WHY DESIGN FOR PEOPLE WITH
READING DIFFICULTY AND LOW LITERACY

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Past work and interest in the topic

This study was carried out as part of research to understand the nature of how low literacy users search and retrieve information. We compared how low and high literacy users of Barnet Citizens Advice Bureau performed information search and retrieval on a kiosks information system in the UK. The kiosk provided self-help information in a number of social services areas. Six high literacy and six low literacy users were presented with information search tasks classified as having low, medium and high complexity. Key results indicate that (i) low literacy users take eight times more time than high literacy users to complete an information search task, and yet were significantly less accurate, (ii) low literacy users on average spent one-third more time on a web page than high literacy users, but did not seem to be informed by it, (iii) low literacy users employed a much less focused information search strategy than high literacy users visiting eight times more web pages in total, (iv) low literacy users back-tracked 13 times more frequently than high literacy users, and are four times more likely to re-visit web pages, and (v) low literacy users are 13 times more likely to be lost than high literacy users. These findings show we should design differently for these low literacy user groups (Kodagoda, & Wong, 2008).

Following up on one of the issues highlighted in the Kodagoda and Wong study, we compared the readability of 4 daily newspapers with the Barnet Citizens Advice Bureau WebPages. We wanted to identify the difference in readability between popular newspaper articles and the expression of social service advice and information on the Barnet CAB web pages. We used manual and online tools based on Readability formulas such as Flesch Reading Ease, Gunning fog index and SMOG to calculate the readability levels.   In general, the different formulas counted the number of words, number of sentences, and total number of syllables or complex words in the selected materials, and used them to compute the readability index. The results of this comparison is summarised in Table 1.

The results indicate that the newspaper articles were written for readers with 11 – 13 years of education, also known as adult literacy Level 1 in the UK. The WebPages articles were written for readers with 14 – 17 years of education, equal to a level 2. The results are shown in table 1.   An average adult reads at a level of an eighth grade or with 9 to 10 years of education (Wallace, & Lennon, 2004). This shows the selected newspaper articles and the Barnet Citizens Advice Bureau WebPages are written well above the average adult readers' (socially disadvantaged people) readability level. This mis-match of reading level of the information presented on CAB website with the expected reading level of the socially disadvantaged user, who tends to fall under the classification of a low literacy user, could explain some of the problems we identified.

Table 1 – Comparison of reading levels between popular newspapers and CAB website

	Daily Express	Daily Telegraph	Metro	The Guardian	Barnet CAB Website
Readability score (SMOG Index; Flesch Index; Gunning Index)	12.15 54.50 11.94	11.02 57.50 11.59	11.44 56.50 11.06	12.97 30.00 13.51	15.60 37.15 17.96
Reading level (years of education)	11 – 13	11 – 13	11 – 13	14 - 17	14 – 17
Equivalent literacy level	Level 1	Level 1	Level 1	Level 2	Level 2

Current motivation for the workshop

The observation made at the Barnet Citizens Advice Bureau kiosks information system show, the difficulty users have in search for information. The users who had problems in searching for information were low literacy users. There is a need to understand the information search behaviour of such low literacy user groups and find solutions to overcome their difficulty in information search.

This will bring insight to their information search behaviours. The research will help find solutions to improve the information search and presentation of results.

According to the European eGovernment Action Plan 2010, one criteria is that all citizens must benefit. The roadmap for inclusion eGovernmet includes user groups at a disadvantage, including adults with low literacy, poor readability & other disabilities. We believe by making Governments, policy makers, designers, aware of these user groups, we can help make new standards and guidelines in the rapidly evolving e-government and e-social services environment.

We believe the Semantic Web technology could form the basis of a solution for this group of users. Tim Berners Lee describes the future of the Web is not a replacement to the existing web, but an extension which will be the Semantic Web. As relevant citizen and social services information is often distributed across several systems, or 'silos' as is the case with many on-line e-government information located in different government departments, it is particularly difficult for low literacy users to retrieve relevant information (Wong, Keith, & Springett, 2006). The vision of the Semantic Web is to enable autonomous agents to congregate scattered information and manipulate them in a meaningful way for their users. Presently, much data and documents are stored in HTML. This makes it complicated to extract information in way which makes sense to the users. The vision of the Semantic Web is to enable machines, autonomous agents to extract information and manipulate it, for their users. Currently HTML is used as a means of presenting data and documents; the problem is its visual markup hides the semantic contents the machines and agents care for.

The Semantic Web provides a framework for machines and agents to extract information using end user applications, making necessary decisions on how information should be presented to fit for the purpose of their users. The same data could be used by the end user application and be manipulated according to their user requests (Quan, & Karger, 2004).

Our current research is focused on how technologies such as the semantic web could be used to design for people with low literacy.

Critical issues

Kodagoda & Wong (2008) identified a number of critical differences between the information search strategies invoked by low and high literacy users. These are critical issues that should be considered when designing systems for this category of users, and are summarised below.

- Low literacy group of users tend to do a less focused and ineffective search due to the many navigational judgments they make during an information search task. It is important to present the information in a way, which easily make sense, avoid confusion and make them aware when they have reached their goal.
- With many navigational paths available to reach the goal, many low literacy users tend to take a longer path than the optimal path. When designing systems keep the user focus and find potential to have one path. This would reduce the overall time spent on the search, and ability to obtain information fast and accurately.
- Revisiting of pages take place for two reasons (i) when a user backtracks or users the back button (ii) when following links on a WebPages. This results when the user gets disoriented from the original path and tries to move to new navigational paths. By keeping the user focus on the goal, this will help reduce the backtracking.
- Low literacy users have a higher number of unique WebPage visits, suggesting a less focused search. Smith (1996) calls this 'user lostness' or 'users disorientation' in the search task. In summary we should find ways to improve the amount of time spent on a search task, reduce number of page visits, reduce number of unique page visits, reduce number of back tracking and reduce the level of revisits which results in user disorientation, and less focused search or user lostness.

Additionally, according to Shalla, & Schellenberg (1998) and Canadian Council on Social Development (1996), low literacy users also tend to be socially disadvantaged and that such a group is also more likely to be unemployed. They have a high tendency to be less motivated. Therefore, when designing systems for this group of users it is important to design systems and interfaces that would keep their focus and interest, guiding them to reach the goal.

Final critical issue that we should consider is what are the best technologies we could use to bridge the gap between low and high literacy users?

Design guidelines

We propose the following design guidelines, which we will continue to investigate:

- Use technologies such as Semantic Web as it will enable autonomous agents to congregate scattered information and manipulate in a meaningful way for its users. By using ontologies it gives structure to the Semantic Web. Ontologies represent concepts within a domain and the relationships that exist between those concepts. Ontologies makes it easier to identify concepts, domains, and organise commonalities in repositories while having the luxury of sharing information between machines, agents and people with the idea of reusability (Juan, Fernando, & Vega-Riveros, 2004). The following tools could be used to develop ontologies RDF (Resource Development Framework), RDFS (Resource Development Framework Schema), OWL (Web Ontology Language)which is approved by the World Wide Web Consortium.
- To develop ontologies we could use editors such as Altova SemanticWorks or Protégé which is an open source system.
- Ontology development will assist information retrieval by end user applications which will make necessary decisions on what information should be extracted for the user. Further the user will see only one result.

- The users should easily make sense of the extracted Semantic Web information. The main difference between the Web portal and the Semantic portal is, Semantic portal has central control which helps present information.
- Share experiences and others best practice.

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