning problems. Foreign people
Previous conversations	Rosa	N/A	ISO_29140_2_6.2.3_CR, ISO_29140_2_6.3.2_CR	N/A	N/A
Written Language	Rosa	N/A	ISO_29140_2_6.2.6_CR	N/A	N/A

Table 3. Accessibility problems detected after the use of Scenario usability technique.

Accesibilidad y legibilidad de las webs universitarias en Finlandia: presente y futuro

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Resumen

Este artículo describe un estudio de los autores para evaluar la accesibilidad y la legibilidad del contenido de los sitios web de siete universidades en Finlandia. La evaluación de accesibilidad ha sido realizada para comprobar el cumplimiento de las directrices de accesibilidad para el contenido de web establecidos en la recomendación del consorcio W3C en WCAG 2.0. La legibilidad ha sido evaluada usando *Flesch Reading Ease*. Se ha estudiado si las universidades ofrecen la información web accesible para cada usuario (profesores, estudiantes, etc.), independientemente de posibles discapacidades. Finalmente, se presentan diversos avances en materia de accesibilidad y legibilidad según las recomendaciones de WCAG 2.0 resaltando sus principales elementos y sus recomendaciones.

Palabras clave: accesibilidad web, legibilidad, utilidad, inhabilidad, WCAG 2.0.

Accessibility and readability of university websites in Finland: present and future

Abstract

This article describes a study conducted by the authors to evaluate the accessibility and readability of the contents of the web sites of seven universities in Finland. The accessibility assessment has been carried out to check compliance with accessibility guidelines for Web content established by the W3C Consortium recommendation in WCAG 2.0. The readability has been evaluated using the Flesch Reading Ease Level formula for English texts. We have determined whether the universities have provided accessible web information which can be accessed by everyone (teachers, students), regardless of whether or not the user has a disability. Finally, advances in accessibility and legibility based on the recommendations of the WCAG 2.0 are presented highlighting the most important points and recommendations.

Key words: web accessibility, readability, usability, disability, WCAG 2.0.

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1. Introduction

Accessibility indicates how easy is to use, visit or access something, in general, for all people, especially those who have disabilities. Web accessibility is referred to design allowing these people to perceive, understand, navigate and interact with the Web.

Among standardization efforts, we remark the Web Accessibility Initiative of World Wide Web Consortium (W3C) which tries to establish recommendations for achieving accessible contents, browsers and Web development environments. Among their recommendations the Web Content Accessibility Guidelines (WCAG), or set of guidelines for accessible Web pages, are specially important. The last version of this recommendation is WCAG 2.0 [1]. The study carried out in this article is based precisely on this latest version, which provides twelve guidelines to follow. These twelve guidelines cannot be directly tested as they provide the basic criteria that authors should fulfil in order to make content more accessible for people with disabilities. For each guideline, it provides testable success criteria that allow guidelines to be used in situations where appear certain requirements and the need for conformance testing.

In this paper, we have analyzed a group of Web pages of the websites of seven universities of Finland, checking the degree of compliance with WCAG 2.0 recommendations. Firstly, in the following section, we justify the choice of universities to be evaluated. In section 3 we describe the accessibility indicators to be evaluated and the calculated metric that will rank universities according to compliance with the established success criteria in WCAG 2.0. In section 4 we discuss the results of the analysis while the last section is dedicated to the results of readability analysis applied to the text in the page in English dedicated to the history of each university.

2. Selection of websites of universities

The main goal of this work is to contribute to the project ESVIAL funded by the EU Alfa program. It includes, as members, the two universities involved in this project (University of Alcala and Metropolia University). One of the initial tasks in this project is an accessibility review of higher education institutions of the countries of the partner universities. This is the reason why the study includes the Metropolia University as a partner of the project ESVIAL while it has been increased to embrace other universities of Finland. We have chosen the six shown in the latest version (data from 2010) in the

"Academic Ranking of World Universities" (ARWU) available at http://www.arwu.org. We chose this ranking as one of the most known and consistent.

The study includes the analysis of three of the WebPages of each of the seven selected universities. The first one is the main page (Home), the second is a page with forms and the third one is a page with tables. The table 1 shows the universities and the pages finally analysed.

