ASHESI UNIVERSITY COLLEGE

HOW COLORS AFFECT WEB USABILITY

UNDERGRADUATE THESIS

B.Sc. Management Information Systems

Thesis submitted to the Department of Computer Science, Ashesi University College in partial

fulfillment of the requirements for the award of Bachelor of Science degree in Management

Information Systems

Delali Ama Fiakpui

April 2016

ASHESI UNIVERSITY COLLEGE

HOW COLORS AFFECT WEB USABILITY

UNDERGRADUATE THESIS

B.Sc. Management Information Systems

Thesis submitted to the Department of Computer Science, Ashesi University College in partial

fulfillment of the requirements for the award of Bachelor of Science degree in Management

Information Systems

Delali Ama Fiakpui

April 2016

DECLARATION

I hereby declare that this thesis is the result of my own original work and that no part of it has

been presented for another degree in this university or elsewhere.

Candidate's Name: ………………………………………………………………………….

Date: ……………………………………………………………………………………………

Candidate's Signature…………………………………………………………………….…

I hereby declare that preparation and presentation of this [thesis] were supervised in accordance

with the guidelines on supervision of thesis laid down by Ashesi University College.

Supervisor's Signature………………………………………………………………………

Supervisor's Name…………………………………………………………………………..

Date: ……………………………………………………………………………………………

Acknowledgement

Abstract

The web is rapidly becoming the most preferred media option for entertainment, information search and many others. In light of this development, it is important that ones website is able to stand out from the other sites providing the user with the best experience possible in order to ensure customer satisfactory and retainability. Colors have been known to influence customers' decision on a webpage and also influence a user's decision to undertake activities on the web.

Contents

Chapter 1: Introduction

The visual aesthetics of a website have tremendous effects on user engagement. Scientific investigation has proven that in 50 milliseconds, the credibility of a website can be judged by a user, merely on the basis of its aesthetic appeal (Lindgaard, Fernandes, Dudek, & Brown, 2006). The objective of this work is to investigate how color affects the web page usability and user engagement.

Unconsciously, our behavior, health and decision making abilities is greatly influenced by colors (Nurlelawati, Yunusb, & Said, 2012) and also has the tendency to elicit emotions or behaviors in users. The three principles of colors: saturation, hue and value are known to have the ability to affect one's emotions, perceptions and behavioral intentions. Colors are greatly employed in the marketing industry to transmit the desired information to customers. For example Coca-Cola is seen to be packaged in red which signifies youthfulness, happiness and energy (Tornetta, Fox, & Blackbird, 2013). Despite the numerous researches that have been conducted in the marketing and psychological environment of how color affects customers' responsiveness to products, there remains a lot of research needed to be done on the impact of colors in the digital environment (Cyr, Head, & Larios, 2010) .

Typography has a huge impact on multiple aspects of a website such as readability, mood, user experience and perceived article length (Mellas, 2015). Typography of a website helps to deliver the character or purpose of a website and its content. Research has shown that typography accounts for 90% of one's design. This is a very important aspect of web design because the only way one can communicate to his readers is through reading and hence it is important that a lot of emphasis is placed on the typography of the websites since it communicates a lot of information to the user. For decades, different fonts have been created in

order to transmit various information to readers. Different typography types have been employed to communicate different information to its users.

Fonts can be categorized into 2 main types, namely serif and sans serif fonts. Sans serif fonts are mostly used on the web because it enhances readability. Printed workers generally have a resolution of at least 1,000 dots per inch making it easier to read serif fonts; however, because monitors are typically around 100 dots per inch there is difficulty in reading serif fonts on the screen (Kole, 2013).

1.1 Motivation

The internet is becoming the most preferred media for information search, company presentations, entertainment as well as social contacts (Thorlacius, 2008). In light of this development, a significant amount of attention needs to be placed on the aesthetic features of a website since the presence of these features such as the colors and fonts, have a significant influence in communication to the users. Jakob Nielsen, who is known to have played an important role in the web design industry, shows how web design encapsulates 5 central components. These include learnability, memorability, efficiency, errors and satisfaction. These components are important in considering the quality of web sites in terms of functionality (Nielsen, 2012).

According to the ISO 9241-11 definition of usability, a usable website is dictated by the extent to which it can be used by specified users to accomplish goals with efficiency, effectiveness and satisfaction in a specified context of use (Bevan, 2000). This paper seeks to understand the impact of color and fonts on user engagement on a web site. This will go a long

way to ensure that web designers are able to communicate purposefully, their intent, to their prospective audience.

1.2 Research questions

This investigation seeks to find answers to the following research questions,

1) Do colors and fonts influence web usability?

2) Does culture influence the aesthetics preferences of users?

3) Does the educational background of users influence their aesthetic preferences?

4) Does gender influence the aesthetic preferences of users?

1.3 Hypothesis

1) The cultural background of users will affect their color preference

2) The educational background of users influences their aesthetic preferences

3) The gender of users has an influence on their aesthetic preference

Chapter 2: Literature Review

2.1 Introduction

This section seeks to understand the various researches and theories that have been developed regarding the impact colors and typography have on usability and user engagements. This paper also discusses the various researches and theories that have been developed on the effect of color and typography on usability and user engagements.

