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## A Note from the Editor

Dear SIGACCESS member:

Welcome to the new look of the online edition of the SIGACCESS Newsletter – with new layout, the use of sans-serif and larger font throughout, left-justification, and the inclusion of authors' short biographies and photographs (so that you can say hi when you meet them in meetings and conference).

Following the tradition of including a variety of work from around the world, this issue encompasses a variety of topics, from a report from Italy on improving accessibility of a question-answering system to an investigation of the problems older Malaysians face when using mobile phones. This issue also includes a report on International Cross-Disciplinary Conference on Web Accessibility 2008 and an article from the USA that outlines some writing guidelines for authors writing about technology for people with disabilities, more specifically on currently accepted terminology.

*Sri Kurniawan*

Newsletter editor

Association for Computing Machinery

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Finally, you may publish your work here before submitting it elsewhere. We are a very informal forum for sharing ideas with others who have common interests.

Anyone interested in editing a special issue on an appropriate topic should contact the editor.

# Improving Accessibility in an Automated Question-Answering System

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## Abstract

We address the problem of accessibility in information retrieval by introducing a Question Answering system able to filter answers based on their reading difficulty. The reading level estimation technique is applicable to any domain and is potentially adjustable to any user category.

## Introduction

Using a computer to answer questions has been a human dream since the beginning of the digital era. A first step towards the achievement of such an ambitious goal is to deal with natural language to enable the computer to understand what its user asks and perform information retrieval.

Question Answering (QA) can be interpreted as a sub-discipline of information retrieval with the added challenge of applying sophisticated techniques to identify the complex syntactic and semantic relationships present in text in order to find concise answers.

However, a common problem in Question Answering and information retrieval is that in most systems results are created independently of the questioner's characteristics, goals and needs. This is a serious limitation: for instance, a primary school child and a History student may need different answers to the question: When did the Middle Ages begin?

So far, "personalized" QA has been advocated in the foremost evaluation campaign of the field, TREC-QA, starting from 2003[1]; however, the issue was solved rather expeditiously by designing a scenario where an "average news reader" (hence one particular user type) was imagined to submit definition questions [12].

In this document, we report on a study where a model of the user's reading abilities and personal interests is used to efficiently improve the quality of the information returned by a Question Answering system.

## A Web-based QA system

Our baseline system is YourQA [10], a QA system able to extract answers to both factoid questions (e.g. about names and dates) and non-factoid (e.g. about definitions) ones from the Web. The QA algorithm follows three phases:

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[1] "Without any idea of who the questioner is and why he or she is asking the question it is essentially impossible for a system to decide what level of detail in a response is appropriate – presumably an elementary-school-aged child and a nuclear physicist should receive different answers for at least some questions". [12]

1. **Question Processing:** The query's expected answer type (e.g. person, definition) is estimated and the latter is submitted to the underlying search engine (Google, www.google.com);
2. **Document Retrieval:** The top n documents are retrieved from the search engine and split into sentences;
3. **Answer Extraction:**
   (a) A sentence-level similarity metric combining lexical, syntactic and semantic criteria is applied to the query and to each retrieved document sentence to identify candidate answer sentences;
   (b) Candidate answers are ordered by relevance to the query; the list of top ranked answers is returned to the user in an HTML page.

The answers returned by YourQA are in the form of sentences with relevant words or phrases highlighted (as visible in Figure 1) and surrounded by their original passage to provide a context to the exact answer (this is especially useful for definitions).

**1. Title:** GradeSaver: ClassicNote: About Pride and Prejudice, **URL:** http://www.gradesaver.com/classicnotes/titles/pride/about.html, **Google Rank:** 6, **file:** about.html

About Pride and Prejudice.

**Pride and Prejudice, published in 1813, is Jane's Austen's earliest work, and in some senses also one of her most mature works.**

Austen began writing the novel in 1796 at the age of twenty-one, under the title First Impressions.

**Fig. 1: Top answer by YourQA to: "When was Pride and Prejudice published?"**

## A personalized QA system

The salient feature of the personalized version of YourQA with respect to the standard version described above is the presence of a User Modelling component (as illustrated in Figure 2).

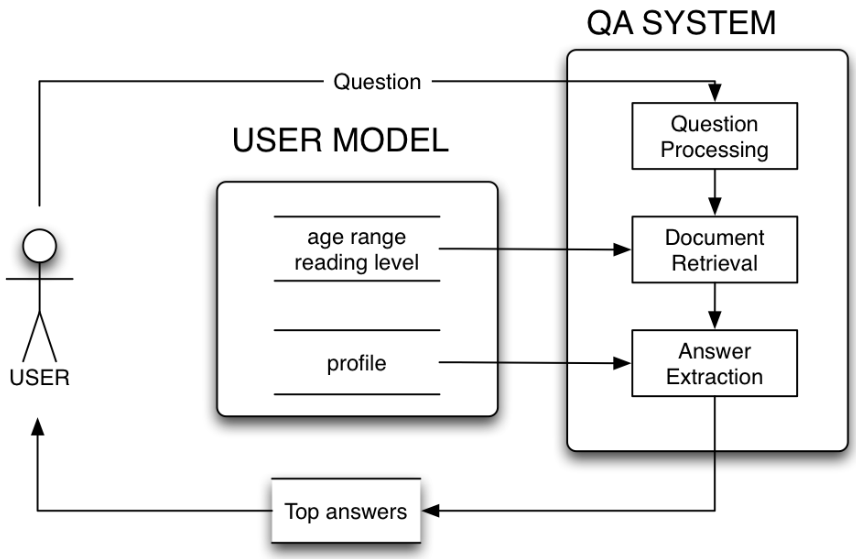


**Fig. 2: Personalized Question Answering Architecture**

As illustrated by the scheme, the interaction of the User Model with the core Question Answering module happens in two phases: first, the User Model provides criteria to filter out unsuitable documents for the user during the document retrieval phase.