University	Web pages
University of Turku	Home: www.utu.fi/en/ Form: www.utu.fi/en/feedback.html Data table: www.utu.fi/en/studying/programmes/masters.html
Aalto University	Home: www.aalto.fi/en/ Form: eage.aalto.fi/?registration/register&lang=en Data table: www.aalto.fi/en/cooperation/career_services/talentit_en/stands/
University of Jyväskyläse	Home: www.jyu.fi/en Form: www.jyu.fi/en/study/study_frontpage/contact-info Data table: www.jyu.fi/en/contacts/
Helsinki Metropolia University Applied Sciences	Home: www.metropolia.fi/en/ Form: www.metropolia.fi/en/feedback/ Data table: www.metropolia.fi/en/apply/how-to-apply/bachelors-degree-evening-studies/timetable-summary/
University of Eastern Finland	Home: www.uef.fi/uef/english Form: www.uef.fi/palaute Data table: www.uef.fi/tutustu
University of Helsinki	Home: www.helsinki.fi/university/ Form: www.helsinki.fi/funds/feedback.htm Data table: ethesis.helsinki.fi/julkaisut/kas/kasva/vk/karkkainen/6luku.html - table1
University of Oulu	Home: www.oulu.fi/english/ Form: www.oulu.fi/english/contact Data table: www.degree.oulu.fi/admission/language-requirements/

Table 1. URL of the analysed web pages.

3. Accessibility: evaluated criteria

This work examines the main accessibility barriers identified in an analysis of a sample of Finnish university websites in relation to the currently applicable W3C/WAI Web Content Accessibility Guidelines 2.0 (WCAG 2.0). The technical accessibility analysis takes into account a set of accessibility criteria based on W3C guidelines.

For the evaluation of each of the pages of the sample, we use as reference the standard WCAG of Accessibility of Web content in the Web 2.0 of the W3C [1] synthesized in a series of technical checks on those aspects which are most relevant and with highest incidence. Based on the study done by the INTECO [2] these verifications

are transformed into one set of fourteen indicators referred to the recommendations of WCAG.

These indicators have been selected because they reflect most of the guidelines of WCAG 2.0 for the three possible levels (A, AA y AAA). A series of checks to analyse different aspects of each indicator are the key elements used for each indicator. These criteria are commonly accepted as providers of an accurate overview of the accessibility of a website.

The indicators considered for the analysis are shown below:

1. Valid Web documents. Checks if the pages are compliant with the grammars of HTML and CSS (used tools: W3C validator of HTML and CSS http://validator.w3.org/).
2. Images. Checks if there is an alternative text for images or images maps as well as that images are not used to transmit textual information (used tools: manual review and TAW validator http://www.tawdis.net/).
3. Headers. There should be a header structure that adequately reflects the logical structure of documents to facilitate reading, understanding and non-visual navigation (used tools: manual review and TAW validator).
4. Links. Check possible links without content, links with the same text and destinations, or links that open in new windows without a warning (used tools: manual review and TAW validator).
5. Contrast and semantic use of colour. Check whether the colour contrast between foreground and background colour is enough and if the colour is not used as the only visual way of conveying information (used tools: Colour checker – extension for Mozilla Firefox).
6. Presentation. Check if the page uses HTML tables for layout and other requirements related to the visual presentation of text (used tools: manual review and TAW validator).
7. Text size. Text must be defined in relative units to allow the resizing for readability, adapting to the needs of people who is accessing it (used tools: manual review and TAW validator).
8. Forms. Form elements for entering data must be used properly to allow proper interaction with assistive technologies and users (used tools: manual review and TAW validator).

9. Data tables. They must be used properly to identify tabular data and related information (used tools: manual review and TAW validator).
10. Accessibility via keyboard. The components of user interface and navigation must be operable, so it is necessary to have all the functionality of the page available through the keyboard (used tools: manual review and TAW validator).
11. Attacks**.** Aimed at evaluating access to the site without causing problems of photosensitivity-caused attacks (used tools: manual review and TAW validator).
12. Navigable. Web sites should help users to browse and access pages (used tools: manual review and TAW validator).
13. Understandable. Aimed at identifying the use of correct language as well as language changes in the document which facilitate understanding of users who use screen readers or speech synthesis programs (used tools: manual review and TAW validator).
14. Enough time. Provide users enough time to read and use contents (used tools: manual review and TAW validator).

Based on the study made by the INTECO [3], the verification are evaluated based on the values "Hits", "Failures", "Few Failures" y "Not Applicable (NA)":

- Hits. Met the requirements for verification.
- Failures. Do not meet the requirements for verification.
- Few Failures. Exceptional circumstances applicable to checks where the failure is minimal. This situation is valued as half a point.
- Not applicable. Non availability of minimum number or conditions of items for evaluation.

