

Good Visual Aesthetics Equals Good Web Accessibility

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Abstract

This paper summarises a doctoral research project titled Empirical Investigation of Visual Aesthetics¹ and Accessibility (EIVAA). The project proposes to investigate the relationship between visual aesthetics and Web accessibility, with the aim of building a framework to guide the development of aesthetic accessible Web content. As a first step, a formative study was conducted to examine the relationship between visual aesthetics and Web accessibility from a technical perspective. Thirty Web pages that had previously been rated on various aspects of their visual appearance in a study by Michailidou et al. [20] were investigated. The visual aesthetic dimensions considered in their study were “clean”, “clear”, “organised”, “beautiful”, and “interesting”. In our study, all thirty Web pages were tested for accessibility using an automatic evaluation tool, “Cynthia Says”². Initial results show that Web pages which were previously agreed by participants to be visually clean, clear, and organised had lesser numbers of Web Content Accessibility Guidelines (WCAG) 1.0 failures. This suggests that visually pleasing pages along these design dimensions may not pose a barrier to accessibility. The implications of our study and future research directions are discussed.

Introduction

Visual aesthetics have been shown to enhance positive user experience in the context of the World Wide Web (Web) (e.g [8, 15, 17, 20, 23 and 25]). However, there is still much tension between visual aesthetic considerations for Web pages and their effect on ease of use for people with disabilities [22, 26]. On the one hand, most Web developers feel stifled by Web accessibility requirements and associate accessibility with visually unappealing designs. On the other hand, accessibility advocates assert that Web accessibility does not hinder the Web developer [10]. This apparent tussle has not been helpful to the accessibility community [22]. Moreover, most of the work that has been done in this area is theoretical and anecdotal in nature. Whether it is possible to achieve aesthetic accessible designs in practice still remains a pressing problem [10].

The EIVAA project seeks to investigate the relationship between visual aesthetics and Web accessibility with the aim of guiding aesthetic designs that are also accessible. To achieve this goal, extensive user studies and eye tracking information will be used to understand which Web pages are visually pleasing to sighted users, so that technical and manual (involving users and accessibility experts) accessibility tests can be conducted for such pages. We believe that this may reveal the interplay between visual aesthetics and Web accessibility. Based on our findings, research-based Web

¹Visual aesthetics here refers to visual pleasure. For the purpose of experimentation, visual aesthetics was investigated along five design dimensions previously studied by Michailidou et al. [20].

²Cynthia Says - <http://www.contentquality.com/>

design guidelines will be proposed, and a framework for guiding aesthetic accessible designs will be developed.

Related Work

There is currently work in Human-Computer Interaction that seeks to understand the role of visual aesthetics in interaction design. However, many researchers in the field are yet to understand what visual aesthetics entails in practice [9]. This problem is not peculiar to Human-Computer Interaction domains alone. From antiquity, understanding the subject of visual aesthetics has been a problem. Early philosophers were also divided on the issue of visual aesthetics and how its study should be undertaken [19]. While some adopted an "objectivist" approach, others took an approach which was much more "subjectivist". The former group closely associates visual aesthetics with the object being viewed, and sees beauty as a "measurable construct" that is derived from the physical form of the object [27]. The latter are of the opinion that the person experiencing an object decides whether the object in question is beautiful or not [14]. In the context of the Web, the two approaches are often used together because of their inter-relatedness. Typically, study participants are required to state their visual aesthetic preferences for Web pages along design dimensions such as order, symmetry, clarity, beauty, complexity, ease-of-use and so forth. Some of the afore-mentioned design qualities can also be treated as objective measures, depending on the approach the researcher wishes to adopt [7]. Frohlich [6] points out that for interaction design, these two approaches have their implications. According to him, the objectivist approach would require that interactive system designers focus more on the product being designed, and that they strive to design in a way that conforms to the norm in terms of beauty expectations. Of course, these may vary across communities [15, 28]. The subjectivist approach would require that designers design according to the stipulated best practices in their respective industries and believe that by so doing, the user might just be able to see the beauty that exudes from the finished product and come to appreciate the efforts of the designer. Frohlich recommends the latter approach as the former may be "distracting".