Secondly, the User Model provides criteria to re-rank candidate answers based on profile relevance during answer extraction.

## User Model

As a target domain which would be generic enough to be a proof-of-concept of the usefulness of personalized Question Answering and at the same time a concrete, task-oriented application of User Modelling, we chose the education domain: hence, the User Model in YourQA represents students searching for information on the Web for their assignments.

Two basic aspects compose the user representation: on the one hand, the user's interests in terms of answer contents; on the other, the user's preferences in terms of answer presentation. These are modelled using three attributes:

- Age range, $a \in \{7-10, 11-16, adult\}$; the first two ranges correspond to the primary and secondary school age in Britain, respectively;
- Reading level, $r \in \{basic, medium, advanced\}$;
- Profile, *p*, a set of textual documents, bookmarks and Web pages of interest.

Analogous User Model components can be found in the SeAn [1] and SiteIF [7] news recommender systems, where information such as age and browsing history, respectively are part of the User Model.

More generally, our approach is similar to that of personalized search systems such as [11], which constructs User Models based on the user's documents and Web pages of interest.

In this paper, we focus on readability as a tool to improve accessibility. For a detailed discussion of the personalization component of YourQA, see e.g. [9].

## Approaching Readability in Question Answering

Among the most widely used approaches to reading level estimation are models based on sentence length, such as "Flesch-Kincaid" [6], Fry [4] or SMOG [8]. The key idea behind these approaches is that the readability of text is inversely proportional to its length, hence readability is assessed using variations of sentence length-based metrics.

However it can be noticed that in Web documents, sentences are generally short and more concise than in printed documents, regardless of the complexity of the text. Hence the discriminative power of the above metrics can be affected by the fact that the difference in length between complex documents and simple ones is often not as wide as the printed text.

As opposed to the previous approaches, the language modelling approach which has been adopted in YourQA and is illustrated below accounts especially for lexical information. The technique has been proved in [3] to be at least as effective as the Flesch-Kincaid approach when modelling the reading level of subjects in primary and secondary school age.

We model reading level estimation as a multi-classification task which consists in assigning a document d to one of k different classes, each of which represents one reading level. In order to represent the three different age ranges defined in the corresponding attribute of the User Model, we define the three following classes:

1. *basic*, representing a document suitable for ages 7 – 11;
2. *medium*, representing a document suitable for ages 11 – 16;
3. *advanced*, representing a suitable for adults.

## Reading Level Estimation

We approach reading level estimation as a supervised learning task, where representative documents for each of the three classes are collected as labelled training instances and used to classify previously unseen documents according to their reading levels.

Our training instances consist of about 180 HTML documents, which originate from a collection of Web portals where pages are explicitly annotated by the publishers according to the 7–11, 11–16 and adult age: these contain 33,154, 33,407 and 35,024 words respectively.

Examples of such Web portals include BBC education (bbc.co.uk/schools), Magic Keys storybooks (www.magickeys.com/books/), and NASA for kids (kids.msfc.nasa.gov). The readability judgments of the Web portals are our gold standard for learning reading level classification. The fact that our training instances are labelled by an external trusted source contributes to the objectivity and soundness of our approach.

As a learning model, we use the Smoothed Unigram Model, which is a variation of a Multinomial Bayes classifier [3] based on the representation of the data known as unigram language modelling.

Given a set of documents, a unigram language model represents such set of as the vector of all the words appearing in the component documents associated with their corresponding probabilities of occurrence within the set.

In the test phase of the learning process, given an unclassified document $D$, a unigram language model is built to represent the single document $D$ (as done for the training documents). The estimated reading level of $D$ is the language model $lm_i$ maximizing the likelihood $L(lm_i|D)$ that $D$ has been generated by $lm_i$ . In our case, three language models $lm_i$

are defined, where $i \in$ *{basic, medium, advanced}* and the likelihood is estimated using the function:

$$L(lm_i \mid D) = \sum_{w \in D} C(w, D) \cdot \log[P(w \mid lm_i)]$$

where *w* is a word in the document, *C (w, d)* represents the number of occurrences of *w* in *D* and *P (w | lmi)* is the probability that *w* occurs in $lm_i$ (approximated by its frequency).
Related work. Within computational linguistics, several applications have been designed to address the needs of users with low reading skills. The computational approach to textual adaptation is commonly based on natural language generation: the process "translates" a difficult text into a syntactically and lexically simpler version.

In the case of PSET [2] for instance, a tagger, a morphological analyzer/generator and a parser are used to reformulate newspaper text for users affected by aphasia. Another example of research in this direction is Inui et al.'s lexical and syntactical paraphrasing system for deaf students [5], where the judgment of experts (teachers) is used to learn selection rules for paraphrases acquired using various methods. In the SKILLSUM project [13], used to generate literacy test reports, a set of choices regarding output (cue phrases, ordering and punctuation) are taken by a micro-planner based on a set of rules.

The approach presented in this work is conceptually different from these: exploiting the wealth of information available by using the Web as a source, the QA system can afford to choose among the documents available on a given subject those which best suit the given readability requirements.

## Reading Level Filtering

The first step carried out during personalized document retrieval is the estimation of the reading level of each document returned by Google in response to the query. Such estimation is conducted via language modelling following the technique exposed above. The documents having an incompatible reading level with the user are discarded so that only those having the same estimated reading level as the user are retained for further analysis.

As there can be queries for which the number of retrieved documents matching the requested reading level is less than the number of documents returned by the system (currently five), this condition is relaxed so that part of the documents having other reading levels are accepted in the set of candidate documents for answer extraction.

In particular, if the user's reading level is advanced, medium reading level documents are considered and, in case the threshold number of documents is not met, basic documents complete the set. If the requested reading level is medium, documents having a basic readability are used to complete the set; finally, if the requested reading level is basic, medium documents are accepted in the set. In all cases, due to the absence of other criteria at this stage of the QA algorithm, the choice of which documents to retain for a given reading level is determined by the search engine rank of the former (a higher rank determines preference).

