COLORS IN HUMAN INTERACTION FOR DIFFERENT CATEGORICAL WEBSITES

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ABSTRACT: *The websites are interconnected in globally to distributing the products &services and millions of people have been interconnected them too. The success of any websites is affected by how many users have been interact with the system.User interface of websites should be more comfortable to gain a better human interaction. User interaction is a psychological thing that focus on the design of computer technology.This study was done mapping study to identify the research gap. Visual design elements,especially colors are the key factors that can make higher human interaction.Selecting suitable visual design elements with colors and allocating them attractively, is much of difficult to manage. Because the same procedures or concepts of user interface design are not applicable for every categorical website.Most of the time, selecting particular colors foruser interface design depends on the knowledge of user interface designer and requirements.Managing color combinations to user interface design according to the different category of websites is difficult to handle. In this study there were two ways used as for the first, quantitative method for gaining the data from the users regarding the website impression and colorsthroughout the ten selected websites categories and as for the second,investigating the color involvement as overall, partitions of the homepage, text and button was done by using three hundred websites.This study found certain color combination for the website categories, partitions of the homepage, text and button along with their background. User behaviours during the time it spend on the homepage, were differently happened in the partitions of the homepage.Attractiveness, perspicuity and stimulation impressions were differently depended on the environment of the color in human interaction throughout website categories. This study defined the relationship with the impression and the certain color combinations to the website categories.Furthermore, if there is the way to use qualitative method to get this kind of data that would be more valuable for this study.*

Keywords: human interaction, color, impression, websites, visual design

1. INTRODUCTION

1.1 Background

The Web is enabling global distribution of products and services through Internet websites as mainly. And in the age of computers, all systems will be transferred to an automated system for saving the time and effort and Increasing the performance of each productivity of any business (Andlib et al., 2014).The website is an integrated collection of many local web elements or is distributed on geographically dispersed computers(Khatkar, V., 2011).User Interface (UI) Design focuses on anticipating what users might need to do and ensuring that the interface has elements that are easy to access, understand, and use to facilitate those actions. It is existing with software, visual design and content and it should be simple and easily accessible to a proper and good interface. Even professional analysts believe that well-designed user interface can be improved performance and more essential to help customers (Marcus et al., 2000). Human-Computer Interaction (HCI) is a field of study focusing on the design of computer technology and, in particular, the interaction between humans (the users) and computers. Maintaining a better user interface is more

reasonable for gaining a better user interaction. Therefore, the color should be also a main fact to create better human interaction. In building a successful website it is imperative that the design matches the organization's objectives, which should be well defined. Clearly, different types of websites will have different goals. Developing a web interface design for different types of websites should be clearly different with them according to their aims and objectives. In this study finding a solution about the relations between colors and impression in human interaction of selected limited different categorical websites.

1.2 Motivation

In the field of web user interface is very important area to gain a better success in any business under the website domain. Most of the time web user interface designing is happened with client's requirements and the aims and objectives of the websites (Usekiet al., 2003). the web user interface designer's sensibility, experience and knowledge are highly affected to the UI, specially selecting the colors. Many studies have been mentioned that different types of websites' user interface design have differently developed considering the requirements and the environment of website type.Entertainment domain websites on visual design, multimedia and site responsiveness highly demanded than other domains websites such as financial, e-commerce etc.(Zhang et al., 2014). There is a specific target audience that has been focused to gain goals of every websites(Papachristos et al., 2011).Because of that in the development of web user interface design should be careful regarding the target audience also.The men and women are differently attracted to color of the interface design and differently impress with them and as well as according to different ages of people as children, youngers and adults are differently(Sarah et al., 2008, Bilal et al., 2002, Large et al., 2005)

1.3Research significance and objectives

There is a color combination, that which has been developed by using 12 most emotional descriptive terms such as formal, fresh, friendly, attractive etc. and dominant and secondary colors by using a single website (Papachristos et al., 2011). There is fewer descriptions that described some specific colors with the emotional impression for different category of websites. Therefore, the main objective of this study is to find what the colors are suitable to apply different kind of website categories and how they can be mapped emotions of impressions in human interaction for the user interface through different selected 10 categories of websites and also need to find the areas of the homepage that involve to user attention. Throughout this research above mentioned things that can be actually achieved in correct way. Knowing what the common colors and specific colors has been used and should be used by user's information, Knowing how color should be balanced to achieve higher

human interaction, Client have a brief idea about how interface should be filled with the correct colors for getting better human interaction with the environment of the websites category and also UI engineers and UI designers have a better knowledge about how to manage particular colors inside the circle which enhance the human interaction maximized.