Web Visual Aesthetics

Empirical studies on visual aesthetics for the Web have followed of one of two directions:

- There are those studies that have concentrated on replicating experiments to validate visual aesthetic theories of old. In such studies (e.g [16]), Web pages are used as visual stimuli in place of works of art and geometrical shapes which served as test beds in the early days of experimental aesthetics. One popular aesthetic theory that has been investigated in the context of the Web is Berlyne's [1] arousal theory. Berlyne's theory holds that people love to experience aesthetic pleasure at moderate levels.
- There are also studies that have focused more on investigating the relationship between visual aesthetics and different aspects of user experience. Some aspects explored so far include: usability [8, 17, and 24], credibility [15, 23], desirability/preference [25], complexity [20] and more recently, accessibility [18].

Although these studies have consistently shown that visual aesthetics enhances positive user experience, very little is known about the interactions between visual aesthetics and accessibility. Sighted Web users trust Websites they perceive to have good Web page aesthetics, and would more readily transact with such sites [15]. Also, users perceive

information obtained from a Website with good visual aesthetics to be more credible than that obtained from a Website with poor visual aesthetics, even if the two Websites in question have the same content [23]. Visually pleasing pages are generally perceived to be easier to interact with [8, 17] and less visually complex [20]. Moreover, beauty determines the visitor's initial impressions, hence their preference [25].

The influence of Web visual aesthetics on accessibility is one area that has not benefited much from empirical research. The increasing trend in Web visual aesthetics is speculated to hinder people with disabilities from accessing Web resources effectively, especially people with visual impairments³ [26]. This belief has had an impact on the way most Web developers perceive the Web Accessibility Initiative (WAI)⁴. Some Web developers are reluctant to comply with proposed guidelines for building accessible Websites, because they perceive them to be "restrictive" design-wise [10, 22]. Perhaps, the inability to clearly distinguish between visually pleasing and displeasing Web designs also has a part to play in this matter. The question that needs to be asked is: what is the true visual nature of Web designs that manifest inaccessibility?

Web Accessibility: The need to make the Web accessible to people with disabilities cannot be over emphasized. Apart from the fact that interacting with the Web gives users with disabilities a sense of belonging [10], it also makes them feel more independent [21]. With the potential socio-economic benefits accessibility brings to the Web community, one would expect that the accessibility initiative would be well received by all. Unfortunately, this has not been the case. Several actions have been taken, mostly legal and educational to make Web developers and builders of user agents, authoring tools, interactive systems and providers of Information Technology (IT) services, conform to accessibility requirements. For example, in the United States of America (USA) Section 508⁵ which outlines accessibility standards has been adopted. Some notable guidelines include the Web Content Accessibility Guidelines (WCAG) Version 1.0 [5] and 2.0 [4] recommended by the World Wide Web Consortium (W3C)⁶ under their Web Accessibility Initiative. Other guidelines specified by the World Wide Web Consortium include the Authoring Tool Accessibility Guidelines (ATAG) [11] and User Agent Accessibility Guidelines (UAAG) [12]. WCAG version 1.0 and 2.0 outline the necessary steps to take in order to produce Web content that is accessible to people with disabilities. ATAG specifies what developers of tools used to create and maintain Web content should do in order to advance the accessibility mission, while UAAG explains how to make technologies used to interact with the Web accessible to people with disabilities, and how this helps in making the Web accessible in general [10].

Accessible Designs – The Overlap: The relationship between Web accessibility and visual aesthetics or good design is an area of research that is still poorly understood. One work that has attempted to examine the overlap between accessibility and design is that of Regan [22]. According to him, the current state of affairs is one that can be described as

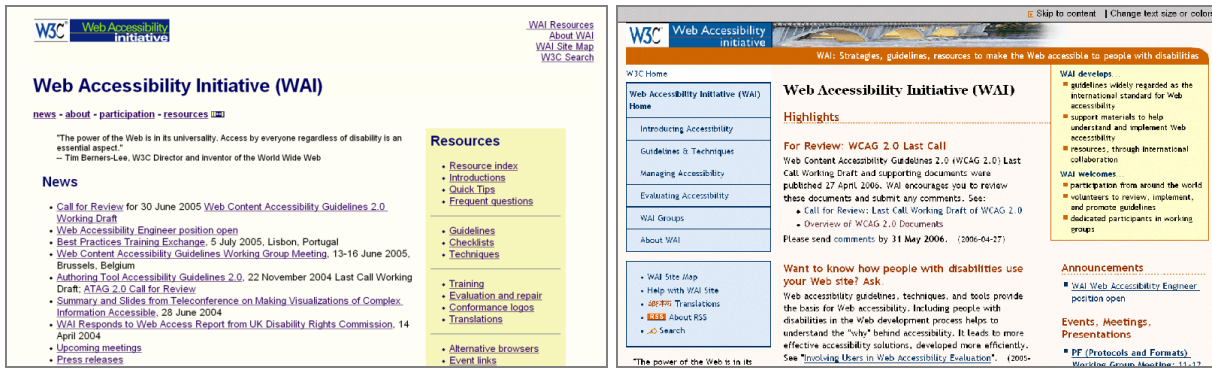
³According to the World Health Organisation (WHO), visual impairments include total blindness and partial or low vision. See <http://www.who.int/mediacentre/factsheets/fs282/en/> (Accessed 8th, January, 2009).