The subsequent QA phase of answer extraction therefore begins with the documents left out of the reading level filtering phase.

## Evaluation

Our evaluation of reading level estimation was conducted according to two criteria: first, an objective assessment of the robustness of the unigram language models created to represent the User Model's reading level; second, an assessment of the agreement of users with the system's estimation.

### Robustness of the Unigram Language Models

The robustness of the unigram language models was computed by running 10-fold cross-validation on the set of documents used to create such models. First, we randomly split all of the documents used to create the language models into ten equally sized folds. Then, estimation accuracy was computed in two ways:

Approach A. Within each fold, the ratio of correctly classified documents with respect to the total number of documents was computed separately for each level. Then, the average between the three reading level estimation accuracies of each fold was used as accuracy of the fold. The final accuracy was thus the average accuracy of the different folds. The results of this experiment gave an average accuracy of 91.49 with a standard deviation of 6.54.

Approach B. The ratio of correctly classified documents with respect to the total number of documents was computed for each fold regardless of the reading level. Such ratio was used as accuracy for the fold and the average accuracy was computed for the ten folds as before. The results of this second experiment gave an average accuracy of 94.23% with a standard deviation of 1.98.

A high level of accuracy is important to ensure the consistency of reading level estimation. These results prove that unigram language models are good predictors of the basic, medium and advanced reading levels. However, this does not prove a direct effect on the user's perception of such levels. The following experiment takes charge of the user-centric aspect of reading level evaluation.

### User Agreement with Reading Level Estimation

The metric used to assess the users' agreement with the system's reading level estimation was called Reading level agreement ($A_r$).

Given the set R of results returned by the system for a reading level r, it is the ratio between suitable(R), i.e. the number of documents in R rated by the users as suitable for r, and the total number of documents in R: $A_r = suitable(R)/|R|$. $A_r$ was computed for each level. The reading level agreement experiment was performed as follows.

**Participants**. The involved participants were 20 subjects aged between 16 and 52. All had a self-assessed good or medium English reading level, and came from various backgrounds (University students/graduates, professionals, high school).

**Materials**. The evaluation was performed by the 20 participants on the results returned by YourQA for 24 questions some of which are reported in Table 1. For each question, the results were returned in three different answer groups, corresponding to the basic, medium and advanced reading levels. As can be seen in Table 1, the answers include factoids ("Who painted the Sistine Chapel?"), lists ("Types of rhyme"), and definitions ("What is chickenpox?").

| Query | Aadv | Amed | Abas |
|---|---|---|---|
| Who painted the Sistine Chapel? | 0.85 | 0.72 | 0.79 |
| Who was the first American in space? | 0.94 | 0.80 | 0.72 |
| Who was Achilles' best friend? | 1.00 | 0.98 | 0.79 |
| When did the Romans invade Britain? | 0.87 | 0.74 | 0.82 |
| Definition of metaphor | 0.95 | 0.81 | 0.38 |
| What is chickenpox? | 1.00 | 0.97 | 0.68 |
| Define German measles | 1.00 | 0.87 | 0.80 |
| Types of rhyme | 1.00 | 1.00 | 0.79 |
| Who was a famous cubist? | 0.90 | 0.75 | 0.85 |
| When did the Middle Ages begin? | 0.91 | 0.82 | 0.68 |
| Was there a Trojan war? | 0.97 | 1.00 | 0.83 |
| What is Shakespeare's most famous play? | 0.90 | 0.97 | 0.83 |
| Average | 0.94 | 0.85 | 0.72 |

**Table 1. Examples of queries and reading level agreement**

**Procedure**. Each evaluator had to examine the results returned by YourQA to 8 of the 24 questions. For each question, he/she had to assess the three sets of answers corresponding to the reading levels, and specify for each answer passage whether he/she agreed that the given passage was assigned to the correct reading level.

Table 1 reports some sample questions along with their agreement scores. It shows that, altogether, evaluators found our results appropriate for the reading levels to which they were assigned. The accuracy tended to decrease (from 94% to 72%) with the level: this was predictable as it is more constraining to conform to a lower reading level than to a higher one.

## Conclusions and Perspectives

In this article, we address the problem of accessibility in information retrieval by introducing a Question Answering system able to filter answers based on their reading difficulty. The reading level estimation technique based on language modelling has the advantage of being applicable to documents in any domain.

We have demonstrated an application addressing the needs of students of the primary school, secondary school and adult age. However, the method we propose is suitable to model the reading level (and granularity) of any user category (expert/novice, child/adult, foreigner/mother tongue, etc.) provided that training documents are available.

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# The use of Mobile Phones by Older Adults: A Malaysian Study

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## Abstract

Mobile phone has become essential parts of personal and business life. The recent growth of mobile phone usage is an observable fact that crosses all age and gender boundaries. It can potentially play a significant role in assisting older people in many ways especially in terms of maintaining social relationship, providing sense of safety and accessibility. However, older people seem to be a neglected user group in the design of mobile phone devices and services. Hence, this paper attempts to report the issues which are related with the design of mobile devices and services for older people aged 56 years old and over in Malaysia. The findings may serve as a reference to mobile device manufacturers and service providers when designing mobile devices and services for older Malaysians. This research uses a survey instrument to gather data from older peoples across all the states in Malaysia with the total of 176 older peoples responded. The questionnaires were mainly distributed to older persons who use mobile phones independently in their daily routines

## Introduction

The recent growth of mobile phone use is a phenomenon that crosses all age and gender boundaries. More than just the latest electronic gadget, mobile phone has become integral parts of our business and personal lives. According to the Handphone User Survey in 2005 by Malaysian Communication and Multimedia Commission, nearly 80% of people living in Malaysia aged between 20 and 49 years owned or used a mobile phone. The ownership percentages of people in higher age brackets are slightly lower. The ownership drops drastically to 8.7% for people 50 years old and above [1].