1.4 Research Problem and questions

UI designers are facing a tough problem regarding the selection of color whether that can be gain higher human interaction according to the environment of particular website even there are specific color management guidelines available. They can use very attractive color combinations for any websites but they don't have any idea about all of those colors are being suitable for every category of websites. And also, they have no idea about where the positions of the homepage that impress by the usersand how colors should be balance there too. Following questions are studying throughout this study.

2. RESEARCH METHODOLOGY

The areas under the impression and colors have been evaluated in this study by using online questionnaire and Hotjar, Image Color Summarizer, TinEye, CheckMyColours those are online tools which are provided data belong to the color. The area under impression is belong to the human interaction and using a questionnaire is the best way to measure psychological view of peoples (Bakker et al., 2013). In the initial step of the process, this study used SimilarWeb to find top ranked websites per a website category out of ten websites categories and those categories has been defined clearly by giving their subcategories.Arts & Entertainments (AE), Autos & Vehicles (AV), Beauty & Fitness (BF), Business & Industry (BI), Food & Drink (FD), Games (G), Health (H), Shopping (S), Sports (SP) and Travel (T) are the ten website categories. AE category is included with animation & comics, architecture, awards, celebrities & entertainment news, fashion & modelling, humour, movies, music & audio, performing arts, photography, TV & video and visual arts & design likewise every category has been defined with providing certain sub categories in SimilarWeb. But in this study is not considered these sub categories except the categories. SimilarWeb is also providing global ranks of every websites as overall and separately with their categories as well. During the previous studies regarding this kind of topics, has been done based on statistics from Alexa for filtering highest ranked websites. But in this study has been used SimilarWeb website under the reasons of providing both websites global ranking and separately with the categories.There are many color extraction tools used in to extract particular websites as that has been done to measure websites in country wise (Irina et al., 2006).TinEye is an online tool that provide color extraction details for the given image. Therefore, for the first

step was taking the screenshot of all selected websites' homepages by using Nimbus Capture Chrome Extensions which is a chrome extension available on the Chrome web browser (Xiaodong, G., 2010, Punchoojit et al., 2011) and getting the overall color involvement information of websites' homepages by using TinEye website as follows; That is giving all the color details with name, hash code and the percentage of the involvement. Image Color Summarizeris an also online tool which provides color involvement information for given image. Basically, website homepage is consisted with navigation, header, content and footer which are relatively consisted with (home, about, contacts and others), (logos, images, videos, elements and others), (infographics, paragraphs and others), (about, contacts, terms of service, privacy policy and others) (Leavitt et al., 2005). Therefore here, provide screenshot images of partitions of homepage separately to Image Color Summarizer to get the color involvements separately. CheckMyColours is an also online tool which provides color involvement information for every elements of the homepage such as text, symbols, image and others. Therefore, for this study using this tool to get all the colors of texts and buttons and the background which belongs to them.Hotjar is a website which is providing functionalities regarding the user behaviours by using a tracking mechanism. This study let different kind of users randomly to use the certain websites to track their behaviours. Tracking code is automatically generated by Hotjar and should be added the code into the websites before allow user to use that. Heatmap is the section of the Hotjar which shows how user moved throughout the website, clicked and scroll down as follows,according to the results of the Heatmap, it can be identified how user moves throughout the homepage, clicking specific areas and where the places user stay little more time than others.Discovered past studies to determine the certain relationships and certain differentiates for the particular areas to cover the scope of the study and to measure how people are interacted for different websites along with their website categories.**H1**: Attractiveness impression of the websites influences on the environment of the color in the human interaction (Douneva et al., 2015, Santoso et al., 2016, Bonnardel et., 2011, Tuch et al., 2012), **H2**: Perspicuity impression of the websites influences on the environment of the color in the human interaction (Santoso et al., 2016, Douneva et al., 2015), **H3**: Stimulation impression of the websites influences on the environment of the color in the human interaction (Santoso et al., 2016,Lin et al., 2016), **H4**: Overall impression of the websites influences on the environment of the color in the human interaction (Thielsch et al., 2013), **H5**: Visual design elements of the websites influences on the environment of the color in the human interaction (Yoshinori et al., 2002, Douneva et al., 2015, Lin et al., 2016, Rosen et al., 2004).
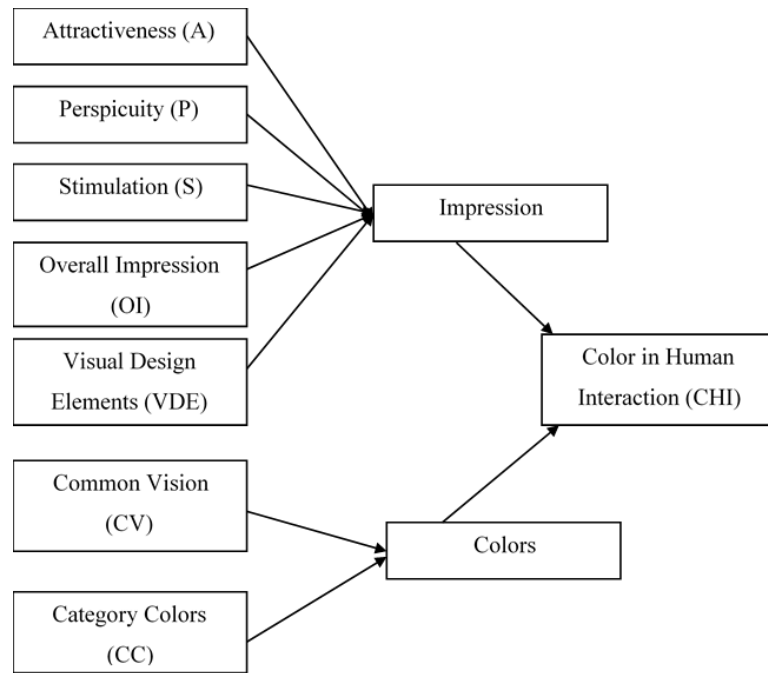
Figure 1. Questionnaire design model