⁴ Web Accessibility Initiative (WAI) - <http://www.w3.org/WAI>

⁵ Section 508 - <http://www.section508.gov/>

⁶ World Wide Web Consortium (W3C) - <http://www.w3.org/>

“a failure of the imagination”. Accessible Websites have poor visual designs [22]. Henry [10] points out that, theoretically, the myth associated with this issue is false. However, she acknowledges that how to achieve aesthetic accessible designs in practice is still a problem. She further states that the lack of resources such as skills and money on the part of Web developers, and inaccessible Web tools and technologies are responsible for this. To set a good example, Henry led a redesign of the Web Accessibility Initiative Website [10]. Figure 1 shows screenshots of the homepage visual design before and after redesign in 2005. She acknowledges that the new and current design in Figure 1 (b) may not be an epitome of visual beauty because of limited resources, but it represents a demonstration of the fact that visual aesthetics and accessibility can be compatible [10]. One question that needs to be asked, however, is whether the designs we classify as beautiful are truly visually pleasing. One Web user may prefer the new homepage design over the old because of more use of colour and graphics. Another person may prefer the old design for its simplicity. Although we may not be able to design for every taste or satisfy subjectivity as Frohlich [6] points out, there is a need to have an understanding of what visually pleasing designs are, or at least an approximation with the help of models of Web users' aesthetic perception. Such designs may then be investigated for compatibility with accessibility.



(a) Before

(b) After

Figure 1: A New Look for the Web Accessibility Initiative Homepage [10]

Formative Study

We have been able to examine the accessibility level of thirty Web pages that had been previously rated on various aspects of their visual appearance in a study by Michailidou et al. [20]. The visual aesthetic terms that were considered in their study were “clean”, “clear”, “organised”, “beautiful”, and “interesting”. They were chosen from a pool of visual aesthetic terms commonly used in Web research (see [17]). The same visual aesthetic terms were investigated in our study. The aim of our study was to examine the relationship between visual aesthetics and Web accessibility from a technical perspective.

Materials

The Web pages used for our experiment were taken from [20], and had originally been selected from Alexa⁷ UK Top 100 Websites as of 18th December, 2007 when their study was first conducted. The Web pages were representative of common genres available online such as entertainment, news, e-commerce, personal, academic and social-networking Websites. The ratings for the visual aesthetics of the Web pages were obtained from an on-line study where 55 participants ranked the thirty pages in a counter-balanced manner

according to the five visual aesthetic characteristics mentioned earlier (see [20] for more details).

Method

The thirty Web pages were examined against WCAG 1.0 which was the stable version of WCAG available at the time our study was conducted. The number of guidelines failed by the individual Web pages was noted. We were interested in the number of guidelines failed, rather than the checkpoints. If at least one checkpoint was violated under a guideline, then that was counted as one failure for the associated Web page irrespective of the number of checkpoints failed under such a guideline. The automatic accessibility evaluation tool used was Cynthia Says. We chose Cynthia Says because it is a free Web-based tool that presents accessibility evaluation results in a clear manner. The Web pages were tested for all three WCAG 1.0 conformance levels: "A", "AA", and "AAA". An automatic accessibility evaluation method was chosen because of the nature of our study, which was formative. Although this method is presently less reliable than manual accessibility evaluation methods, it is important to note that automatic validation and evaluation tools like the one used in our study still play a significant role in helping Web developers identify potential accessibility bugs [13]. In addition, these tools are often the first port of call for Web developers who wish to evaluate their products against stipulated standards.

