The Impact of Emerging Website Design Features

Xiaosong Li
Computer Science Practice Pathway
Unitec Institute of Technology
Auckland, New Zealand

Jahanzaib Ali Chishti
Department of Electrical and Computer Engineering
University of Auckland
Auckland, New Zealand

Abstract— **The emerging design features emphasize the uniqueness of a website. While they may convey the key spirit of a website to the audience effectively, there are other considerations. What are the motivations behind these emerging design features? How could they influence the websites' behaviors, such as the website usability and accessibility, and how could they be used properly? What are their future? This paper presents a pilot study to explore these issues by analyzing 60 selected websites from three categories (bank, library and school) in correspondence with the selected new features. 7 website design features were selected from [6] to investigate the changes on the usage of the design features from 2013 to 2017. Website loading time and accessibility were tested. The results suggested that the motivations behind these emerging design features include: highlighting the key contents of a website; making a website stand out from the rest; and benefitting from the latest technologies. The emerging website design features improve the website accessibility in most of the cases, and sometimes they improve the website usability. To make the website look special, some conventional features might be less adopted. The design features that can improve the interactivity of a website have gain a lot more attention in last four years. Contacting with the audience of a website is payed much more attention now. Whether a design feature is proper for a particular website depends on the nature of the website. The results of this pilot study could be used as the reference for website designers and developers and also could be used as the start points or the hypotheses for future research. The research limitations and the future work have been discussed.**

Keywords-component; Emerging website design features; influence; accessibility; performance

I. INTRODUCTION

The research work of [1] demonstrated that website design is a moving target and website designs became increasingly graphical in nature, reliant on browser scripts, and less consistent.

Many new website design features have been introduced in the recent years. Some of them were identified as the website design trends for 2017. While they may convey the key spirit of the website to the audience effectively, and some of them may subtly improve the user experience [5], there are other considerations. Many of the features are relevant to color, typography and geometric shapes in the website design. Some of them are not compliant with the traditional website design standards or conventions, for example, an appearance of chaos and diversity, using ***Serif*** typefaces and etc. Not all the new features are necessarily good features and should be implemented [6].

The most glaring deficiency of the website design practices studied by [1] was their inadequate accessibility. Some of the practices such as tables, and browser scripts could impede accessibility and usability, which need to undergo either initial or further empirical studies [1]. What are the motivations behind the emerging website design features? How could they influence the websites' behaviors, such as the website usability and accessibility, and how could they be used properly? What are their future? An understanding of these questions and a clear indication of the usefulness and acceptance of new features would benefit the continuing evolution of web page standards. This paper presents a pilot study to explore these issues aiming to provide references for web designers and developers on applying these emerging features and to develop starting points or hypotheses for next step research.

60 websites were tested and analyzed. The websites were selected from three categories (bank, library and school) as the research dataset, which includes 13 bank websites, 17 library websites and 30 school websites. 6 emerging website design features based on the studies of [2-5] were selected for testing and analysis. The method used is similar to [6 and 7], where the results were broken into groups to analyze features. Each website was checked against the 6 emerging website design features. The page loading time and accessibility of each website were tested. The results were grouped and analyzed based on the website categories and whether the websites have or not have a particular design feature. 7 website design features were selected from those listed in [6], to investigate the changes on the usage of the website design features from 2013 to 2017.

In the rest of this paper, the methods used in this study is briefed first, an overview of the studies and the practices on the emerging website design features is provided, the selected website design features to be studied are described then, the data, testing and the results are presented and discussed after that, that is followed by a summary and future work.

II. METHODS

A mixed method of combining qualitative and quantitative approaches was used in this pilot study. The motivations of using the emerging design features were identified by qualitatively analyzing existing studies and current practices. 6 emerging website design features were selected for testing. An emerging design feature on a testing website was identified by observation. Quantitative data were collected by using testing tools, the data then were analyzed qualitatively.

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Totally 60 websites were selected as the testing dataset. To make the testing environment as consistent as possible, all the websites were selected from .nz domain. To compare the websites' behaviors for different types of websites, three categories from .nz domain were selected: 13 bank websites (bank + .nz); 17 library websites (library + .nz); and 30 school websites (.school.nz).