Older people seem to be a neglected user group in design of mobile devices and services, although the requirements to create well functioning solution for them are documented in various published manuscripts. People over the age of 60 use mobile phones for very limited purposes, such as for calling or sms in emergency situations [3]. Most complaints are related to displays that are too small and difficult to see, buttons and characters that are too small causing them to push wrong numbers frequently. They also avoid using more complex function, non user-friendly menu arrangement, and unclear instruction on how to find and use a certain function and services that are too expensive [4]. Mobile phones can potentially play an important role in helping older people in many ways if the problems related to the use of mobile phones can be solved, especially for maintaining and developing social relationship, and providing a sense of security and safety [4].

Unfortunately, there were not many studies that involved older persons in the development phase of mobile phones. This forms the motivation of the reported study.

## The Study

The main objective of this research is to replicate the study performed by Kurniawan et. al. in a different country [2]. The focus of this study will be on verifying the relevance of the identified design issues as well as comparing the similarities and difference between the two user populations. Essentially, we perform the initial literature review on mobile phone usage among older peoples, looking at the broader context of mobile devices and services issues, current problems highlighted in various previous studies. In order to acquire the overall picture of mobile phone usage by older peoples, some published manuscripts related to the mobile phone usage, problems, perceived benefits and features are reviewed. All the information above is collected using on-line searches specifically on the online databases namely ACM, IEEE, technical reports, academic textbooks, magazines, online articles and others.

For this study, we used the original questionnaires reported in [2]. Our respondents are older people who use mobile phones in their daily routines independently across 14 states in Malaysia. One hundred and seventy six older people responded to the survey.

## Results

This section represents the results of the survey of 176 older people in Malaysia who taking part this survey. This section also covered about demography information, usage patterns, and the design of mobile phone that the elderly suggested to use. The results from the questionnaire which rated by respondents were reported in the next section.

### Demographic Information

The survey was dominated by male respondents (60%). As shown in Figure 1, the majority of the respondents were 56-60 years old (56%) and had used mobile phones for more than 2 years (60%).

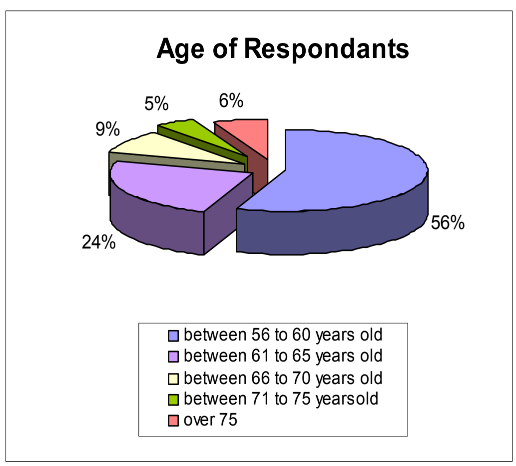


**Figure 1 : Number of respondents according to age**

### Usage Patterns

This section in the questionnaires cover the usage patterns that usually used by older user. As illustrated in Figure 2, 105 respondents used mobile phones for more than 2 years and only 8 respondents noted that they used mobile phones for less than 6 month. More than half used their phones daily. Almost all were on prepaid scheme. On an average month, 40% paid RM

30-RM70, 37% paid less than RM30 and 23% paid more than RM70. Around half of respondents frequently used 4-5 functions out of the eleven functions listed. The first two reasons for using mobile phones were for emergency (60%) followed by for a casual conversation (48%). They most often called their children/grandchildren (64%) or friends (50.5%).

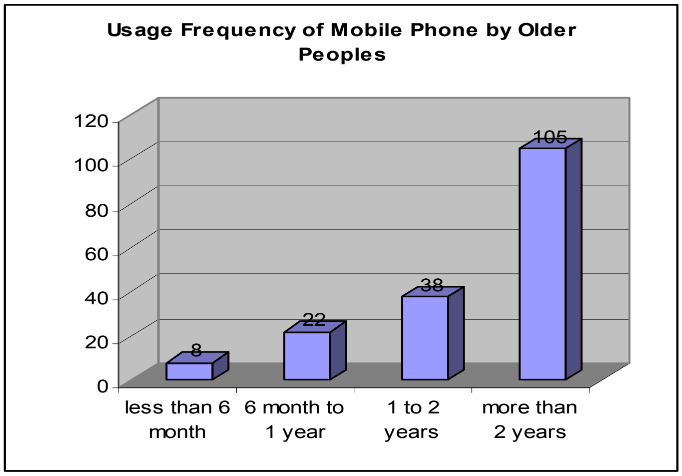


**Figure 2 : The usage Frequency of mobile phone by older people**

## The Design

Most of respondents realize how important mobile phone to their daily lives. Because of this, and because they use mobile phone on a daily basis, they were increasingly interested in personalizing their phones so that they have the design and functionality that match their preference.

The respondents were instructed to rate each feature either it is 'tolerable' 'annoying' or 'stressful' based on their experience with various aspect of their mobile phones. Around half of respondents marked 'tolerable' for almost all features and very few respondents considered using any features as 'annoying' or 'stressful' (5%) .

The following were highlight some of the major problems when using the current phone the respondent found and explores some of the reasons noted:

- Button : Small, rubbery buttons were disliked.

Reason: They preferred metallic buttons, which clicked when pressed.

- Menus : Complex and too many options those are often unnecessary.

Reason: Older users require longer time to think of what to type or to choose from options.

- Functions: That are difficult to understand, complicated and thus impossible to recall

Reason: These are the functions that should be "hardwired" to particular buttons.

- Display: One that can display large text and whose screen backlight does not turn off when idling

Reason: Older persons require extra cognitive processing time when dialing number or write text

- Shape/size: That is too small to hold and read easily. Size 'bulky'.

