Designing Websites for People with Cognitive Disorder

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ABSTRACT--- ***This article highlights current issues involved in designing websites which are usable for people with cognitive disorder. This is as a result of the growing number of the elderly and other people with cognitive problems who have been reported to find it difficult to access or use a number of websites today. This review employs a narrative approach with critical analysis of key issues and recommendations in current literatures. Overall, findings from this study suggests that people with cognitive disorder and those specialized in such conditions should be incorporated more in the design of guidelines for developing websites and also in designing websites. The outcome of this study will provide relevant stakeholders with insight on some of the issues faced in designing websites that are accessible and usable to people with cognitive disorder and recommendations for future designs.***

Keywords--- Cognitive Disorder; Websites; Designs; Accessibility

1. INTRODUCTION

The population of aged citizens is on a gradual increase. Senior citizens (people aged over 65years) accounted for over 17% of the UK population in 2010 and this figure is estimated to rise up to 23% by the year 2035 [1, 2]. These people are trapped within the digital divide because they were used to accessing printed information whereas this source of information is gradually facing out with advancements in digital technology [1].

Consequently, there is a high tendency that they will be faced with various degrees of difficulties as they tend to embrace digital technologies because most of these technologies, particularly websites require users to be able to recall, comprehend and make decisions in good time [3]. People aged over 65 years are usually perceived to have lower cognitive abilities compared to other users. They have been repeatedly cited in this review to experience deterioration of their cognitive faculties such as working memory, decision-making and ability to learn new things [1, 3, 4, 5]. They are also reported to be easily distracted by irrelevant content. They lose concentration very easily and carry out tasks in a very slow pace compared to other users. They also find it difficult to handle complex tasks because they usually experience memory overload [4, 6]. Meanwhile, cognitive disorder (CD) is not only common amongst people who are quite advanced in age; it can be acquired at any age [7]. There are people below 65 years that suffer from memory difficulties such as learning disabilities, dementia, depression, mental retardation, autism and traumatic brain injury among others [3].

Recent studies have shown that their experience with the use of digital technologies, in this instance, websites, have been quite poor as a result of issues related to accessibility, usability and online safety and the challenge of cognitive load [1, 2]. According to Chou, Lai, and Liu [6] and contrary to what is perhaps, widely perceived, people with CD such as the elderly do not reject digital technologies. They are being put off by complex user interfaces that make it extremely difficult to cope with their degenerating senses (p.920). For instance, elderly people as well as people with CD see the internet as a means to communicate and participate in the lives of their families. They also see it as a means of reaching out to other people with or without disabilities. In addition, as noted by one report [8], it presents an opportunity for disabled people to express themselves freely without the fear of been stigmatized because of their condition. Likewise, information provided on the internet can help both the elderly and people with other forms of CD to be more productive and to take better care of themselves by learning online [6, 8].

It is apparently true that some web designers and owners have continued to fail to accommodate people with disabilities, particularly those with cognitive disorder which is the focus of this review. Most worrisome is that as evident in recent studies, the population of the elderly is experiencing an increased growth. This further implies that a good number of people with cognitive and other forms of mental problems will continue to be left out if key issues relating to website

accessibility and usability are left unaddressed. To this effect, this study aims to review website designs; guidelines, common practices and requirement gathering techniques and what is required to accommodate people with cognitive disabilities.

2. METHODS

A literature search was conducted for relevant published electronic resources available on Google Scholar, Science Direct and the WAI (Web Accessibility Initiative) website. A series of combination of the following search terms were used. The search terms include: "website", "web", "internet", "design", "cognitive", "disability", "mental", "disorder", "problem", "learning", "intellectual", "memory", "accessibility" and "usability". Relevant materials obtained using the above method were quite inadequate and prompted a general search using the Google general search engine of web accessibility articles that highlighted some issues and recommendations that are of interest to this study. Only articles were published within the last 10 years and in English language were included in this study. Nevertheless, some other articles that failed to meet this criterion but were identified by reference follow-up (snowball) methods were included.

3. RESULTS AND DISCUSSION

Savitch, Freeman & Clare [9] identified six issues that needed to be addressed in order to make websites accessible and usable by people with CD. They include: scrolling difficulties, navigation, getting lost on a page, clicking on the wrong link, clicking on text which was not a link and becoming worried or upset. Interestingly, these issues were the most re-occurring issues cited in nearly all the articles reviewed in this study. But notwithstanding, some other articles also cited security, memory overload, distraction, complexity of the needs of people with CD, non-inclusion of people with CD (or CD specialists) in the design process by most web-designers and inadequacies of current guidelines among others. These aforementioned issues shall be the focus of our discussion.

A. Web Accessibility Guidelines

Some countries have internal laws which specify legal protection and frame works for people with disabilities such as the UK's Disability Discrimination Act (DDA) of 1995 that seeks to ensure people with disabilities are accorded equal access to websites as with those without disabilities [10, 11]. Also, there are professional guidelines such as the Web Content Accessibility Guidelines (WCAG) and the Web Accessibility Initiative (WAI), put together by the World Wide Web Consortium (W3C) to help bridge the divide experienced in accessing web content between people with and without disabilities [2, 7, 10, 11, 12, 13].