The total number of evaluated indicators is the following one:

$$Total\_of\_indicators = N^{o}\_indicators\_evaluated \cdot N^{o}\_pages\_evaluated$$

Being the number of evaluated indicators equal to 14 (the indicators described in this section) and evaluated numbers of pages equal to 3. Therefore, the maximum number of indicators taken into account in the evaluation is 42.

From this number it is necessary to eliminate the indicators not applicable (NA). For each of the pages, this number will take a different value. Once you have found the previous data, the success rate of the page is calculated as follows.

$$Success\_rate = \frac{100\% \cdot Hits + 50\% \cdot Few\_Failures}{Total\_applicable\_indicators}$$

Being *Hits* the indicator that meet the requirements of the success criteria of WCAG 2.0, *Few_Failures* is the indicator of minor failures, and total_applicable_indicators is the value calculated above (42 - NA). In the case of the total number of indicators are fulfilled, and then the success rate of the page would be 100%.

4. Accessibility: evaluated criteria

Table 2 summarizes the results obtained in the analysis of accessibility for the sample of 7 university portals in terms of percentage of covered or not covered indicators, those with few errors, not applicable and success rate (ranked from highest to lowest level).

University	Hits	Failures	Few failures	NA	Success rate
1. University of Turku	22	12	1	7	62.85%
2. Aalto University	19	12	4	7	54.28%
3. University of Jyväskyläse	18	17	0	7	51.48%
4. Helsinki Metropolia	17	18	0	7	48.57%
5. University of Eastern Finland	16	19	0	7	45.71%
6. University of Helsinki	13	19	2	8	38.23%
7. University of Oulu	13	22	0	7	37.14%

Table 2**.** Results of the analysis made on the portals.

The main problems which were found out are the following ones:

1. University of Turku. During the validation of documents, there aren't any websites that validate HTML or CSS grammar. In the case of presentation, one of the websites contain common errors such as not fulfilling the required minimum spacing as well as having text blocks that contain more than 80 characters. Even more, there are static sizes in the text in every page. The selected website with forms contains errors because it has not labels in its elements. When analyzing the accessibility of keyboard, the user cannot access all the elements with the keyboard in all of the websites. All websites

contains problems of navigation as they have many items that do not have focus option for keyboard and mouse.

2. Aalto University. During the validation of documents, none of the websites properly validates its HTML code because they contain a large number of errors. Only the CSS code of one website is valid. One of the websites presents errors in the headers because it contains two at the same level and not well structured. Regarding the contrast and the semantic use of color, the pages have many links that change color merely when the user passes over them. The selected website with forms contains errors because it has not labels in its elements and does not show enough support for the user. All websites contains problems of navigation as they have many items that do not have focus option for keyboard and mouse.
3. University of Jyväskyläse. During the validation of documents, there aren`t any websites that validate HTML. Two of the websites have errors in the images because they do not contain alternate text. One of the websites presents errors in the headers because it does not contain the header h1. In terms of presentation, all pages containing the mistake of using tables for layout information from the page without being data. The selected website with forms contains errors because it has not labels in its elements and does not show enough support for the user. There are errors on data tables because there is not an abstract of the table and there are not headers in the columns. When analyzing the accessibility of keyboard, the user cannot access to all the elements with the keyboard in all of the websites. All websites contains problems of navigation as they have many items that do not have focus option for keyboard and mouse.
4. Helsinki Metropolia. During the validation of documents, two websites properly validate its HTML and CSS code, the other website do not validate because it contains five errors. We consider this as a minor error. All of the websites have errors in the images, because they do not contain alternate text; we consider this as a minor error. Two of the websites presents errors in the headers because they have repeated headers of the same level. Regarding the contrast and the semantic use of color, there are two pages containing a good number of contrast errors in their texts, images and links. In the case of presentation, all pages have errors because they use style attributes within the

HTML code. There are static sizes in the text of all websites. The selected website with forms contains errors because it has not labels in its elements. When analyzing the accessibility of keyboard, the user cannot access to all the elements with the keyboard in all of the websites. All websites contains problems of navigation as they have many items that do not have focus option for keyboard and mouse.