Only the design features on the website home pages were checked. The home page is typically visited more than any other page and should get extra attention when being designed [12]. According to Chapter 5 of [13], the most other web pages get much less traffic that the home pages. Most websites are organized in a multitier hierarchy from home pages to the other pages. Home pages have website primary elements [13, Chapter 6]. Therefore, the testing results of the home pages should be meaningful and can be used as references in the future studies.

Due to the time limits and other conditions, only a few measurements were obtained from the testing. For usability, website ***loading time*** were tested by using Google Chrome. Other tools [14,15] were also considered to test website performance, however, due to certain issues, their data were not included in this report. WebAIM [16] was used to test website accessibility, for each website, three testing results were collected: ***Styles Errors***, ***Alerts*** and ***Contrast Errors***.

The behaviors of the websites with a particular new feature or without the feature were compared. Other 7 website design features were selected from those listed in [6] to investigate the changes of the design features usage from 2013 to 2017.

III. Emerging Website DEsign Features

This section provides a general understanding of the studies and the practices on the emerging website design features. As these are the new features, most literature used in this section are online magazines or blogs.

There have been studies that explore the website user interface design features. This include Jones and DeGrow's work in 2011 [7], they examined the homepages of the Fortune 500 using an extensive list of design elements derived from prior research for researchers to study the history and evolution of web design. Wridgway [6] continued the similar study in 2013, where 10 features were identified. Some of the features studied were not really new features, however, they gained more attention recently due to the motivations discussed below, for example, animations are included in this study as well.

In 2016 and 2017, many studies were conducted for emerging website design features [2-5]. 10 emerging design features were identified in [2]; 16 design features were identified in [3]; 5 emerging design features were identified in [4]; and 5 emerging design features were identified in [5].

The motivations behind these emerging website design features were discussed from various studies. In 2017, websites are likely to start moving back to basics and placing more emphasis on key content [2]. Website owners aren't focusing anymore on providing the most detailed information to their visitors, but are instead choosing to convey their message in the most efficient and immediate way possible [4]. Fig. 1 shows a home page with repeated pattern of oval shape to highlight the key contents of the website.

Figure 1. The home page of www.waipalibraries.org.nz

Fig. 2 shows a portion of a high school website home page (http://www.westlake.school.nz/), where large text font is used to accentuate important point: begin your Westlake journey here. Apparently, the point is conveyed to the audience effectively. Based on the above discussions, highlighting the key contents of a website is one of the main reasons for the new features.

Figure 2. An example of large text font usage

Modern projects make a strong, lasting impression on users [3]. Imaginative or creative headings is a welcome way to be unique in the design [2]. Fig. 1 also shows curved lines and lines drawn at an angle, which make the home page special and can be distinguished from other websites easily. Fig. 3 shows an example of using duotone (http://wcl.govt.nz/), where an image printed with multiple (two) tones or inks. It is created using the superimposition of one contrasting color over another (the blue background image). This is helpful to emphasize the uniqueness of the website as well. Based on these discussions, making a website stand out from the rest is another main reason for the new features.

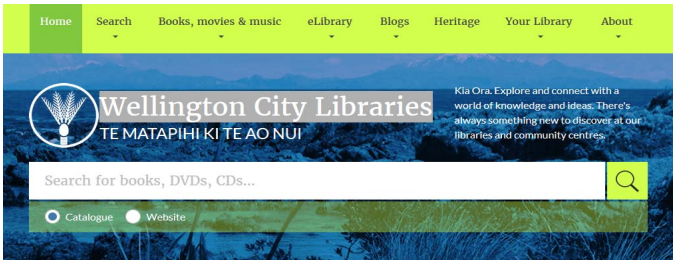

Figure 3. An example of using duotone

The rapid evolution of standards, technologies and tools for creating websites, in particular the development of client side techniques such as JavaScript packages and powerful new CSS advancements and libraries such as Bootstrap, provide more opportunities for website user interface design. Features hardly to achieve in the past can be achieved now. With the arrival of the new technologies [8], we will need to challenge presumptions about what can be achieved and can be achieved efficiently for our website design. In order to get the most out of these new possibilities, we need to challenge our assumptions about content order in our wireframes [8]. Fig. 4 shows the home page of a bank website (https://www.rabobank.co.nz/), which focuses on a ***Bootstrap*** grid pattern, where controls and containers are set out on the page using a grid like arrangement. Benefitting from the latest technologies is another motivation for the emerging design features.