Figure 1 shows that how variables and factors designed according to a model to prove the certain hypothesis and objectives.The initial experience of user is influencing their overall success with application calledImpression. The impression is a critical moment in which to gain a user's trust andconfident. Because after an interface started within few minutes the user should be ableto use it productively. The visual properties as color, texture, shape and spatialrelationship of objects are being reasons for creating an effective impression of user.

3. RESULTS AND DISCUSSIONS

3.1 Demographic Analysis

The frequency method was used to do demographic analysis in an appropriate way. Throughout 10 questionnaires of selected 10 website categories, there were 195 responses collected. According to the perspective of this study age and gender were the democratic variables used. 117 out of 195 responded by Male (60%) and 78 out of 195 responded by Female (40%). Out of 195 responses, less than 25 age people and 25-35 ages people were responded mostly as a percentage of relatively 37.9 % and 56.4%. The results have been shown that reliability and validity results of the questionnaires as Cronbach alpha values greater than 0.5 (Threshold value = 0.5) and the KMO value was 0.725 (Threshold value = 0.7).

There are weak relationships between Overall Impression (OI) and other dimensions throughout the most of the websites categories because of $r < 0.5$ and $\rho > 0.05$. OI dimension was allowed to user to gain suggestions about the user interface regarding impressions. But in the some of the categories,there are strong relationships with specific dimension following as in BI websites and Swebsites, OI has strong relationship with A, P, S and CHI relatively (r=0.556*, ρ<0.05), (r=0.819**, ρ<0.01), (r=0.890**, ρ<0.01), (r=0.864**, ρ<0.01) and (r=0.583*, ρ<0.05), (r=0.563*, ρ<0.05),

(r=0.812**, ρ<0.01) and (r=0.600*, ρ<0.05).In the rest of the websites, in G websites, OI got a strong relationship with A and P relatively (r=0.708**, ρ<0.01) and (r=0.554*, ρ<0.05) and in T websites with P, ST and CHI relatively as (r=0.619*, ρ<0.05), (r=0.559*, ρ<0.05), (r=0.603*, ρ<0.05).TheS websites has only strong significant relationship with all other variables in the study that discussed as r>0.5 and ρ<0.05 and 0.01 (Table 4.5) than other categories.

A variable as strong significant independent variable was performed in AE, AV, BF, G and S websites following values relatively as (ρ = 0.012), (ρ = 0.016), (ρ = 0.001), (ρ = 0.002) and (ρ = 0.000).Therefore, H1 was only positively (t > 0) supported in AE, AV, BF, G and S websites except in BI, H, SP and T websites. P variable as strong significant independent variable was performed only in AV and BIfollowing values relatively as (ρ = 0.029), (ρ = 0.007) except other website categories.Therefore,H2 was only positively (t>0) supported in AV and BI websites. S variable as strong significant independent variable was performed only in SP and T websitesfollowing values relatively as (ρ = 0.010), (ρ = 0.044) except others.Therefore, H3 was only positively (t>0) supported in SP and T websites.OI and VDE variables were not significant in the regression model in these website categories as their ρ values were over '0.05'. When considering all the results, the regression result for AV websites is the only one which has proven H1, H2 hypothesis.