For example, the WCAG 2.0 guidelines, an upgrade of the WCAG 1.0 attempts to address a number of accessibility issues across various web technologies. They are primarily hinged on the following principles:

- Information and user interface are presentable to users in the way they can easily access
- User interfaces and navigation are functional
- Information presented and tasks carried out by users must be understandable.
- Web content provided must be able to be interpreted by a wide range of users which also includes assistive technologies [13, 14].

But unfortunately, full compliance has not been recorded. Evidence from this review have shown that a number of website designers and owners have failed in the past to adhere to the DDA laws or to implement the W3C guidelines even when it is quite obvious that some of these guidelines can be easily incorporated in their website design process [8, 11]. This can be seen with the number of government, commercial and personal websites in the UK that have failed to accommodate her disabled users [11]. More so, accessibility problems such as missing 'alt tags' can be fixed relatively easily as they require less complex coding and do not require redesigns of the site.

Some level of progress has been reported with regards to addressing the problem of missing 'alt tags'. For instance, some web design tools such as Adobe's Dreamweaver and Microsoft's Expression Web now prompt web designers to include alt tags during design [13, 15]. However, the same may not be said for other accessibility issues that affect people with CD such as memory overload. Perhaps, one may argue that most solutions proposed to aid people with disability to access web content easily lay more emphasis on those with visual disability [16, 17] and the use of screen readers. This view was also supported by one study [7] who observed that most web accessibility experts involved in the drafting of web accessibility guidelines like the WAI and WCAG come from fields relating to sensory and physical disability. The absence of specialist knowledge relating to CD implies that the accessibility needs of people with CD will be neglected in the drafting of these guidelines.

In addition, although the guidelines provided are very resourceful, solely complying with these guidelines cannot guarantee accessibility as web designers may only pay lip-service to it. Web designers may only focus on passing the validation test rather than ensuring that their web sites are actually accessible [7]. Moreover, not all aspect of compliance is measurable. It is thus expected that this issue will benefit from further research.

B. Non-inclusion of people with CD in the website design process

Poor web design and web content that are inaccessible by people with CD arise sometimes as a result of the non-consideration of the needs and capability of people with CD [8, 15]. According to Chou et al.[6], some web designers focus more on enabled and young adults when they want to elicit user requirements for their websites. They are usually of the perception that they know what older people or people with disabilities will need. The outcome of their study usually fails to point out what these people actually need because they do not possess the same level of understanding and experience in accessing web interfaces. Whereas interacting with people with CD can present a web designer with a better picture of what their needs are. For example, web designers can be able to see their first hand reaction to certain tasks and other things that may not be covered by basing their designs solely on existing theories about people with CD [7].

C. Stakeholders Involvement

Web designers cannot be blamed alone for the neglect of people with CD in designing websites. Findings in this review show that some clients, managers and decision makers do not care if items put up on the web sites are accessible to disabled users such as pop-ups, adverts and the number of items on a page [7]. Moreover, the above study also reported that it is difficult to get team members in large projects to implement accessibility guidelines if they are not backed by the client or project manager especially in the absence of recognized techniques that can implement these guidelines.

D. Complexity of Needs

Another reason for the non-inclusion of people with CD in design process may be that they tend to snap-out and snap–in frequently, resulting in inconsistent and unreliable results. This is coupled with the complexity and diversity of their needs as a result of the severity of their condition and the perceived difficulty in creating solutions to address them [7]. Moreover, older people are more likely to find it difficult to read most web contents especially those with certain colours or fast-moving textual or graphical objects like adverts and pop ups. A possible solution that may appeal to people with cognitive problems will be to design websites with the minimal use of images, colours, animation and pop ups. This is because, in the past, prior to the introduction of graphic based web pages, there were fewer issues with regards to accessibility of websites for people with disability [12, 15]. However, this may not appeal to other web users as observed in one of the study reported in one article [5] because of the heterogeneity of web users. Moreover, it will be quite unrealistic to ask web designers and owners to build separate websites for people with disabilities except if they are the primary target of the website [7]. The amount of time and resources needed to come up with solutions that can address their needs may also be overbearing.

E. Design Issues

Distraction

People with memory difficulties can still learn and retain information for a period of time with the right approach. The use of sound, video and interactive platforms to deliver information has been noted to be very instrumental in helping people with cognitive problems to understand better [1]. That is because this form of interaction could help attract and generate interest of people with CD [7]. However, there is an equal opportunity that it could easily cause distraction and confusion. One possible reason for this is that people with CD tend to perform poorly in multitasking situations or when their sensors and working memory is been overloaded [1, 4, 18]. Thus, there is a need to encourage one task at a time with minimal distraction. This in turn could help them channel their attention properly. However, it may be quite difficult to carry this out as the needs of people with CD may vary with age or the severity of their cognitive difficulty. For example, older people are aware of their current limitations and have designed better means to carry out tasks, though slowly compared to young adults. However, the same cannot be said of younger people with severe cognitive problems and with little or no computing experience [1, 4, 16].