Figure 4. An example of a website employing the latest technologies

It was argued that interface aesthetics may play a greater role in people's attitudes towards computerized systems [9], which was supported by the later research demonstrating that design aesthetics may be helpful in achieving the business objectives [10 and 11]. The visual design aesthetics did significantly influence the usefulness, ease of use, and enjoyment, which ultimately influenced users' loyalty [10]. Applying aesthetic standards can ultimately improve how students react to and interact with those courses. Users also draw on aesthetic factors to judge usability and credibility [11]. Based on these, aesthetic should be part of the consideration for the new design features. However, aesthetics seemed to not be considered with high priority in the development of the emerging website design features. They try to avoid a set of design aesthetics that everyone applies, as they make websites look similar [2].

IV. Selected Emerging Design Features

Many emerging website design trends and features were identified and discussed in [2-5]. Some of them are common from a few studies. For this pilot study, we tried to select most common, non-ambiguous, objective and easy to identify features for testing. The following six features were selected and their codes are given in the brackets (the codes were defined for presentation and discussion purposes):

- Geometric shapes, lines, and patterns (***Geometric Shapes***).
- Duotone gradient imagery (***Duotone***).
- Use of animations and GIFs (***Animations***)
- Grid pattern (***Grid***)
- Large typography as part of the key visual (***Large Typography***)
- Think outside the box with 3D geometric shapes (***3D***)

Wridgway [6] investigated Fortune 500 Company Home pages in 2013 and identified 10 design features. The percentages of the usage of each feature were calculated and presented. To understand the changes between 2013 and 2017, 7 of the features were examined in this study. The following are the descriptions and their usage percentages of the 7 features listed in [6] (the codes given in the brackets were defined for presentation and discussion purposes of this study):

- ***93%*** of Fortune 500 companies had Logo in Top Left Corner (***Logo***)
- ***47%*** of websites have a clear call to action button on their homepage that takes users 3 seconds or less to find (***Clear call***)
- ***60%*** of Companies feature latest News and Blog Posts on their homepage (***News + Blog***)
- Contact Information was hard to find on ***63%*** of Fortune 500 Companies (***Contac***t)
- Average loading time of homepage is ***6.5 seconds*** and size of Homepage is 766 Kb.
- ***80%*** of websites use primarily a light background and color scheme (***Light Background***)
- ***63%*** of websites use high-quality images on their homepage to connect with users (***HQ Images***)

V. Testing Data and Results

A. The Six Emerging Design Features

The objectives of this study is to obtain an understanding for using new website design features. This is started from analyzing the impact of the emerging website design features

on the website's usability and accessibility. However, due to the time limits and other conditions, only a few measurements were obtained in the testing. The website loading times were tested by using Google Chrome. Under the ***Network*** tab, with the ***Inspect*** option on, users can start to record the activity once the page has started to load. Once the page has finished loading, the ***Load Time*** is shown at the bottom of the web page in red. Other tools were also considered to test website performance. WebSitePulse [14] produces too much data to refine. Website Optimization [15] caused a few issues. For example, some websites were too large for it (does not allow data >3mb), for some it took too long time to response, for some others there was a '403 error' and etc.

WebAIM [16] was used to test website accessibility, for each website, three results were collected: ***Styles Errors***, ***Alerts*** and ***Contrast Errors***.

The website home pages were observed and the 6 selected emerging design features were identified. Fig. 5 shows the distribution of the 6 selected emerging website design features.