5. University of Eastern Finland. During the validation of documents, there are not any websites that validate HTML code. Two of the websites have errors in the images because they do not contain alternate text. Regarding the contrast and the semantic use, we have found out several errors in some of the texts of every page, moreover, there are links that are identified only by passing over them. In the case of presentation, all pages have errors. In one of them, a table is used for layout information. There is static size in the text of every page. Besides that all pages use style attributes within the HTML. The selected website with forms contains errors because it has not labels in its elements. There are errors in data tables: there is not an abstract of the table. When analyzing the accessibility of keyboard, the user cannot access to all the elements with the keyboard in all of the websites. All websites contains problems of navigation as they have many items that do not have focus option for keyboard and mouse.
6. University of Helsinki. During the validation of documents, only one website properly validates its HTML code, the others websites do not validate because they contain a large number of errors. In the case of CSS code, all of the websites are correct. All of the websites have errors in the images because they do not contain alternate text and they can be replaced by mark-up. One of the websites presents errors in the headers because it contains headers at the same level and they are not well structured. In the case of presentation, no websites are fulfilling the required minimum spacing and one of the websites has attributes of presentation in its HTML document instead in the CSS document. Even more, a website uses absolute units. The selected website with forms contains errors because it has not labels in its elements and does not shows enough support for the user. There are errors in data tables, e.g. there is not an abstract of the table. When analyzing the accessibility of keyboard, the user cannot easily access all the elements of two websites with

the keyboard. Two of the websites have errors of navigation referred to location and focus. None of the websites has declared the language of the document in the page.

7. University of Oulu. During the validation of documents, no websites validate HTML code. Two of the websites have errors in the images because they do not contain alternate text. One of the websites presents errors in the headers because it does not contain the header h1 and has repeated headers of the same level. All of the websites have errors in the links because contain consecutive links of image and text send the user to the same resource. Regarding the contrast and the semantic use of color, there are two pages containing many contrast errors in their texts, images and links. In the case of presentation, all websites contain common errors such as not respecting the required minimum spacing and including text blocks that contain more than 80 characters. Even more, there is static size declaration in the text of every page. The selected website with forms contains errors, because it has not labels in its elements. When analyzing the accessibility of keyboard, the user cannot access to all the elements with the keyboard in all of the websites. All websites contains problems of navigation as they have many items that do not have focus option for keyboard and mouse.

5. Evaluation of readability of web pages

Readability is the ease in which text can be read and understood. As an additional part of the research, we have done an assessment of the readability of textual contents of web portals of the seven selected universities using the well-know Flesch Reading Ease Level formula (RES) for English texts (Flesh tool: http://flesh.sourceforge.net/) [2]:

$$RES = 206.835 - 1{,}015 \cdot \left(\frac{total\_words}{total\_sentences} \right) - 84{,}6 \cdot \left(\frac{total\_syllables}{total\_words} \right)$$

We have analyzed the readability of the web pages which present the history of each universities. The results are shown in table 3.

University	Accessibility position	Flesch Reading Ease Level	Level of readability
1. University of Jyväskyläse	3	46.8	Hard
2. University of Helsinki	6	42.91	Hard
3. University of Turku	1	37.58	Hard
4. University of Eastern Finland	5	29.72	Very Hard
5. Aalto University	2	27.27	Very Hard
6. University of Oulu	7	26.85	Very Hard
7. Helsinki Metropolia	4	11.27	Very Hard

Table 3**.** Results of readability analysis

6. Future of web content accessibility

The future of the accessibility of Web content is clearly linked to the new version of WCAG Accessibility Guidelines 2.0 [1], which is not currently being implemented in web sites. The international initiatives which promote a commitment from countries to achieve a world without barriers are going to be considered as a compulsory reference in the coming years.

In this line of action in October 2010, U.S. President Barack Obama signed the "21st Century Communications and Video Accessibility Act", the new law that will help people with disabilities to access and participate in the digital world. On the European side, in November 2010, the European Commission adopted a new strategy to break the barriers that prevent people with disabilities participate in society on equal terms. This is the "European Disability Strategy 2010-2020: A Renewed Commitment to a Barrier-Free Europe" [5].

One in six people in the European Union has a certain degree of severe disabilities. This means around 80 million people who cannot often participate fully in society and in the economy due to physical barriers and attitudes of the rest of the society. The plan is aimed at enabling that all citizens with disabilities in the European Union can take a bus without problems or surf the Internet or manage a DVD drive or vote in elections without the help from others.