2.2 Colors

Although research into the psychology of color is not a well developed area, several studies have provided evidence of a relationship between colors and emotions (Cyr, Head, & Lariosc, 2010) . Nurlelawati, Yunusb, & Said (2012) conducted a meta-study on 40 previous researches between the period of 1964-2011 in order to investigate the impact of color on humans. The research focused on how colors have impacted work performance, the use of color to create negative or positive perception of a particular surrounding or task , its influence on moods and emotions and its influence in arousing certain behaviours (Nurlelawati, Yunusb, & Said, 2012).

Alsudani & Casey(2009), in their research discuss how users are able to judge the credibility of a site through its aesthetics. Two frameworks are generally used to judge the credibility of a website when focusing on the aesthetics. The first framework focuses on web design as a pure individual such as the color, design, typography, pictures and video clips. The second framework, which is based on human psychology, is of the concern that web pages are relationship individual elements that form a whole visual composition of the web page (Alsudani

& Casey, 2009) . In their investigation, Cry, Head & Lariosc (2010) concluded that color appeal is a significant determinant of website trust and satisfaction with differences noted across cultures.

Factors such as aesthetically pleasing color combinations can play an important role in generating positive effect, which may be particularly important for a commercial website where a company is trying to encourage users to associate a given company brand with positive feelings (Hall & Hanna, 2004).

2.3 Culture

Culture has been known to have an influence on the preferences on people and thus influences their choices. Color in research is seen as a differentiator by culture and signifies different meanings. Research has shown that countries with high collectivism rate as compared with individualistic countries trust a site because of its visual design. However those with a high individualism were influenced to trust a site primarily based on its informational design (Cyr, Head, & Larios, 2010). Cry (2008) conducted a research to examine the relative strength of relationship to trust versus satisfaction to loyalty across cultures. This article was centered on how websites could be modeled in order to ensure trust and satisfaction which would eventually lead to loyalty. Focus was placed on three factors which are; navigation design, visual design and information design. The research was based on three countries, Canada, Germany and China. From this research, it was deduced that countries with a high collectivism rate such as China, according to Hofstede's cultural framework, trusted a website through the visual design, unlike countries such as Canada and Germany which were considered individualistic. This research

proved that visual design which also involves colors resulted in trust, satisfaction and loyalty (Cyr , 2008). Further investigation done by (Cyr, Head, & Larios, 2010) proved that culture played an important role in color preferences of web users. This research was conducted with people from three countries namely Canada, Germany and Japan. The research tested blue, yellow and grey on people from these three cultures. Despite assertions made by earlier research that the color yellow would be mostly preferred by Japanese, it was found out that yellow was disliked by people of all the cultural groups. However blue was mostly preferred by Canadians than any of the other 2 cultural groups and grey was preferred by Germany as compared to the other cultural groups. The table below shows the cultural dimensions in Ghana according to the Hofsede's framework of culture.

Table 1.2 Ghana's cultural dimensions

Dynamics	Ghana
Power Distance	80
Individualism	15
Masculinity	40
Uncertainty Avoidance	65
Long term orientation	4
Indulgence	72

Ghana is known to have a low invidualism rate of 15% hence making it a collectivist nation. Colors have been known to symbolize significant meaning in the Ghanaian culture. Colors in Ghanaian context have been explored with regards to the traditional colors of the country being the colors of the national flag; red, yellow and green. Colors have also been analyzed with respect to the Kente cloth which is amongst one of the rich cultural heritage of Ghana. Different

colors are worn for different occasions For instance gold which denotes status, yellow is used to signify vitality, green represents growth and spiritual unity is depicted with blue (Falola & Salm, 2002). In the Ghanaian culture, pink is used to signify calmness and gentleness mostly depicted as a feminine color. Red however is known to stand for blood and strong political and spiritual feelings.

Color has also been analyzed in the light of color temperature and how it is perceived by gender as aesthetically pleasing. This research made use of cool colors (blue) and primary warm colors (red and orange). Gender had no impact on color preference, however most of the subjects preferred the web sites that utilized warm colors or those that had a contrast between warm and cool colors. However websites that utilized only warm colors were not appreciated by the subjects (Coursaris, Swierenga, & Watrall, 2008).

Contrary to the findings of Coursaris, Swierenga and Watrall (2008), an experimental investigation done to prove the effects of music and color in an online store setting proved that color produced significant effects on users. Cool colors were found to stimulate low level of pleasure and arousal than warm colors (Cheng, Wu, & Yen, 2009).

2.4 Fonts

Font is also known to play a very important role in the online context because 90% of the time, communication is made through text; hence this is why it is important for developers to pay attention to the fonts when designing a website. An eye tracking study conducted to investigate font type and size that maximize online reading performance and comprehension found out that, serif font enhanced faster reading. In addition, with regards to fixation duration smaller fonts

recorded the highest percentage (Beymer, Russell, & Orton, 2008). Sans serf's Helvetica and serf's Georgia were used in the research.

Table 2.2 Fonts

Serif fonts	Sans serif fonts
Century schoolbook	Arial
Courier new	Tahoma
Georgia	Verdana
Times New Roman	Comic Sans MS

Majority of text that is viewed on a computer screen are mostly a blend of sans and sans serif fonts. A Post hoc analysis conducted by Bernard, Bonnie, Riley, Hackler, & Janzen (2002) indicated that both Times and Arial were read significantly faster than Courier, Schoolbook, and Georgia. Fonts at the 10-point size were read significantly more slowly than fonts at the 12-point size (Bernard, Bonnie, Riley, Hackler, & Janzen, 2002).