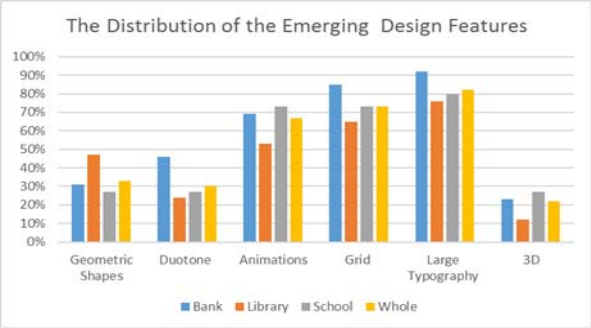

Figure 5. The distribution of the 6 selected Emerging website design features

The blue color represents the distribution within the bank dataset. For example, 92% of the bank websites use ***Large Typography*** on their home pages, which is higher than any other datasets. The orange color represents the distribution within the library dataset. For example, only 12% of the library websites use ***3D*** on their home pages, which is lower than any other dataset. The gray color represents the distribution within the school dataset. For example, around 27% of the school websites use ***3D*** on their home pages. In general, ***Animations***, ***Grid*** and ***Large Typography*** are widely used on all types of websites, where ***Animations*** was used from 53% to 72%; ***Grid*** was used from 65% to 84%; and ***Large Typography*** was used from 77% to 92%. The yellow color represents the general distribution for the whole dataset. ***Animations*** are most popular on school websites; ***Duotone*** gradient is used most in the bank websites and normal geometric shapes are most popular on library websites. This could be further interpreted as that ***Animations*** are likely popular for websites targeting young audience and ***Duotone*** is more popular for business websites.

All the websites were then split into two groups for each Emerging design feature: the group with the feature and the group without the feature. Table 1 shows the website numbers after the splitting. Each website in the group defined in Table 1 was tested for four measurements: page loading time; style errors, alerts and contrast errors. The results then were averaged within each group. Fig. 6 shows the results.

Fig. 6 shows that ***Geometric Shapes*** reduced the page loading time from an average of 6.7 seconds to an average of 4.4 seconds. ***Duotone*** reduced style errors from an average of 16.4 to an average of 7.6; reduced alerts from an average of 27.8 to an average of 15.8; increased contrast errors from an average of 17.8 to an average of 23.3. ***Grid*** and ***Large Typography*** increased the page loading time from an average of 4.29 and 3.57 seconds to an average 6.53 and 6.46 seconds. ***3D*** improved the websites performance and all three accessibility measurements. These suggested that the emerging website design features do influence the website performance and accessibility. In most of the cases, they improve the website accessibility and sometimes they improve the website usability.

TABLE I. THE DETAIL WEBSITE NUMBERS FOR EACH GROUP

Features	***With***	***Without***
Geometric Shapes	20	40
Duotone	18	42
Animations	40	20
Grid	44	16
Large Typography	49	11
3D	13	47

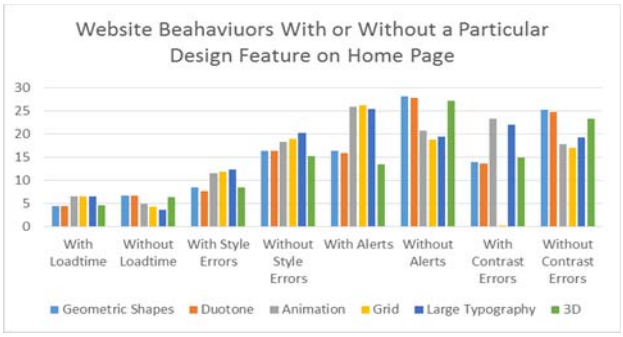

Figure 6. The website behaviours with or without a particular Emerging design feature on their home pages

Animations and ***Large Typography*** increased the contrast errors; all the other features significantly reduced the contrast errors. ***Animations***, ***Grid*** and ***Large Typography*** increased the number of alerts; all the other features significantly reduced the number of alerts. All the features greatly reduced the style errors. In most of the cases, they improve the website accessibility. ***Animations***, ***Grid*** and ***Large Typography*** increased the load time, all the other features reduced the load time. Fig. 5 shows that ***Geometric Shapes***, ***Duotone*** and ***3D*** are less popular features, however, they performed positively on all the four testing measurements. The lower popularity could be due to that they are the new features introduced recently. We could expect that they will get more popular in the near future. ***Animations*** and ***Large Typography*** performed

negatively on three testing measurements with style errors as an exception. Fig.5 shows that ***Animations*** is less popular than ***Large Typography***, with around 15% lower. We expect that ***Animations*** may get lesser popular in the near future, so ***Animations*** should be used cautiously. This is consistent with conventional guidelines regarding animations. According to Chapter 12 of [13], animations may detract users' attention from the main content of web pages and should only be used when they are relevant to your message.