Reason: Can't grab and held uncomfortably.

- Colours: Although color was not as important as other features, some older persons disliked brightly colored phones.

Reason: Fear of being too visible

## Roles of Mobile Phones in Their Lives

In this study, we also asked them using 5-point Likert-like scales their views on the roles of mobile phones in their lives. These are:

1. It is **cheaper** to use mobile phone than to use landline phone.
2. I have more **friends** after having a mobile phone.
3. I feel more **confident** to go out by myself after having a mobile phone.
4. I am not afraid of getting **lost** after having a mobile phone.
5. I know I can always call somebody on my mobile phone when I am in **trouble.**
6. I feel safer to be **alone** because of my mobile phone
7. It is **fun** to use mobile phone

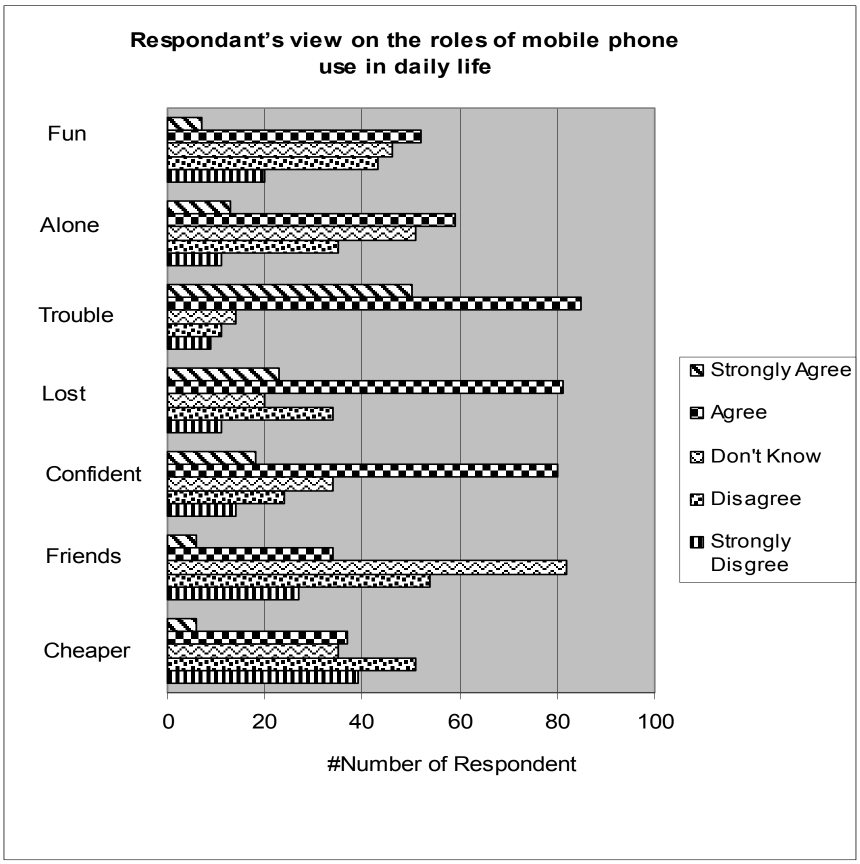


**Figure 3 : Respondant's view on the roles of mobile phone use in daily life**

Figure 3 above illustrates the distribution of ratings. The most positively respondent statement was the fifth statement, was one that suggests that mobile phones allow older people to call somebody when they were in trouble (90% respondents agreed or strongly agreed to this statement). The most negatively responded that using mobile phone was fun (20 respondents).

To understand mobile phone users' opinions on less common functions, a list was created for the respondents to rate as 'must be removed' (1), 'good if removed'(2), 'can live without'(3), 'good to have'(4) and 'must have'(5). The respondents tended not to choose the 'must be removed' option. Although video and camera is a hot commodity on the Internet right now and the interest in mobile video is growing by the minute, some respondents quickly pointed that camera and video phones must be removed. They thought that camera phones were the ‘most dangerous invention of the 21st century’ as it encouraged people to do “evil” things such as bullying. The majority checked ‘can live without’ or ‘good to have’. All these top 3 functions are classified under good to have or must have factor were address book, text messaging and alarm clock, as summarized in details in Table 1. The results gained in this research are not much different with the results survey conducted by Kurniawan *et. al.* [2].

| | **INFLUENCE LEVEL OF RESPONSE** | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| **QE1 (Camera)** | 5 | 13 | 75 | 61 | 16 |
| **QE2 (Videophone)** | 4 | 17 | 97 | 41 | 11 |
| **QE3 (Address book)** | 0 | 1 | 21 | 55 | 93 |
| **QE4 (Diary)** | 1 | 82 | 49 | 49 | 28 |
| **QE5 (Alarm)** | 1 | 2 | 30 | 80 | 57 |
| **QE6 (Text Messaging)** | 1 | 1 | 42 | 58 | 68 |
| **QE7 (MP3 Player)** | 9 | 11 | 83 | 50 | 17 |

**Table 1 : The Influence Level of Response the Features in the Mobile Phone**

## Conclusion

This study is the first step in understanding design issues of mobile devices and services by older people in Malaysia. It presents rich data results from literature review and questionnaire methods. The study shows that older persons used and had strong opinions on some advanced features of mobile phones.

As a research approaches, questionnaire has been proven in this research to be quite successful in gaining an understanding of how some older persons used mobile phones. The survey findings were able to capture basic requirements of a mobile phone preferred by older persons, prior to design. The paper questionnaires were used to highlight analytically several issues that were important for older users.

The survey data confirm the view of the respondents that mobile phones are for emergency, for instance. The survey also indicated that the most important role of mobile phones was to provide assurance to older persons that they could always call somebody when they were in trouble.