A study focused on reading comprehension and subjective preference of online fonts was conducted using the Georgia font, designed be Matthew Carter and this font was found to be preferred to Times New Roman and thus perceived by readers to facilitate ease of reading online as compared to Times New Roman and Verdana (Boryaski, Neuwirth, Forlizzi, & Reglie, 1998). However this paper will be focusing on the effects of colors on web usability.

2.5 Approaches

Different approaches have been utilized in order to determine color preferences among users with the view to encourage ease of use. Nurlelawati, Yunusb, & Said (2012) conducted a meta-

study on 40 previous researches between the period from 1964-2011 in order to investigate the impact of color on humans. Others such as (Coursaris, Swierenga, & Watrall, 2008), continued later.

Bonnardel, Piolat, & Le Bigot (2011) took a different approach. Unlike earlier researchers, who created real websites to give their subjects a feel of navigating through an actual website, they created photoshoped images of websites where users logged onto a system and accessed the information. Also all experiments were conducted in a controlled setting.

A majority of research done employed the empirical approach for this research and hence thsis paper will employ this approach.This paper would however not be using the approach of Bonnardel, Piolat, & Le Bigot (2011) because we would want users to have a natural feel of the website and hence would not be performed in a control setting.

2.6 Limitation

- The research of how color impacts website usability, the cultural setting focused on was in the American, European and Asian setting. No work has been published in the African context.

- Limited colors used for the researches conducted. Most of the researches conducted make use of limited colors such as blue, gray and yellow.

Chapter 3: Methodology

3.1 Population

The population used for this study was students of Ashesi University College. This population was selected mainly for its representativeness and also because factors pertaining to readability and retention are essential to learning online. One essential purpose of this research was to collect data on the most important colors and fonts that are preferred by college students in order that recommendations aimed at improving web design can be used to suite the universities youthful population.

However the limitation to the use of this population was that, since the Ashesi University is a diversified community, students from different cultures may be influenced differently by the cultural change and may not be a true representation of how people from specific cultures would respond to the various color schemes.

On the other hand, since this institution is made up of an influential amount of data needed to draw conclusive evidence to the research, Ashesi's student population was used for the study.

3.2 Sample method

The simple random sampling method was used as the sampling method for this research. This is because a good representation of the population was needed to draw conclusive evidence. The population was partitioned into 4 strata representing the 4 year groups in the school. The groups were further broken down into gender, country of origin and majors

3.3 Steps for the study

Ashesi's course repository website served as the basis for this experiment. This is because scientific research conducted by Mitra, Willyard, Platt, & Parsons (2006) discovered that sites that relate directly to students course work ranked second highest on the list to search engines as the most visited site by students (Mitra, Willyard, Platt, & Parsons, 2006).

Courseware was redesigned in order to be able to suit the current needs of students. The new courseware made use of Java script functionality in order to make it more interactive. This was done by employing the Achaius theme; a theme available in Moodle during the development of the experiment. A total of five themes were developed which included the default theme which mainly embodied by a combination of Ashesi colors and the rest of the three pages adopting other colors. Behaviours of users were tracked using a cookie to view the frequency of their visits to Courseware and also the activities that they perform on the site. External users were however tracked using google analytics to be able to understand their pattern. Sessions were also used to keep track of the themes that were selected by users. This allowed for the allocation of themes to users and also keep track of their theme choices.

Questionaires were administed to users to understand the rational for their choices and also express their thoughts on the new interface and provide feedback on how they felt the interface could be improved .These quesionaires also helped us to understand the convenience they had in using the various website themes.

3.4 Variables

The variables that will be employed in this research are

Students {Major, Gender, Nationality}

Page Usage {NumberOf Visits, visitLength}
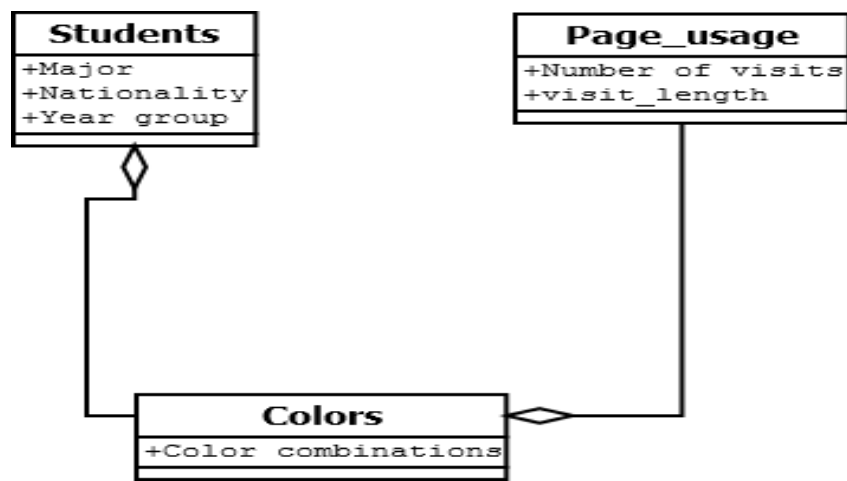
Colors {color combinations}

Figure 3.1 Database Variables

3.5 Data Processing method

The data collected was analyzed using the R programming as the statistical tool for this research.