B. Changes from 2013 to 2017

To investigate the changes of the usage of the design features from 2013 to 2017. Selected features from [6] were studied, as [6] provided the usage information of these features in 2013, which can be used for comparison. 7 website design features were selected from those listed in [6]. The home pages of the websites from the testing dataset were observed and the 7 selected design features were identified. Fig. 7 shows the distribution of 6 features except for the loading time, it demonstrates the distribution for the whole dataset as well as each sub-dataset (bank, library and school). The numbers from 2013 listed in Section IV were compared with the numbers in Fig. 7.

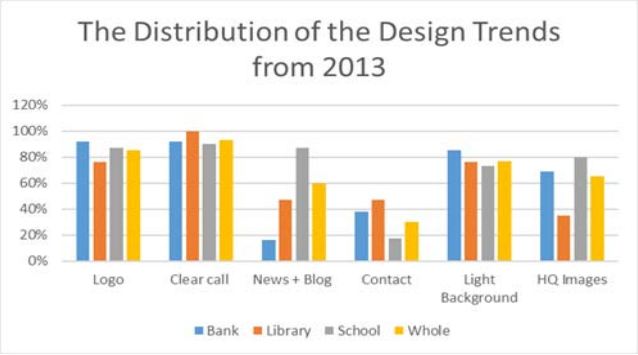

Figure 7. The distribution of the design features obtained from 2013

Comparing the data from 2013, where ***93%*** of Fortune 500 companies had logo in top left corner, the percentage is reduced, now only around ***83%*** of the websites studied have the logo in top left corner. The usage of this feature has been dropped by ***10%*** in four years. This feature is conventional, which suggested that to make the website look special, some conventional features might be less used. Above ***90%*** of the websites studied have a clear call to action button on their home pages, this is significantly increased from the ***47%*** from 2013. Action buttons could improve the interactivity of a website. This could be further interpreted as that the design features that can improve the interactivity of a website have gained a lot more attention in last four years. ***60%*** of the websites studied feature the latest ***News and Blog Posts*** on their home pages, the percentage is the same as the data from 2013. However, only 16% of bank websites feature the latest ***News and Blog Posts*** on their home pages, which is much lower than the percentage of all the websites (60%). On the other side, 87% school websites feature the latest ***News and Blog Posts*** on their home pages. Apparently, ***News and Blog Posts*** are much more popular on school websites than bank websites. The percentage of ***hard to find contact information*** is ***30%*** for whole websites, which is much lower than the ***60%*** from 2013, this suggested that contacting with the audience of a website is payed much more attention now. ***77%*** websites use primarily a light background, which is consistent with the ***80%*** from 2013 and remains high. In general, around ***63%*** websites use high quality images on their home page, this number is consistent with the number (***63%***) from 2013. However, only **35%** library websites use high quality images, this is much lower than ***63%***. These results demonstrated the evolution of website design features in last four years.

VI. SUMMARY AND FUTURE WORK

In summary, we have performed testing and analysis on the emerging website design features in this pilot study.

The motivations behind these emerging website design features mainly include:

- Highlighting the key contents of a website.
- Making a website stand out from the rest.
- Benefitting from the latest technologies.

The results suggested that the emerging website design features improve the website accessibility in most of the cases, and sometimes they improve the website usability. The findings from the website design features of 2017:

- ***Animations***, ***Grid*** and ***Large Typography*** are widely used on all types of websites.
- ***Geometric Shapes***, ***Duotone*** and ***3D*** are less popular features, however, they performed positively on all four usability and accessibility measurements used in this study. The lower popularity could be due to that they are the new features introduced recently. We could expect that they will get more popular in the near future.

Comparing the website design features between 2013 and 2017, the following conclusions were obtained:

- To make the website look special, some conventional features might be less adopted.
- The design features that can improve the interactivity of a website have gain a lot more attention in last four years.
- Contacting with the audience of a website is payed much more attention now.