The data captured also revealed the preferred physical design of mobile phones for older persons. It is clear from this study that mobile phone design and usage for older persons is not necessarily limited to or based on old style, out-of-date model, and supporting only very basic calling functions. And finally, to unwrap to more interesting findings, more extensive statistical analysis is needed to find functions which can be customized to older user needs and perceived to be senior-friendly and reliable.

## Acknowledgements

Without the generous help of many people, it would have been very difficult for us to complete this project. Thanks to almighty that gave us the strength and spirit. We would like to forward our deepest thank to our colleagues, lecturers and technical staffs from the

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# General Writing Guidelines for Technology and People with Disabilities

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## Introduction

The recommendations in this article reflect current thinking on language for writing in the academic accessibility community. Certain words or phrases can (intentionally or unintentionally) reflect bias or negative, disparaging, or patronizing attitudes toward people with disabilities and in fact any identifiable group of people. Because language can convey these things, it can influence our impressions, attitudes, and even actions. Choosing language that is neutral, accurate, and represents the preference of the groups to which it refers can convey respect and integrity.

Terminology changes over time. Indeed many terms that were acceptable 50 years ago are not generally acceptable now. Perhaps some of the terms we suggest here may be unacceptable for unforeseen reasons 50 or even 5 years from now. The language in use at a given time reflects the attitudes and philosophies of the time. It is important to understand the meanings and backgrounds of the terminology you use to make sure that your writing accurately reflects your own attitudes and philosophies.

We have attempted to gather suggestions for terminology that currently reflects the preferences of various disability groups and accurately portrays those groups. We have also tried to avoid trendy terminology that seems to come and go quickly. Also listed are several terms that today's authors should avoid. When appropriate, we've listed occasions when these terms are in fact appropriate to use. Recognizing that language usage changes over time, we consider this document an overview of terminology currently appropriate. For updates to this document reflecting terminology changes, please see http://sigaccess.org/xxx.htm

This article describes terminology appropriate for academic publications in the field of accessibility. Terminology varies as used by disabled people themselves, historically, and among various stakeholder communities (such as the medical, education, rehabilitation, and disability rights establishments). For this reason, different language may be commonly used in other contexts.

In general,

- Define your terms. In the context of your writing, does 'blind people' mean people who cannot see or people who primarily use screen readers to access the computer?
- Be consistent. For example, if you've chosen 'cognitively impaired' keep using that -- don't switch between 'cognitively impaired' and 'intellectual disability' throughout the writing.
- When describing people with no disability, use the terms 'non-disabled' or 'persons without disabilities' rather than 'normal' or 'healthy'.

## Impairment, Disability, or Handicap?

The words 'impairment', 'disability', and 'handicapped' have different meanings that convey critical distinctions. Use language that maintains the integrity of individuals as whole human beings by avoiding language that (a) equates persons with their condition (e.g., epileptics, the deaf), (b) has superfluous, negative overtones (e.g., stroke victim or sufferer ), or (c) is regarded as a slur (e.g., cripple).

The words 'impairment', 'disability', and 'handicap' are not synonymous [3, 9]. The following is taken from the American Psychological Association Online Style Manual [3]:

Impairment is used to characterize a physical, mental or physiological loss, abnormality or injury that causes a limitation in one or more major life functions. For example, "The loss of her right arm was only a slight impairment to her ability to drive."

Disability refers to a functional limitation that affects an individual's ability to perform certain functions. For example, it is correct to say, "Despite his disability, he still was able to maintain employment."

Handicap describes a barrier or problem created by society or the environment. For example, "The teacher's negative attitude was a handicap to her." Or, "The stairs leading to the stage were a handicap to him.

A disability is a measurable impairment or limitation that "interferes with a person's ability, for example, to walk, lift, hear, or learn. It may refer to a physical, sensory, or mental condition" (Schiefelbusch Institute, 1996).

The word handicap is not a synonym for disability. Rather, a handicap is a disadvantage that occurs as a result of a disability or impairment. The degree of disadvantage (or the extent of the handicap) is often dependent on the adaptations made by both the individual and society (Department of Physical Medicine and Rehabilitation, 2000). Therefore, the extent to which a disability handicaps an individual can vary greatly. For instance, a person who uses a wheelchair would be much less "handicapped" in a building that is wheelchair accessible than one that is not.

It is important to consider terms that disabled people themselves use. Consider, for example, the fact the term 'hearing-impaired' is not considered acceptable within the deaf community (see below).

## Terms to avoid:

There are many terms that are considered especially offensive to people with disabilities [5, 7, 9]. Listed here are some tips specifically relevant for accessibility researchers. In general, avoid using:

- terms that equate people with their disability such as 'quadriplegics,' 'the deaf,' and 'the disabled.' Instead, use 'people who use a wheelchair,' 'deaf people' or 'people who are deaf,' and 'people with disabilities.'
- normal and/or abnormal
- victim of __________
- suffering from _________
- afflicted with __________
- defective

- trendy euphemisms. Expressions such as "physically challenged," "special," "differently abled," and "handi-capable" generally are regarded by the disability community as patronizing and inaccurate [5].
- patients (use this word only when referring to people who are residing in a hospital or are in need of medical attention).

## Person first language

Preferred language varies from country to country. In the United States , 'person with a disability' tends to be favored [8]. In other countries, 'disabled person' is preferred. Given variations in accepted terminology, both will be seen in computing publications.

## Vision terminology

The phrase 'visually impaired' is commonly used. While this is a phrase that is acceptable to most stakeholders, for scientific writing this phrase often does not convey enough information. In writing, it is important to note characteristics of the disabled participants.

For example, in some studies it is critical to know if participants are screen reader users or whether they prefer magnification or visual filters. Not all blind people use screen readers, some people with low vision use screen readers, others use magnification software or other software to help better navigate a visual interface. Make sure that your writing explicitly states any assumptions, for example do not use the term "blind people" when you really mean "people who use screen readers as their primary means of accessing a computer."