The Commission has identified eight key areas of action: one of them is the accessibility, understood by the Commission as the access of people with disabilities, under the same conditions as the rest of the population, to the physical environment, transportation, technologies and information systems and communications and other facilities. There are still significant barriers in all these areas. On average, only 5% of public websites fully conform to WCAG 1.0 accessibility guidelines [6]. The emergence

of WCAG 2.0 will surely help to increase this number, as they have been updated considering a more efficient implementation. Adaptation to the technological changes that have taken place in recent years will also help in this initiative.

WCAG 2.0 is based on version 1.0 and has been designed to be applied to a wide range of Web technologies existing now and in the future. It is also aimed at being testable with a combination of automated testing and human evaluation. WCAG 2.0 is organized around four overall principles that provide the foundations for Web accessibility:

- Perceivable. Information and user interface components must be presentable to users in ways they can perceive.
- Operable. User interface components and navigation must be operable.
- Understandable. Information and the operation of user interface must be understandable.
- Robust. Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies

Some guidelines appear under the principles. Twelve guidelines provide the basic goals which designers and authors should pursue in order to make content more accessible to users with different disabilities. The guidelines are not testable, but provide the framework and overall objectives to help authors to understand the success criteria and to better implement the techniques. For each guideline, testable success criteria are provided to allow WCAG 2.0 to be used where requirements and conformance testing are necessary such as in design specification, purchasing, regulation and contractual agreements.

For each of the guidelines and success criteria in the WCAG 2.0 document itself, the working group has also documented a wide variety of techniques. The techniques are informative and fall into two categories:

- Those which are sufficient for meeting the success criteria
- Those which are advisory that goes beyond what is required by the individual success criteria and allow authors to better implement the guidelines. Some advisory techniques address accessibility barriers which are not covered by the testable success criteria. Where common failures are known, these are also documented.

Unlike what happened with the checkpoints in WCAG 1.0, now there are guidelines that are assigned to a priority (1, 2, 3) which indicates how it affects the accessibility of a web site if the checkpoint is not fulfilled. All of the following conformance requirements must be satisfied if a web page wants to comply with WCAG 2.0:

1. Conformance Level. As WCAG 1.0, this version includes three levels: A, AA and AAA. However, it is not recommended that Level AAA conformance be required as a general policy for entire sites because it is not possible to satisfy all Level AAA Success Criteria for some specific contents.
2. Full pages. Conformance is only for full Web pages and it cannot be achieved if part of a Web page is excluded. For the purpose of determining conformance, alternatives to part of a page's content are considered part of the page when the alternatives can be obtained directly from the page. Authors of Web pages that cannot conform due to content outside of the author's control may consider a statement of partial conformance.
3. Complete processes. When a Web page is one of a series of Web pages presenting a process, all Web pages in the process should conform at the specified level or better.
4. Only Accessibility-Supported Ways of Using Technologies. Only accessibility-supported ways of using technologies are relied upon to satisfy the success criteria. Any information or functionality that is provided in a way that is not accessibility supported is also available in a way that is accessibility supported.
5. Non-Interference. If technologies are used in a way that is not accessibility supported, or if they are used in a non-conforming way, then they do not block the ability of users to access the rest of the page.

We have also started to work in developing studies about the compliance of WCAG 2.0. For example, we have participated in an analysis of the 2.0 accessibility of the web portals of top-ranked universities. Table 4 shows the results of this analysis for the top-ranked universities in the world.

From these results, we conclude that most of the analyzed web sites of these ten universities did not reach an acceptable level according WCAG 2.0 (50%). Only two of them (Cambridge and Oxford) successfully passed the test of accessibility. Therefore, it is still a large way to see a generalized implementation of WCAG 2.0 in the main websites of the world.

Web site	Success rate
University of Cambridge	55,41 %
University of Oxford	51,35 %
Columbia University	48,68 %
University of Chicago	45,95 %
Harvard University	44,44 %
Massachusetts Institute of Technology (MIT)	41,89 %
Princeton University	41,89 %
Stanford University	39,19 %
California Institute of Technology	38,89 %
University of California, Berkeley	34,72 %

Table 4. Web accessibility success rate of universities in 2011

7. Conclusions

Accessibility of universities in Finland is not bad compared with the results other similar universities in other countries (analysed by the authors in previous studies not yet published) as it is shown by above results. Three of the universities which were analysed (43%) exceed acceptable accessibility barrier, but two (28.5%) are very close to the barrier. Only two universities (25.8%) are out of the acceptable accessibility level. Regarding readability evaluation of the selected seven sites under analysis, three of them have show a «Hard» level of readability while the other four are in the «Very Hard» level. Note that the University of Turku has the best results in both categories, accessibility and in readability. This usually means that the organization has devoted special efforts to the goal of offering good accessibility to users.