Whether a design feature is proper for a particular website depends on the nature of the website. For example, animations are likely popular for children's websites and duotone is more popular for business websites. The results also suggested that the emerging website design features are improving the design quality in general:

- ***Animations*** are likely popular for websites targeting young audience and ***Duotone*** is more popular for business websites.

- ***Animations*** may get lesser popular in the near future, so ***Animations*** should be used cautiously.
- ***News and Blog Posts*** are much more popular on school websites than bank websites.

60 sample websites limited the strict statistical analysis on the testing results. The website design features were identified by subjective observation during the data collection. This limited the number of the design features studied and weakened the accuracy of the data. More measurements should be sought for further study. Futhermore, the websites from 2013 and 2017 are from different domains, this may limit the value of the comparison results. Despite these limitations, the testing and analysis reported in this paper should provide meaningful information for understanding of emerging website design features which can be used as references in future study.

The results of this pilot study could be used as the reference for website designers and developers and also could be used as the start points, or the hypotheses for future work. A similar approach could be used to study a new website design feature in the future. How a new design feature is related to the website aesthetics could be included. To make the results more objective and more reliable, more measurements could be included in the testing. Atomizing the feature extraction process is important. This can avoid errors and improve the efficiency. A user subject test could be employed to get a more complete picture of the emerging website design features.

REFERENCES

[1] M. Y. Ivory and R. Megraw, "Evolution of web site design patterns," ACM Transactions on Information Systems (TOIS) 23, no. 4, 2005, 463-497.

[2] A. L. Turner, "Web design trends we can expect to see in 2017," Design & Dev, 2017, https://thenextweb.com/dd/2016/12/22/web-design-trends-can-expect-see-2017/#.tnw_7LigFHgc Last accessed 15/8/2017.

[3] Merixstudio, "Web Design Trends for 2017," Magazine for designers and web developers, 2017, https://www.awwwards.com/web-design-trends-for-2017.html Last accessed 15/8/2017.

[4] WixBlog, "The Hottest Web Design Trends You Should Know In 2017," 2017, https://www.wix.com/blog/2016/11/the-hottest-web-design-trends-you-should-know-in-2017/ Last accessed 15/8/2017.

[5] G. Gosha, "5 CurrentTrends to Amp-up Your Web Designs in 2017," 2017, https://www.sitepoint.com/5-emerging-trends-to-amp-up-your-web-designs-in-2017/.

[6] G. Wridgway, "Web Design Trends – Fortune 500 Company Homepages," Nova Marketing Intelligence, 2017, http://novamarin.co.za/web-design-trends-fortune-500/ Last accessed 15/8/2017.

[7] S. L. Jones and D. DeGrow, "Fortune 500 homepages: design features," IEEE transactions on Professional Communication, 54(1), 2011, 13 pages.

[8] M. Keogh, "Why we need to challenge our design tools & assumptions," 2017, https://www.liquidlight.co.uk/blog/article/why-we-need-to-challenge-our-design-tools-assumptions/ Last accessed 15/8/2017.

[9] N. Tractinsky, "Aesthetics and apparent usability: empirically assessing cultural and methodological issues," In Proceedings of the ACM SIGCHI Conference on Human factors in computing systems, pp. 115-122. ACM, 1997.

[10] D. Cyr, M. Head, and A. Ivanov, "Design aesthetics leading to m-loyalty in mobile commerce," Information & Management 43, no. 8 (2006), 2006, 950-963.

[11] A. Sonderegger and J. Sauer, "The influence of design aesthetics in usability testing: Effects on user performance and perceived usability," Applied ergonomics 41, no. 3, 2010, 403-410.

[12] J. Nielsen and H. Loranger, "Prioritizing Web Usability. Pearson Education," Berkeley, CA: New Riders, 2006.

[13] P. J. Lynch and S. Horton, Web Style Guide, chapter 5, 6 and 12, Yale University Press, New Haven, 2009.

[14] WebSitePulse, "Test Tools (Web Page Test)," https://www.websitepulse.com/help/testtools.web-page-test.html.

[15] Website Optimization, "Web Page Analyzer," http://www.websiteoptimization.com/services/analyze/

[16] WebAIM, "WAVE (Web Accessibility Evaluation Tool)," http://wave.webaim.org/.