In other studies, it may be critical to distinguish participants by degree of vision loss. The terms 'blind', 'legally blind; and 'low vision' are commonly used, but for scientific writing require definition with reference to the research

### Terms to avoid:

- sight deficient
- people with sight problems
- 'unsighted'

## Hearing terminology

The choice of the words for referring to people with a hearing loss will depend on many factors. People who use sign language generally refer to themselves as deaf. In some cases, the word Deaf is spelled with a capital D to refer to members of the Deaf Community [6]. This would be appropriate if discussing a cultural issue. The use of deaf with the lower-case spelling more typically refers to a hearing loss and is appropriate if cultural issues are not part of the discussion topic.

Some deaf people prefer to use sign language; others prefer to rely on spoken language through speech, lipreading, residual hearing, hearing aids, or cochlear implants. Thus, when describing deaf participants it is often crucial to indicate the communication preferred by the individual.

Typically, the term hard of hearing is used to refer to less severe hearing loss than the term deaf. Again, however, this terminology is culturally sensitive and for individuals is determined in many cases by their community identify rather than by the degree of hearing loss.

In writing about participants with a hearing loss, choice of terminology will often be determined by the topic of study.

Hearing impaired is a term typically reserved for medical writing and refers to the decibel-level of hearing. Because it negatively emphasizes a deficiency , the term hearing impaired is typically rejected by members of the Deaf Community. However, elderly people who have experienced hearing loss later in life may prefer the term hearing impaired as they do not identify with the deaf or hard of hearing groups.

As examples, when writing about topics that include sign language or Deaf Culture, use 'deaf' or 'Deaf'. When writing about general accommodation for this group use 'deaf and hard of hearing'. If you are writing about topics that include or are directly dependent on decibel level of hearing, refer to the degree of hearing loss.

### Terms to avoid:

- deaf mute
- deaf and dumb

## Mobility/Motor/Dexterity Terminology

The word mobility generally refers to walking or moving about and so the term 'mobility impairment' may be an inappropriate classification when referring to computer use. If the intended classification is meant to refer to a person's ability to use a standard mouse or keyboard, motor or dexterity impairment would be a better choice. 'Motor disability' and 'physical disability' are also acceptable terms.

Wheelchair usage: Use the phrase 'person who uses a wheelchair' or 'wheelchair user' rather than 'confined to' or 'restricted to' a wheelchair.

### Terms to Avoid:

- restricted to a wheelchair
- confined to a wheelchair
- wheelchair-bound
- deformed
- crippled
- physically challenged

## Cognitive Terminology

Cognitive disabilities affect a person's ability to learn, process and / or remember information, communicate, or make decisions. Specific forms of cognitive impairment are often referred to in medical literature as deficits. This term may be used in computer science when referring to specific cognitive skills, for example 'people with a visual processing deficit', but avoid 'people with deficits'.

It is important that writers carefully define cognitive disabilities. Consider whether the research relates to learning disabilities, intellectual disability, or specific cognitive ability (such as memory or language processing). Be precise in describing the characteristics of the population.

Developmental disability is any severe mental and/or physical disorder that began before age 22 and continues indefinitely. Individuals with mental retardation, autism, cerebral palsy, epilepsy and other similar long-term disabilities may be considered to have developmental disabilities.

Mental illness is a term describing many forms of illnesses such as schizophrenia, depression and emotional disorders. Use 'person with a mental disability.'

For people who do not have a cognitive disability, use terms 'people without disabilities' or, in the case of developmental disabilities, 'typically developing children.'

### Terms to Avoid:

- retarded
- deranged
- deviant
- demented
- deficient
- people with deficits
- insane
- slow or slow learner
- abnormal or normal
- mad, crazy, paranoid
- mongoloid (use person or child with Down Syndrome instead)
- "special ed"
- clinical terms such as "neurotic" and "psychotic" should be used only for clinical writing.

## Other

The terminology discussed here does not completely cover all areas of accessibility research. For example, work with older adults is currently an important area. The general principles indicated here, however, should apply in considering writing on topics not covered here.

## Summary

As we stated at the beginning, appropriate terminology changes over time and with context. This article, however, is a starting point for current research on accessible computing.

## Acknowledgments

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# W4A 2008 – a review

*David Sloan[1], Yeliz Yesilada[2]*

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The 5th annual International Cross-disciplinary Conference on Web Accessibility (W4A for short) took place alongside WWW 2008 in Beijing, in April 2008. The conference venue was Beijing's International Convention Centre, next door to the Bird's Nest Olympic Stadium, and given the closeness of the conference - in location and timing - to the world's most famous sporting event, it was fitting that the conference theme looked at how accessibility can be addressed as Web user become more active, as content creators. Our theme was "One World, One Web: Surfers become Designers?"

We were particularly interested in exploring the implications on Web accessibility of the increase in numbers of authors, and the resultant dilution in technical capability of web authors. How well do web authoring tools and user agents (including AT) support accessible authoring? And how accessible are these web authoring tools - whether available publicly as part of the Social Web or as corporate business.

We accepted 12 papers, with an acceptance rate of 36%, 7 Communication papers, and 4 Web Accessibility Challenge submissions. Author representation was extremely diverse, covering all 5 continents. Using International Olympic Committee-style three letter country codes, paper authors represented AUS, BRA, CAN, ESP, GBR, GER, GRE, ITA, POR, THA, TPE, UGA, and USA.

## Keynotes

The first conference keynote talk was given by TV Raman, of Google Inc, one of the most familiar and respected names in the field of non-visual software and web access. He outlined developments at Google in supporting accessibility of rich internet applications, an area of great interest, given the emergence of Web 2.0, and Google's Cloud Computing concept of distributed content storage and web applications enabling users to manage and publish their content using only their browser. Raman described how technologies such as AxsJAX are being developed and implemented in a way that helps improve rich internet application accessibility, particularly in non-graphic browsing situations, and further examples of this were provided later in a paper presented by colleague Charles Chen.