It is a free software environment for statistical computing and graphics. This software was used

because it runs and compiles on a wide variety of UNIX platforms, Windows and MacOS.

3.6 Technology overview

3.6.1 Moodle

The Moodle framework was employed for this experiment. This is an open source course management system that is designed for educational purposes. This framework is built on php, highly flexible and customizable to suit individual needs. Due to its modular setup, it allows developers to create plug-ins and incorporate external applications to achieve the desired functionality.

The Archaius theme plugin was used in the experiment. This plug-in was used because it gives several options for customizing Moodle. This pluggin allows for custom changing of the 5css and also allows for java scripting.

3.7 Data Analysis

Descriptive statistics: This statistical method is used to describe the basic features of the data in the study providing summaries about the sample and the measures. Descriptive statistics are used to represent quantitative descriptions in a manageable form. It also helps to simplify large amount of data in a sensible way.

Cross Tables: Cross tables also known as multi-dimensional tables are two way tables consisting of columns and rows. This statistical method is efficient in structuring, delivering, summarizing and displaying of large amount of data. It is used to show whether there is a correlation between the row variables and the column variables or not.

Chi Square: The chi-square analysis is used to measure the level of independence of two categorical variables from a single population. It is used to assess if there is any correlation between the two variables.
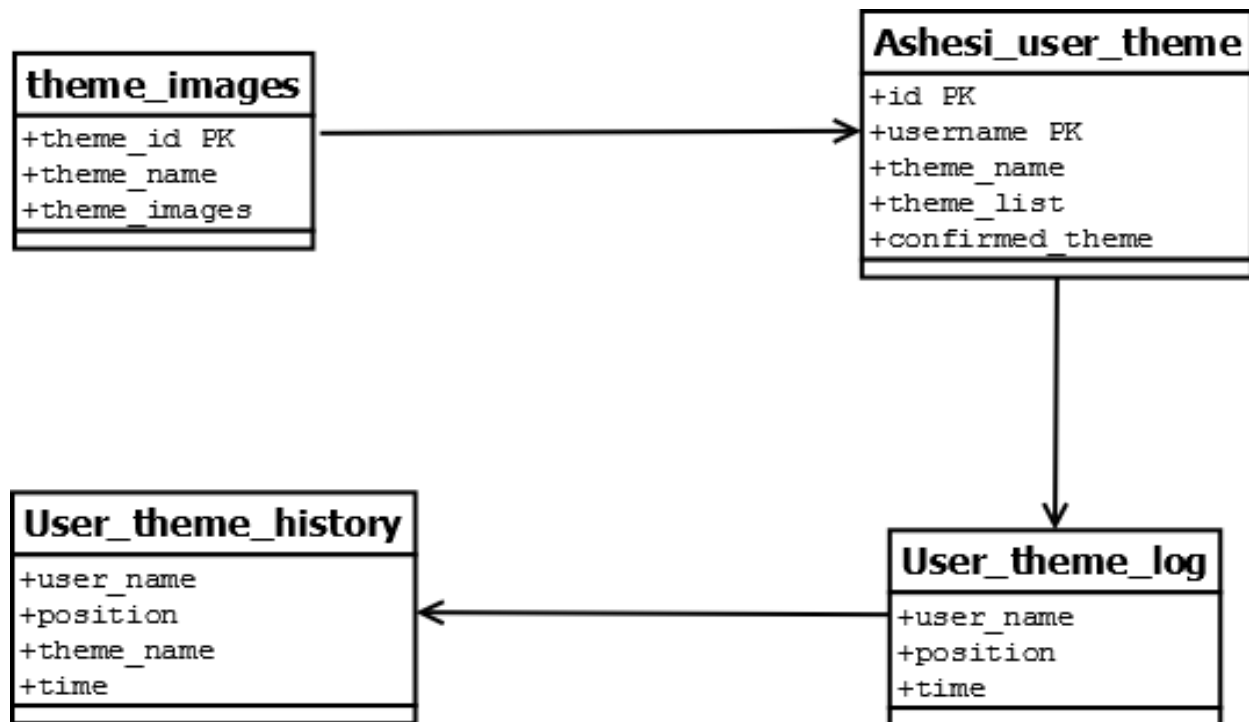
3.8 Relational schema

Figure 3.2 Relational Database Schema

When users decide to participate in the experiment, the date and time they decided to participate in the experiment is saved in the user_theme_log table. A list of themes is displayed to the user from the Ashesi_user_theme table. When the user clicks on a theme, the name of the theme is saved in User_theme_history table and the time the user chose that particular theme is recorded. If a user decides to opt out of the research, the default theme is displayed to the user. During the extraction of user information from the database, the usernames were hashed in order to ensure anonymity.

CHAPTER 4: Experiments and Results

This chapter focuses on the procedures that were followed in conducting the experiment. The experiment section discusses the various procedures, tables and techniques used in calculating the contrast level of the colors that were employed during the experiment. The results section focuses on analyzing the data that was received during the experiment section. These results are analyzed using tables and graphs and conclusive evidence is drawn on them.