Results and Discussion

Significant inverse relationships were observed between "clean", "clear", and "organised" visual aesthetic attributes, and the WCAG 1.0 failures of the Web pages for all three conformance levels. However, "beautiful", and "interesting" showed no significant relationships. So, Web pages that were perceived to be visually "clean", "clear", and "organised" had lesser numbers of WCAG 1.0 A, AA and AAA failures, suggesting that visually pleasing pages in this context may be more readily accessible than their visually displeasing counterparts. However, further studies involving users with visual impairments are required on this issue. Figure 2 shows the relationship between visual aesthetics and WCAG 1.0 AAA failures.

The visual aesthetic terms "beautiful" and "interesting" appeared to be the most subjective of the five terms examined in [20]. We speculate that this subjectivity may have influenced our results. In addition, the word "interesting" is ambiguous and may not be directly related to a Web page's visual appearance. A careful look at the rankings done in [20] reveals that some of the Web pages which were agreed to be visually "cluttered", "confusing" and "disorganised" across participants by virtue of the low visual aesthetic scores given to such pages, received high ratings for being "interesting", and therefore 'visually pleasing'. In our case, such pages were found to have high numbers of WCAG 1.0 failures. Consequently, the term "interesting" exhibited a random behaviour when its relationship with the number of guidelines failed by the Web pages was examined. The same explanation holds for the term "beautiful". However, ratings of beauty were less subjective than those of interestingness in their study and this effect came across in our results also. For more information, please see the associated technical report [18].

⁷Alexa - <http://www.alexa.com>

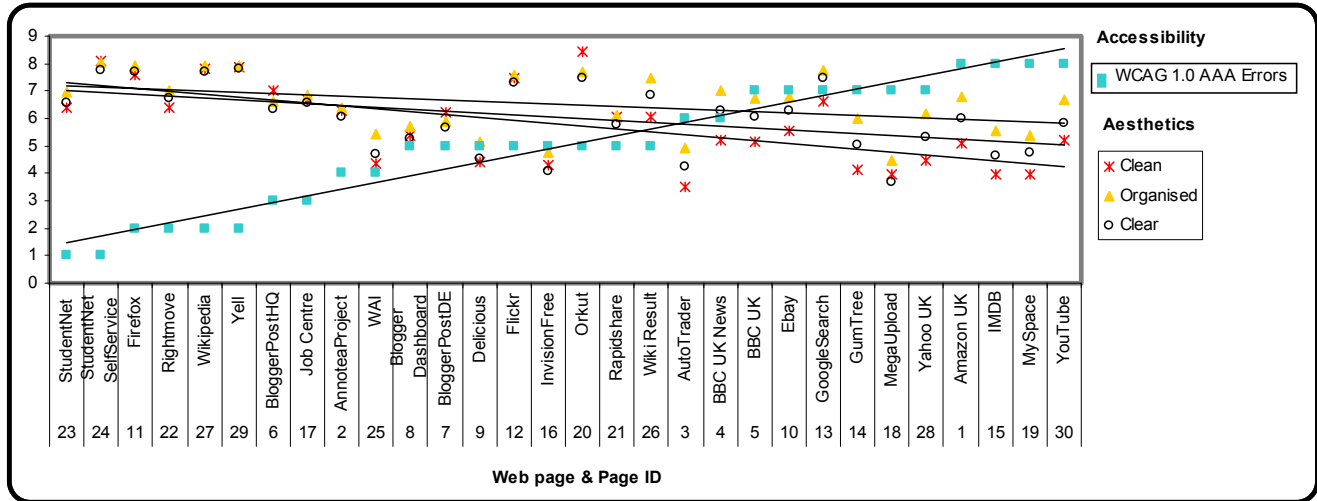


Figure 2: Visual Aesthetics versus WCAG 1.0 AAA Failures

Future Research Plan

In general, we speculate that there may be several factors responsible for the relationships that have emerged from this initial study. For example, it is not clear whether a Web developer's technical background may have influenced the observed relationships, as this was not taken into account. We speculate that experienced Web developers more readily incorporate accessibility into their designs compared to amateurs, leading to good visual designs that may have few or no accessibility issues. Consequently, we will investigate the effect of a Web developer's technical expertise and accessibility awareness. It is envisioned that our findings will help Web accessibility regulators tailor Web access equality awareness programmes, and recommendations to the appropriate target groups.