If the effective implementation of accessibility guidelines is promoted, and if the initiatives announced at the international level are finally implemented, it will be finally possible to get websites for everybody, regardless the limitations of the users. In the future, it would be possible to see that universal design (or "design for all") as a working philosophy for creating web pages: as in other areas where design focuses in simplifying everyday tasks of users, building products, services and environments which are more usable for everyone requiring the minimum effort.

We expect that a major advance in this field will occur when accessibility guidelines, which are a reality, join other standards related to the automatic adjustment of web environments to user characteristics. This means allowing the automatic customization of both web pages and browsers to detect the user's personal

characteristics (hearing impairment, blindness, etc.) but also the adaptation of the environment in which they are placed at a given time (low light, excessive noise, mobile device, etc.). Such standards are beginning to appear: one of the best examples is the recent ISO 24751 [7] which, in the field of education, will allow the description of the characteristics of the student and the automatic adaptation of the corresponding learning environment. This is already beginning to be implemented in e-learning environments. In the future, it should be extended across the web in order to provoke that the websites fit the user rather than requesting the user to adapt to the websites.

Acknowledgement

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Reseña sobre el 3er congreso iberoamericano sobre Calidad y Accesibilidad de la Formación Virtual (CAFVIR2012)

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Los pasados días 25 al 27 de Abril ha tenido lugar en la Escuela Técnica Superior de Ingeniería Informática de la Universidad de Alcalá, el "III Congreso Iberoamericano sobre Calidad y Accesibilidad de la Formación Virtual CAFVIR2012" (http://www2.uah.es/cafvir2012). Esta tercera edición del congreso ha formado parte de las actividades programadas dentro del proyecto ESVI-AL (Educación Superior Virtual Inclusiva – América Latina), financiado por el programa ALFA III de la Unión Europea (www.esvial.org). En su organización han participado también la Universidad de Alcalá, la Universidad Galileo de Guatemala y la institución Virtual Educa.

Este congreso tuvo su primera edición en la Universidad de Alcalá en 2010 y la segunda en la Universidad de La Serena (Chile) en 2011. Esta previsto que la cuarta edición se lleve a cabo en la Universidad de Lisboa (Portugal) en 2013.

Su principal objetivo es poner en contacto a investigadores, pedagogos, desarrolladores y miembros de organizaciones interesadas en la formación virtual, en dos facetas importantes: la calidad y la accesibilidad. La generalización del uso de plataformas de aprendizaje en línea, accesibles a través de internet, plantea nuevos retos en la forma de aprender y de enseñar, y también en la forma de acceder a los contenidos mediante dispositivos tecnológicos en constante evolución.

Medir, mejorar y asegurar la calidad de los procesos, recursos educativos y plataformas tecnológicas, para garantizar el correcto desempeño de todos los elementos que intervienen en la formación virtual - tecnología, gestores, profesores y estudiantes -, permitirá avanzar a las organizaciones involucradas, como lo son las universidades, hacia el objetivo de ofrecer una enseñanza virtual de excelencia.

La formación virtual supone, además, una nueva manera de acceder al aprendizaje por parte de los estudiantes, que presenta una doble cara: por una parte el uso de dispositivos tecnológicos avanzados (*smartphones*, pantallas táctiles, etc.) y de contenidos formativos multimedia (video, sonido, etc.) puede plantear graves problemas de accesibilidad para estudiantes con diversidad funcional pero, por otra parte, la

formación virtual puede suponer la única oportunidad de aprender para otros estudiantes con graves dificultades en el acceso a la formación presencial tradicional.