4.1.1Experiment

Courseware was redesigned using the various color themes. Four main colors were used during the experiment were red (#a32222), yellow (#FFA500), cyan (#3f8764), grey (#808080) and green (#2E3332). The colors were contrasted with white and grey. The More theme on Moodle was changed to the Archaius theme in order to foster a better change of the various colors. The color contrasts of the colors were also used to ensure that there was accurate contrast between the various themes and which were approved by Web Contrasts Accessibility Guidelines level AA and level AAA standards.

Fig 1.0 below shows the previous user interface of courseware
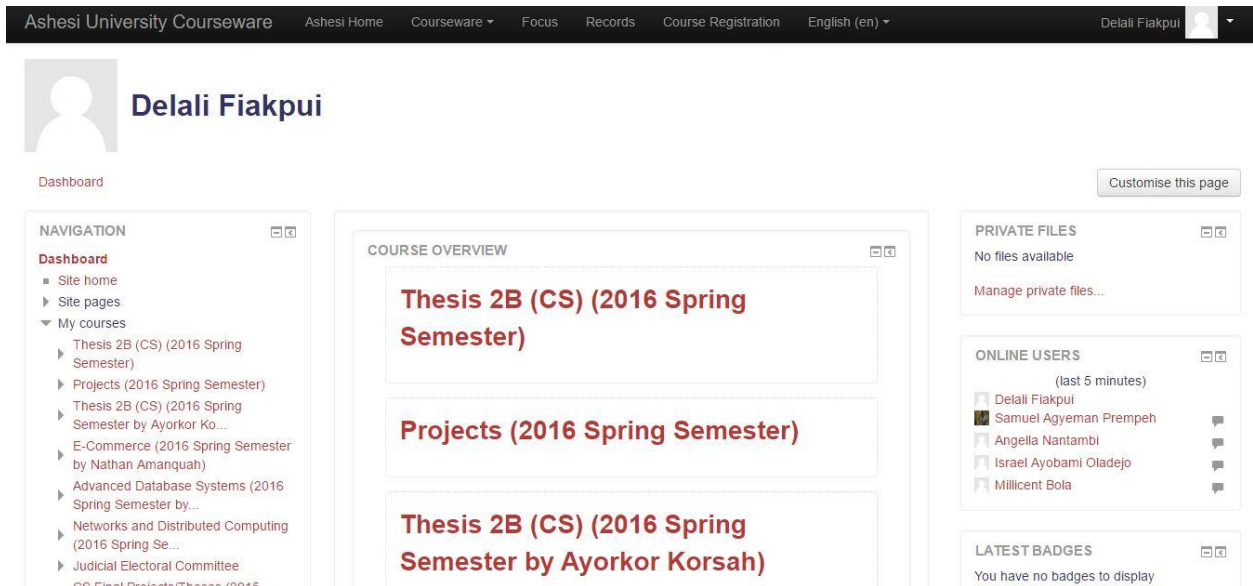

Figure 4.1 Previous Courseware Interface

4.1.2 Colors used in the experiment

4.1.2.1 The default theme

A default theme was created which employed Ashesi's official colors which is a red color (#a32222). The red color is known to represent youthfulness, happiness and energy. This theme is geared towards the youthful nature of the population. The contrast ratio for this theme is Contrast Ratio: 6.86:1 passing the WCAG AA text for normal text and WCAG AAA for large text.

Fig 1.1 below shows the default theme.
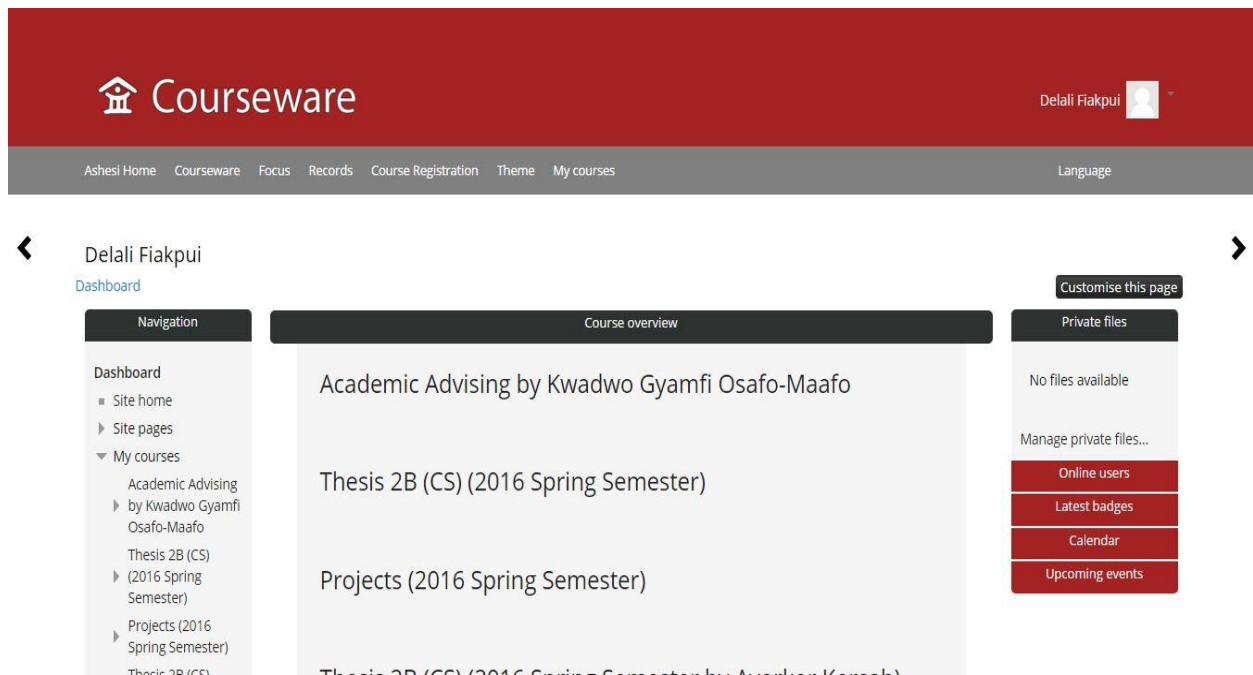
Figure 4.2 Default page