Our second keynote, given by Shadi Abou-Zahra of the World Wide Web Consortium, gave us an early indication of the W3C's activities in the area of Web accessibility for older people. With the additional sociotechnical challenges facing many older Web users, accessibility becomes an even more complex issue, and Shadi discussed the challenges of separating - and addressing - accessibility issues that are due to browser shortcomings rather than that of the Web content they present. We were particularly grateful to Shadi for stepping in at short notice to replace original keynote Mike Paciello, who was unfortunately unable to be with us in Beijing. However we hope to see Mike back at WWW2009.

## Papers

We heard a range of extremely interesting papers, from academia to industry, from theory to practice. Some of the highlights are described below.

Rui Lopes and Luís Carriço contributed to the 'accessibility versus universal usability' debate by presenting an approach to large-scale accessibility evaluation of web sites, based on the concept of web interaction environments, a framework of modelling a site's audience and usage environment. They tested this approach by evaluating the accessibility of a random selection of Wikipedia pages, chosen as examples of pages with multiple authors, and argue that their findings indicate that templated authoring such as that provided by content management systems can improve accessibility.

The accessibility of Wikipedia was also the subject of Marina Buzzi and Barbara Leporini's study, where they evaluated the accessibility of the authoring process and output of Wikipedia to screen reader users. They concluded that the key barriers to accessibility included a lack of information identifying constituent parts of Wikipedia pages, usability problems with searching, and challenges in editing pages – due particularly to the complexity caused by integration of edit functionality on the same page as the actual content.

In describing MoKE, John Garofalakis and Vassilios Stefanis presented a tool for evaluating web content for usability on mobile web devices, using definitions of best practice published by the W3C. They highlighted the tool's approach to addressing the challenge of considering the 'hidden Web' – Web content normally beyond the reach of evaluation tools, such as pages presented as the results of a form-based query.

Leo Ferres and colleagues tackled the subject of improving the accessibility of graph-based content. While in theory graphs may be considered graphical rendering of numerical data, and therefore this source data can be made available to those unable to access it in graphical format, there are many situations where the source data is unavailable, or the construction of the graph may be sub-optimal. Hence an approach is needed to identify the key meta-information of a graph that is presented in an inaccessible format, and to convert this information to a more accessible format.

Stefano Ferretti, Silvia Mirri and colleagues considered the impact on accessibility of the emergence of the 'prosumer' in an e-learning context, and propose a tool to enable shared production of accessibility features, such as text alternatives, to e-learning content. This distributes the task of improving the accessibility of existing e-learning resources in a way that supports adaptation of resources to suit a learner's specific learning needs.

Jeff Bigham described work he and colleagues have conducted in developing WebAnywhere, an online screen reading application that enables users to access web content in audio format from a computer without a screen-reader installed. This, they argued, can help overcome financial and technical barriers that can limit the availability of screenreading technology to those who need it.

We also heard about initiatives supporting Web accessibility around the world – including in Thailand and in Taiwan. Andre Freire gave us results of a survey on web developers' awareness of accessibility in Brazil, an extremely interesting insight into levels of awareness in different sectors.

As we move ever closer to the publication of version 2.0 of the Web Content Accessibility Guidelines (WCAG), members of the WCAG 2.0 working group Loretta Guarino Reid and Andi Snow-Weaver provided a timely overview of the guiding principles behind WCAG 2.0, and the changes in organisation and content from WCAG 1.0.

For more details on the above, and all other W4A 2008 papers, visit the W4A web site, at: http://www.w4a.info/2008/ or the ACM Digital Library; while authors of selected papers have been invited to contribute to a special issue of the New Review of Hypermedia and Multimedia, edited by Leo Ferres.

## W4A 2008 Roll of Honour

**2008 Best Paper Award**: Rui Lopes and Luis Carrico; for The impact of accessibility assessment in macro scale universal usability studies of the web

**2008 John M Slatin Award for Best Communication Paper:** Carlos A Velasco, Dimitar Denev, Dirk Stegemann, and Yehya Mohamad; for A web compliance engineering framework to support the development of accessible rich internet applications

**2008 Web Accessibility Challenge sponsored by Microsoft:**

- **Judges' Award:** Darren Lunn, Sean Bechhofer, Simon Harper; for The SADIe transcoding platform
- **Delegates' Award:** Jeffrey P. Bigham, Craig M. Prince, Sangyun Hahn, Richard E. Ladner; for WebAnywhere: a screen reading interface for the web on any computer

## W4A 2009

W4A 2009 will take its usual place, co-located with the annual WWW conference, on April 20 and 21, in Madrid, Spain. Our theme will be 'Web Accessibility for Older Users: Are We There Yet?', and as such we will be particularly interested in receiving submissions that look to address aspects of the challenge of improving accessibility of the Web to older people. Details of the conference, including submissions, are available on the W4A web site at: http://www.w4a.info/

We look forward to seeing you there!

David Sloan (Programme Chair W4A 2008, General Chair W4A 2009)
Yeliz Yesilada (General Chair W4A 2008)

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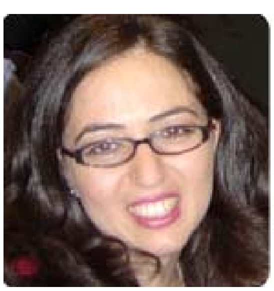
*David Sloan* is Project Lead of the Digital Media Access Group, a research and consultancy unit based in the School of Computing at the University of Dundee, Scotland. He has been involved in the field of web and software accessibility since 1999; and received his PhD in 2006 for a thesis exploring the impact of web accessibility audits on organisational and individual awareness of and attitudes to inclusive design. In his spare time he enjoys cycling, orienteering and hiking in the forests and hills of Scotland, and when it's too cold for that he prefers to be in the kitchen, cooking, drinking good wine and listening to good music.



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