Aesthetic Perception

Further investigations on the ambiguity of the adjectives used to describe Web visual aesthetics in our research will be carried out. In particular, participants' understanding of the visual aesthetic terms used in our future studies, and the consistency of the visual aesthetic judgments made, will be investigated via extensive terminology surveys and user studies. Since the aesthetic perceptions of Web users remain difficult to understand completely, alternative evidence gathering methodologies are desirable. Consequently, eye tracking techniques will be used to understand if sighted users have a way of interacting with Web pages that are visually appealing as opposed to unappealing ones. We are also interested in expert versus novice ratings of Web visual aesthetics. As such, the visual aesthetic judgments of professional Web developers will be investigated against those of novice developers and users in general. Also, the cultural factors that come into play during visual aesthetic evaluations will be factored into our studies [15, 28]. Based on our findings, a holistic model of Web visual aesthetics will be built.

Accessibility Evaluation

The accessibility component of our work will require that Web pages that have been identified as visually pleasing by Web users and developers from our previous studies on aesthetic perception, be investigated for accessibility conformance using different

approaches. Some of the methods that will be used include technical evaluation: involving the use of various automatic tools; user studies: involving people with a wide range of visual impairments; Hybrid methods: involving accessibility experts and the use of automatic tools [3] and expert agreement: based on accessibility ratings from a group of experts [2].

Based on our studies on visual aesthetic perception and Web accessibility, a support framework for Web developers will be built. It is envisioned that this will help guide the development of aesthetic accessible designs. Figure 3 gives an overview of the EIVAA research project. It highlights the two major components of our research: aesthetic perception and accessibility evaluation studies, the methods that will be employed in each case and our expected outcome. For more information please visit our Website <http://hcw.cs.manchester.ac.uk/>

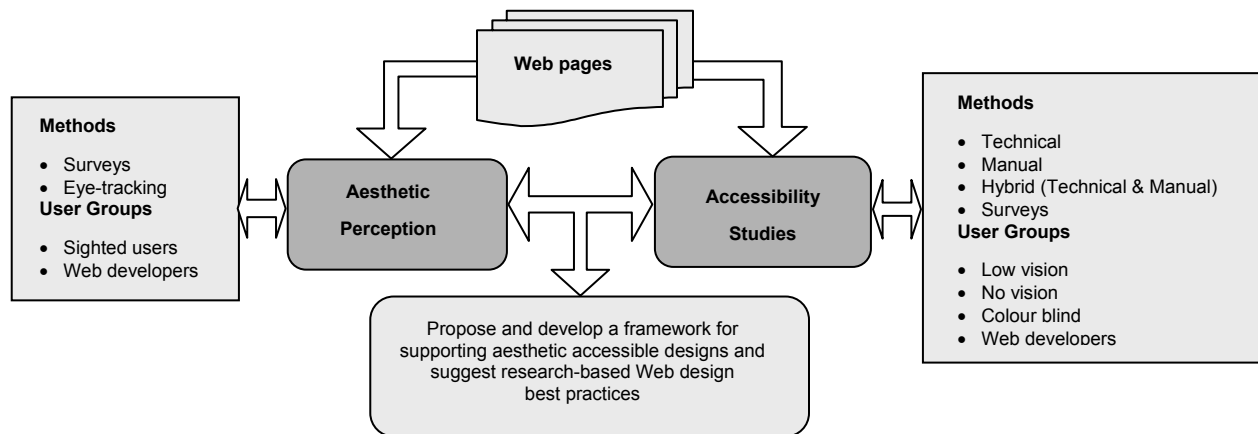


Figure 3: An Overview of the EIVAA Research Project

Conclusion

The EIVAA project seeks to expand the knowledge of the interactions that exist between two important Web constructs: visual aesthetics and Web accessibility. The goal is to build a framework that guides the development of aesthetic accessible Web content. We envision that our findings will be useful to Web developers, interactive system developers, and the accessibility community, who are all currently faced with the challenge of reconciling these two Web constructs.

Acknowledgements

The author would like to thank the anonymous reviewers, faculty members, and participants at the Doctoral Consortium for their useful feedback. She will also like to thank her Supervisor, Dr. Simon Harper for leading her into an interesting area of research. This work is supported by the Akwa-Ibom State University of Technology, Nigeria, West Africa.

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