4.1.2.2 Theme 1

This theme is made of cyan (#3f8764) which comprises 129 (50.59%) green and 129(50.59%) blue. The contrast ratio for this theme is Contrast Ratio: 4.59:1 passing the WCAG AA text for normal text and WCAG AA and WCAG AAA for large text.
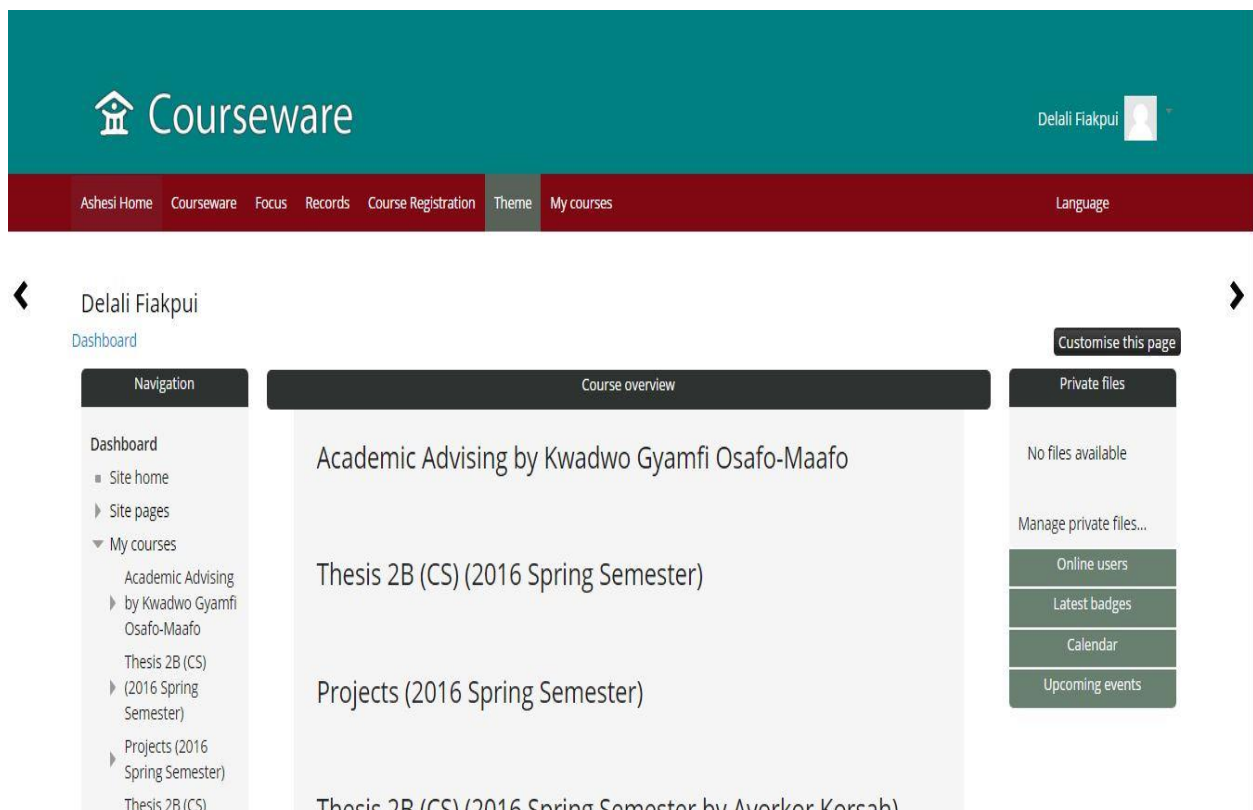