Language

Also, nearly all studies recommended for the use of clear and concise language to describe items on web pages, especially in error and help messages. This is because people with CD find it difficult to understand or contribute on a website when the content of the web page contains abstract or ambiguous statements, jargons, passive verbs and complex sentence structures [3, 6, 10, 11, 18]. For example, elderly users may find it difficult to buy-in to the current language being used on some websites like tweet, poke etc. [6] and others with severe intellectual disability may fail to understand that ‘home’ means homepage on a website [18]. Therefore, the language used on the website should be very clear, if possible only short and simple sentences. Some studies recommended that textual information should be supplemented with relevant visual interfaces [3, 7]. In addition, information expressed graphically should be described adequately

either through voice narration or text [10]. These recommendations they claim is in line with WCAG guideline which requires that alternative means of presenting information should be used to enhance accessibility. However, other studies like [19, 20, 21] observed that the inclusion of graphics led to an increase in the time required to retrieve information. More so, as observed in some websites, the inclusion of graphic content is one of the leading causes of long web pages.

Navigation

In addition, people with CD are more likely to forget the task they are carrying out. For this reason, it is been advocated that web designers should make it easier for users to recognize tasks rather recall events. Burmeister [16] noted that it is important to incorporate certain mechanisms on the web site that can help people with CD to form valid mental models of the site structure. One possible way of achieving this could be by using breadcrumbs, sitemaps and clear titles headings to aid CD to identify their current positions. Also, some articles recommended that web pages should have a structurally consistent format [6, 18]. It is envisaged that this can help CD users who get lost, to be able to trace their way using the memory of the previous pages they have visited. Furthermore, colours can be very useful in helping people with CD in navigating a website. As stated by Freeman et al.[18], people with memory difficulties still do possess contrast sensitivity, visual acuity, and can still identify colours.

Similarly, in this review [21] observed that people with CD often tend to read items from left to right rather than from top to bottom. This implies that they are more likely to show preference for the horizontal menu structures compared to the vertical ones. Moreover, some studies like Taylor et al. [2] have kicked against the use of drop-down menus for people with CD.

Other recommendations made in this review include providing few choices and visited and unvisited links should be made obvious to users. The former is aimed at reducing the number of incidences where the user is overwhelmed by having too many choices, resulting in difficulty to make decisions and memory overload [3]. While the latter is because on some websites, it is difficult for a CD user to know what link has been visited or not [5]. As a result, they may end up clicking same link or revisiting same web page over and over resulting in frustrations.

Similarly, people with CD tend to show preference for linear navigation such as using the back and forward buttons to accomplish tasks [21]. For example, it has been found that elderly users prefer websites to display content in a linear process just the way their TV set would have done [6]. On the other hand, they could still lose track especially if they have to take so many sequential steps to accomplish a task [4]. Moreover, most websites, particular mobile websites only use a left or right pointing arrow to indicate the back or forward button respectively [22]. Therefore, it is possible that people with CD will sometimes find it very difficult to understand these labels as well as other abstract navigation icons used on web pages.

Scrolling

Additionally, people with CD find it difficult to use scrolls as this introduces some level of divided attention. As pointed out by various studies, [2, 5, 19, 22] people with CD are sometimes, unaware that they have to scroll to view information not displayed on the immediate screen. Moreover, lengthy or continuous web pages may pose a huge challenge to web users with CD. This is because they are more likely to find it difficult to recall especially when the background or font style keeps changing. They are also noted to get tired, bored or lost on long pages, especially those with no visible content menu.

Therefore this may call for the designing web pages that take the exact size of the screen so as to make it less likely for them to miss information or get lost and bored as all information are visible [21]. However, as pointed out by Li et al. [4], the one-page-policy may lead to too many information being put-on one page which could overload their working memory.

Security

People with CD are always nervous and easily discouraged to use websites. According to Chou, Lai, and Liu [6], they are usually turned off by request for sign-ups, pop-ups and time limits. Also, they are very uncomfortable and nervous to disclose personal information on the internet especially within a stipulated time frame [6]. They are also noted to feel sceptical about their security, particularly when they feel the instructions provided are unclear or when they need to take too many steps to carry out a tasks. More so, owing to their short memory structure, they find it difficult to remember their passwords for various online accounts. Although some websites are currently implementing some tools that can assist web users in remembering their passwords [16], a good number of websites are yet to key into this.

Furthermore, Chou, Lai, and Liu [6] have advocated for the removal of time limit for data entry so as to encourage this group of disabled users. Nevertheless, it is not known if website owners would be willing to trade this security feature in order to accommodate its disabled users

4. CONCLUSIONS

With the issues highlighted above, and with what is currently been observed on a number of websites, it could be argued that not much has been down to ensure people with CD can access and use web interfaces with ease and safely. To this effect, it is recommended that people with CD should be been incorporated more throughout the design process and not just considering them as an afterthought. This is because designing web pages that can be accessed by CD requires a complex set of solutions both in terms of design and content. In addition, web designers should be encouraged to build websites that are simple to use, thus making the websites more usable to users with low technical skills. A number of solutions have been highlighted in this study; however there is the need for a deeper exploration of this subject matter.

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