Con el fin de poner en común experiencias, investigaciones, nuevos desarrollos, y otras aportaciones de interés dentro de estos objetivos, se hizo una llamada a la participación, dirigida fundamentalmente al ámbito iberoamericano, para la presentación de contribuciones en forma de ponencias en las siguientes áreas de interés:

- Accesibilidad de la formación virtual: educación virtual inclusiva, metodologías, desarrollos curriculares y campus virtuales accesibles, estándares de accesibilidad, diseño para todos y herramientas para mejorar la accesibilidad.
- Aspectos académicos y de contenidos: adaptatividad, calidad de la tutoría virtual, de los contenidos y del diseño instruccional, calidad pedagógica en e-learning, generatividad y calidad e innovación docente.
- Aspectos generales y de gestión:calidad en contextos informales, formación no universitaria, formación continua y formación mixta, estándares de calidad, excelencia en e-learning, aprendizaje basado en procesos y modelos de aseguramiento de la calidad.
- Aspectos culturales e institucionales:calidad como elemento de construcción del Espacio Común Europeo de Educación Superior, calidad como elemento de construcción del Espacio Común de Educación Superior para Iberoamérica, calidad en e-learning y políticas educativas, calidad para la innovación y cambio en instituciones educativas, enfoques y estrategias de calidad en diferentes países y culturas y la calidad para la internacionalización del e-learning.
- Aspectos tecnológicos avanzados: calidad y seguridad de las plataformas de aprendizaje, formación basada en la Web 2.0, calidad en mobile learning (m-learning, calidad y objetos de aprendizaje, herramientas informáticas para el aseguramiento de la calidad, requisitos técnicos para la calidad del e-learning, calidad del software para e-learningy calidad de los juegos y simulaciones para e-learning.
- Evaluación de la calidad: auditoría de la calidad de la formación virtual, certificación de la calidad, cuestionarios de evaluación, evaluación de la calidad de la Educación Superior virtual, madurez de la educación virtual, métricas de la calidad y calidad de la evaluación de conocimientos.

- Casos prácticos: recursos educativos abiertos y estudios de casos sobre calidad.

El número de contribuciones recibidas fue de 102, que fueron revisadas cada una por al menos dos miembros del comité científico del congreso, formado por 93 especialistas de 19 países diferentes. Finalmente fueron aceptadas 69 que han sido recogidas en el libro de actas del congreso y que corresponden a autores españoles (41), peruanos (2), guatemaltecos (4), colombianos (4), argentinos (3), chilenos (5), uruguayos (2), nicaragüenses (1), mexicanos (5), portugueses(1) y paraguayos (1).

El congreso contó también con la participación de dos conferenciantes invitados. Leonor Margalef pronunció la conferencia inaugural "La calidad del proceso: hacia un aprendizaje interconectado" y Jesús González Boticario cerró el programa con su presentación sobre "Atención personalizada a las necesidades de accesibilidad en la educación superior mediante servicios interoperables basados en estándares". Una sesión especial estuvo dedicada a la Universidad Nacional de Educación a Distancia (UNED) en la que presentaron su experiencia en la implantación y certificación EFQM y la experiencia del Centro de Atención a Estudiantes con Discapacidad. En la misma sesión se presentó también el Centro Superior para la Enseñanza Virtual (CSEV).

La alta participación obligó a los organizadores a realizar sesiones paralelas de trabajo, separadas por áreas temáticas, en las que los autores presentaron sus contribuciones y debatieron con los asistentes. También tuvieron lugar algunas presentaciones virtuales on-line en las que los autores hicieron su presentación desde América utilizando el sistema de videoconferencia del que dispone la Universidad de Alcalá, con una gran calidad de sonido e imagen.

REICIS

ACTUALIDAD INVITADA

CEPIS and e-Competence Development in Europe

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Introduction

The Council of European Professional Informatics Societies (CEPIS: www.cepis.org) is the European network of informatics professionals, which brings together 36 national informatics associations drawn from 33 countries across greater Europe. Among the many aims of CEPIS is competence development among ICT practitioners, and it has engaged in a range of activities to support this. This brief article sets out some of these key actions and brings them together in the context of a wider, crucial need for Europe to possess the correct competences among its IT professionals now and in the future.

A particularly important recent development has been the emergence of a reference framework of ICT competences – the European e-Competence Framework (e-CF: www.ecompetences.eu). This framework is an output of the CEN (European Committee for Standardization) Workshop on ICT Skills, which brings together industry, academic, and public policy stakeholders – including CEPIS – to specify pre-standards in the area of e-Skills. The e-CF is made up of 36 ICT competences[6] that can be used as a reference point for such activities such as competence planning for organizations, education and training, and policy makers.