3.2 Demographic variables color analysis

In this study for the demographic variables gender and age were considered. After getting frequency analysis results of colors 10% or above of color involvement was selected to as most.Figure2 shows that how color differentiates with gender according to in their preferences areas.

Figure 2. Results of color preferences according to the gender

Figure 3 shows that how color differentiates with age according to in their preferences areas.
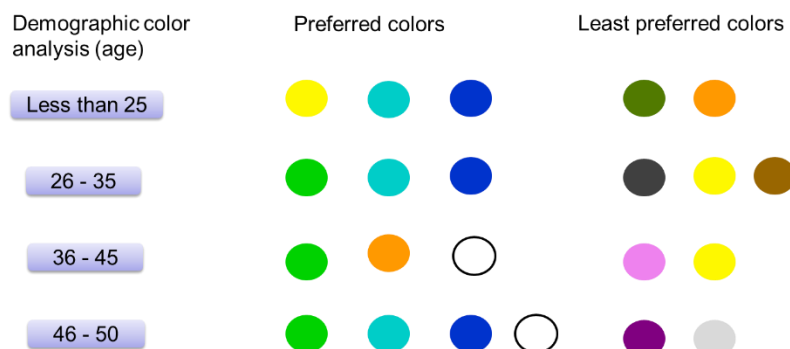

Figure 3. Results of color preferences according to the age

The users were allowed to propose colors which are suitable to apply the website categories as well as not for suitable. The results under the overall involvement by using TinEye shows that how available top ranked websites has been used colors attractively throughout the categories. By considering these results, (Figure 4) the paper could finalize the particular color combinations for each and every website category.
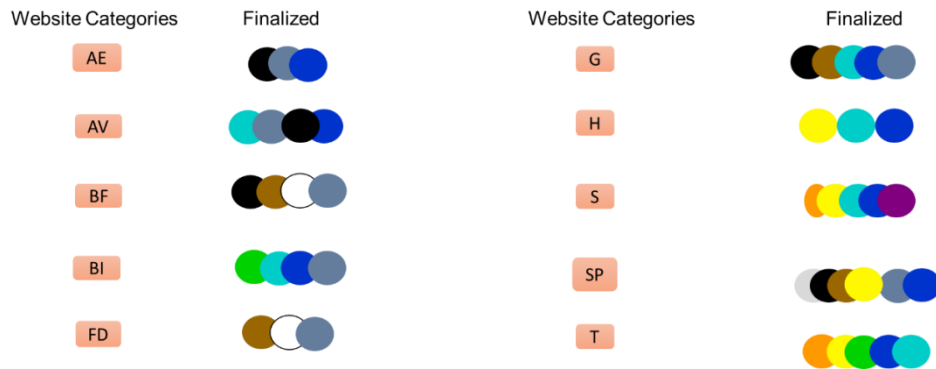

Figure 4. Finalized Color Combinations for The Website Categories

Using Image Color Summarizer, considered 4 partitions of the website homepage as navigation, header, content and footer. According to the results throughout these partitions, Light grey and White colors have been used mostly and then after Black, Blue and Dark grey colors used mostly. In the header, especially Brown color also used in the websites.Although Black color was used mostly in navigation, header and footer, the color involved to navigation (10.9%) and footer (13.0%) rather than header (7.0%). and White color was also used mostly in every partitions but in navigation (39.1%) and footer (29.7%) has taken rather than header (11.7%) and content (15.9%).Texts were used White (37.2%), Dark grey (20.9%), Black (15.6%) and Blue (12.4%) colors mostly rather than other colors and for the background of the texts, White (33.0%), Light grey (21.1%) and Blue (13.1%) colors were used mostly. Some several colors were used for the button colors as Blue (24.4%), Red (15.9%), Orange (11.6%), Green (11.0%) and Light Blue (11.0%). The colors that involved to the background of buttons are White (45.1%) and Light grey (29.3%) mostly.Therefore, White and Light grey colors have been used both backgrounds of the texts and buttons mostly.Summarizing the entire results, Figure 5 shows that how partitions of the homepage, texts, buttons and their backgrounds should be applied with colors.
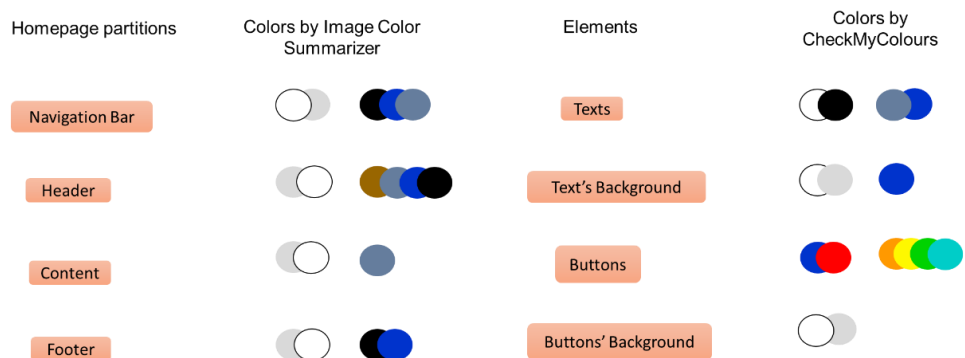