Figure 4.3 Theme 1

4.1.2.3 Theme 2

This theme uses green, grey and white as its color combinations. The color green is also known to greatly liked by a large number of people. In Ghana, great significance is attached to the color green since it is known to denote growth and prosperity in Ghana. The contrast ratio for this theme is Contrast Ratio: 3.8:1 passing the WCAG AAA for large text.
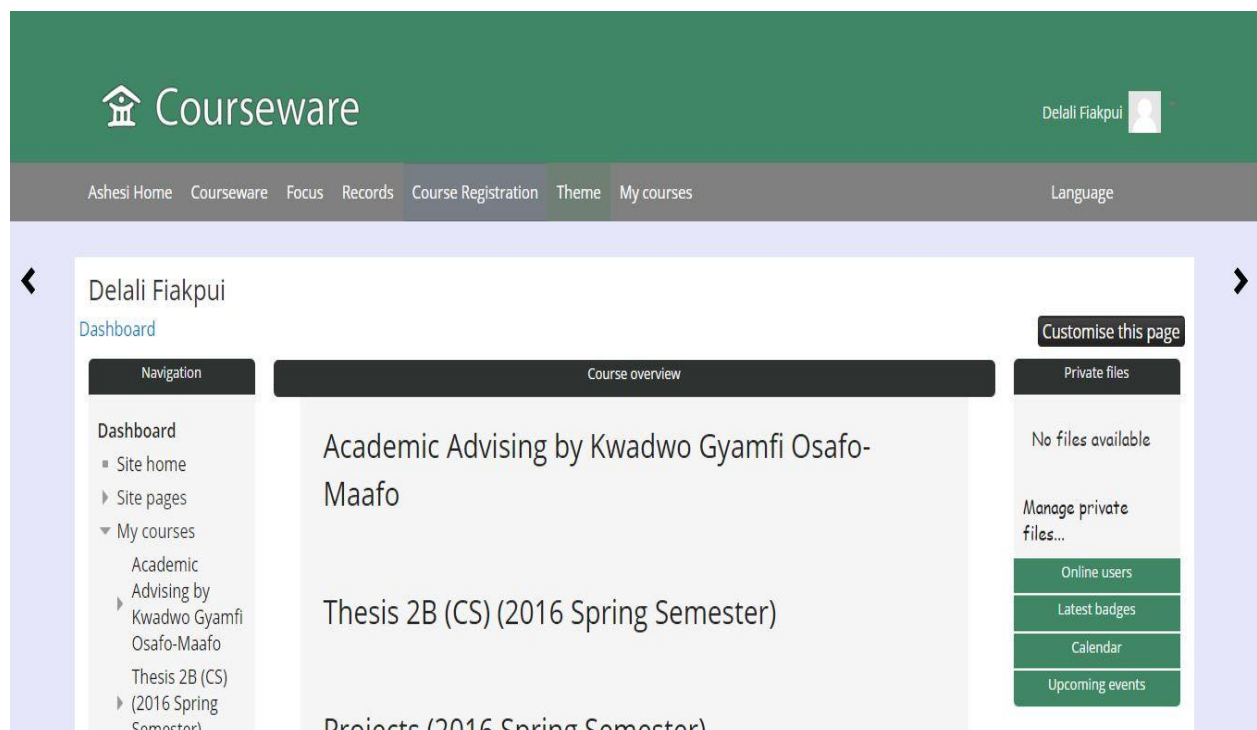
Fig 4.4 below shows Theme 2

Figure 4.4 Theme 2

4.1.2.4 Theme 3

This theme uses orange (#FFA500), white and grey in its color combination. One of the main

reasons for using this theme is to be able to find out the perceptions of people towards. Orange in

Ghana is, mostly seen to depict wealth and affluence. However this color can also be seen to be

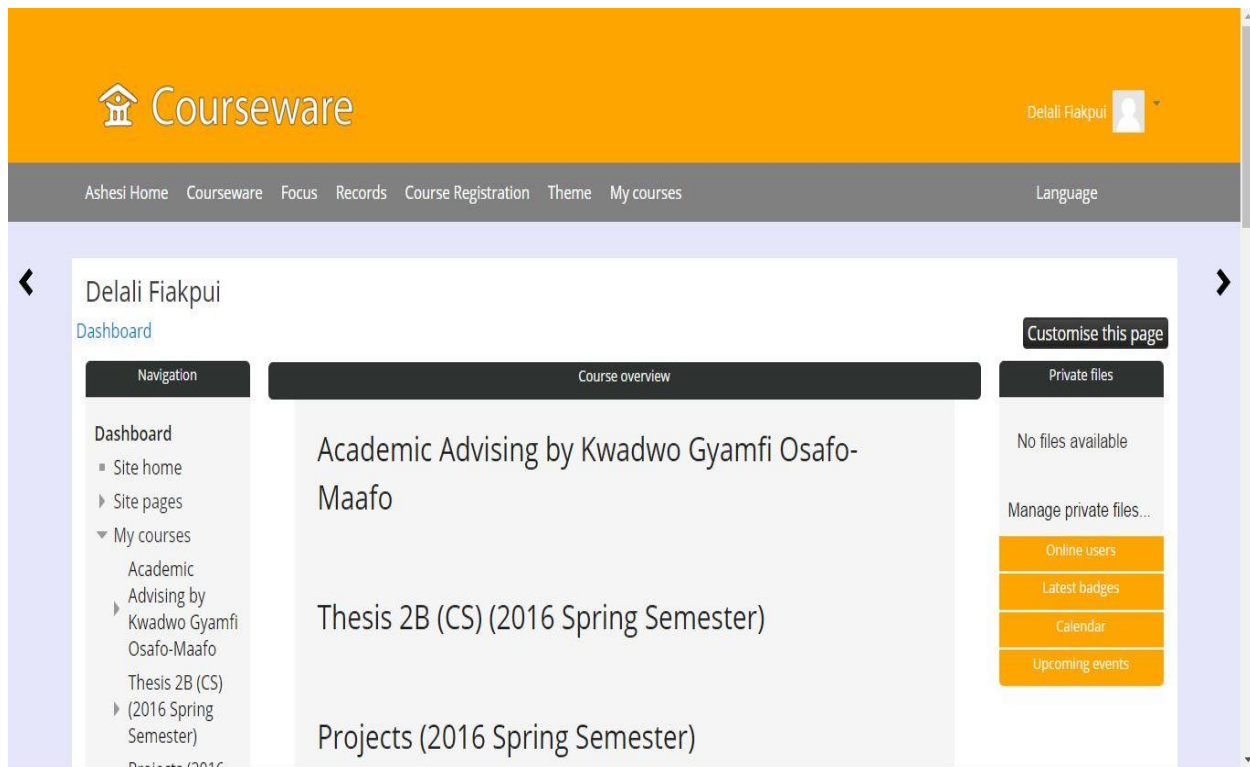childish and may not be liked by people.