Practical implementation

CEPIS, during 2010 and 2011, carried out one of the first practical implementations of the e-CF as a tool for measuring competence through the CEPIS Professional e-

[6] http://www.ecompetences.eu/site/objects/download/5983_EUeCF2.0framework.pdf

Competence Survey[7]. The purpose of this research was to produce an up-to-date snapshot of the actual e-competences of IT professionals across Europe today, using profiles recognised by the labour market and analysing them based on the competences set out in the e-CF.Survey participants, who were IT professionals from greater Europe, provided information through an online self-assessment tool on a range of topics including gender, age, e-competences, educational background, current career profile, and proficiency level in each of the five e-CF areas (Plan, Build, Run, Enable, Manage). The survey responses were then used to create a European report[8] as well as a total of 10 country-level reports.

A range of findings emerged, such as:

- The young talent that Europe needs is lacking
- Continuous professional development among practitioners is crucial
- Career paths linked to education and training are required
- The gender imbalance in the professional must be addressed
- The e-CF works effectively as a practical tool for categorizing and defining e-competences.

The survey has proven to be of considerable use in painting a picture of the ICT professional across Europe and in individual countries. It is constructive at a policy level in that it gives an indication of the e-competence levels of the profession, but it also gave direct feedback to approximately 2,000 ICT professionals in 28 countries on where their current competence levels were against possible career paths that could develop. A more detailed, follow-up survey, incorporating the new CEN ICT Professional Profiles[9], is planned for 2012/2013.

EUCIP

The e-CF has also provided a context and important reference point for EUCIP[10], a professional certification and competency development scheme operated by some CEPIS members. EUCIP consists of three different components: EUCIP Core, an introductory-level three-part ICT professional certification; EUCIP IT Administrator, a multi-module certification focused on the skills required by an IT administrator; and

[7] http://www.cepis.org/index.jsp?p=940&n=2406
[8] http://www.cepis.org/media/CEPISProfCompetencePanEuReport_FINAL_10.10.20111.pdf
[9] ftp://ftp.cen.eu/CEN/Sectors/List/ICT/Workshops/EU_ICT_Professional_Profiles_DRAFT_CWA.pdf
[10] http://www.cepis.org/eucip

EUCIP Professional, a professional certification based around one of 21 different job profiles. Version 3[11] of EUCIP Professional includes specific cross-references to the e-CF Competences, and over time there will be greater integration of e-CF into the structure and content of this programme.

These inter-related activities (surveying and describing the current state of the profession, adopting a shared framework of competences that practitioners must have) are part of a broader need to nurture and develop the ICT profession in Europe. This is a vision that is articulated clearly by the 2012 eSkills and ICT Professionalism study[12], which was carried out by CEPIS and IVI[13] on behalf of the European Commission. This project has done the ground-work for the development of a framework for the ICT Profession as a whole and, specifically, for the creation of a European training programme for ICT managers.

All these initiatives are not merely academic exercises. They strive to build concrete answers to real-world challenges, such as:

- How do I know what skills and knowledge I will need to develop my career?
- What e-competences do my employees need to ensure my organization can both survive and thrive in difficult economic circumstances?
- What education and professional development interventions must my institution develop or adopt to ensure that my courses are relevant and that my students are well prepared for the workforce?

CEPIS is focused on supporting the computer societies of Europe as they attempt to provide coherent, practical answers to questions such as these, which are crucial not just to their members, but to industry, academia, policy-makers, and society in general. Europe needs to have the right people in the right positions to drive growth through the appropriate and innovative use of technology. Through initiatives like these, CEPIS has taken a central role in ensuring that this happen.

[11] http://www.cepis.org/media/EUCIP_Version_31.pdf
[12] http://www.ictprof.eu/documents/Brochure_Fostering_the_ICT_Profession_in_Europe.pdf
[13] http://www.ivi.ie/

Author biography

Frank Mockler is Programme Development Manager at ECDL Foundation, the certifying authority of the leading international computer skills certification programme – ECDL / ICDL. In addition to managing the maintenance and development of end-user and IT professional certification programmes, such as EUCIP, Frank is involved in researching and advocating for the promotion of e-skills and e-competence as a necessary component of individual and organisational development. He represents ECDL Foundation on the CEN (the European Committee for Standardisation) Workshop on ICT Skills. Prior to joining ECDL Foundation in 2005, Frank spent 11 years in the e-learning and electronic publishing industry working in roles relating to quality, instructional design, and content/curriculum development. He holds a Bachelor's degree in Political Science from Trinity College Dublin and a Master's degree in Political Behaviour from the University of Essex.