Figure 5. Color Combinations for The Partitions, Texts, Buttons and Their Backgrounds

3.3 Results of the Hotjar Heatmap

Heatmap has been stored the results separately as desktop and mobile cause the device the users used to log particular websites which were having the tracking code provided by Hotjar.According to the results(Figure 6), movements on the homepage have been recorded in the navigation area mostly and after then in the header area. In the area of content has been recorded rarely because of the button or links were available.The results of the clicking events which have been mostly highlighted relatively in navigation, header and rarely highlighted in the content because of the button was there.And also, as resulted with time duration that user was staying on the homepage, mostly stayed relatively navigation, header, content and footer.
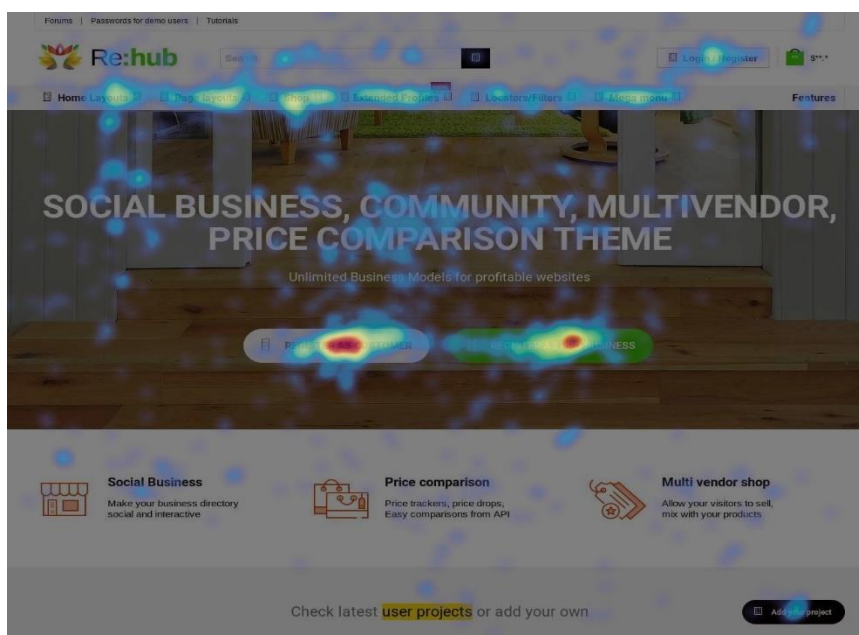

Figure 6. Results of the User Behaviors on the Homepage

4.CONCLUSION AND FUTURE WORKS

The target audience has a big scope in regarding the gender according to the requirements. Male and Female are differently preferred with the colors in any condition. Age is also the thing that belong to the target audience that is also shown the specific differences to the colors. According to the colors that were proposed by user and the colors that were used in the available websites, the paper provide certain color combinations to the website categories. Navigation, header, content and footer are partitions of the homepage of the website and those represent different colors and interaction to the user. But navigation and footer were playing kind of similar scenario in the color involvements. Most probably text color and the background that belong to it are suitable to use opposite colors to make the higher interaction to the user. The colors that belong to the button are suitable to use warm colors with light color background.The interface design is existing with software, visual design and content and it should be simple and easily accessible to a proper and good interface. Well-designed user interface can be improved performance and more essential to help customer. There are some visual design elements such as logo, symbol, color and

text. But image is playing a most effective role used to create an interactive interface as well as colors. There was color combinations of a website with emotional values.

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