Figure 4.5 Theme 3

4.1.2.5 Theme 4

This theme is grey (#2E3332) which comprises 129 (50.59%) green and 129(50.59%) blue. The contrast ratio for this theme is Contrast Ratio: 11.78:1 passing the WCAG AA text for normal text and WCAG AA and WCAG AAA for large text.
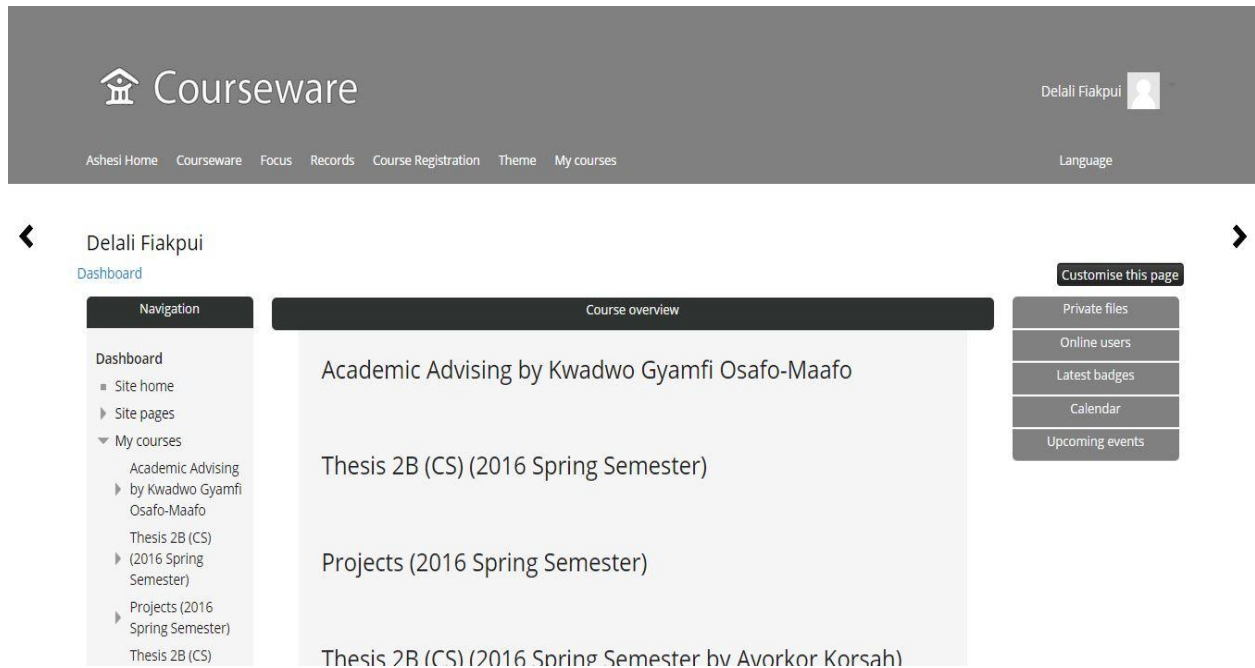

Figure 4.6 Theme 4

4.1.3 Database

The table below shows the various database tables that were created and the information stored

in these tables.

Table 4.1 User Theme Database

Table name	Functionality
Ashesi_user_theme	This table stores the username, contains the theme list assigned to users, takes in the theme that a user choose , stores a users position to participate.
Theme_ images	This table contains the themes with their images.
User_theme_log	This table takes in the username, whether he has decided to participate in the experiment and the time the decision was made.
User_theme_history	This table takes in the themes chosen by students and the time that those themes were chosen.

4.1.4 Test cases

1) A student should be able to decide whether to join the experiment or not with the click of the participate or not participate button.

2) If agreed to participate a student should be shown a form with the list of themes assigned to him or her.

3) A student should be allowed to change themes assigned to him/ her by clicking the theme desired.

4) The chosen theme of the user should be recorded in the database with the time the student changed themes.

5) A student should be able to opt out of the experiment at anytime by clicking the opt-out link.

6) On clicking the link, student should be shown the default theme.

7) However if a student decides to not participate in the experiment, the student should be shown the default theme.

8) A student who decides to opt out of the experiment can decide to join the experiment again by clicking the participate button

9) On clicking the participate button, the student should be able to view the form with themes assigned to him or her.

10) The time the user decides to opt in or out of the experiment should be recorded in the database.

11) The user's theme choices should be recorded in the database along with the time the user decided to change the theme.

Below is the diagram of the form allowing users to choose different themes.
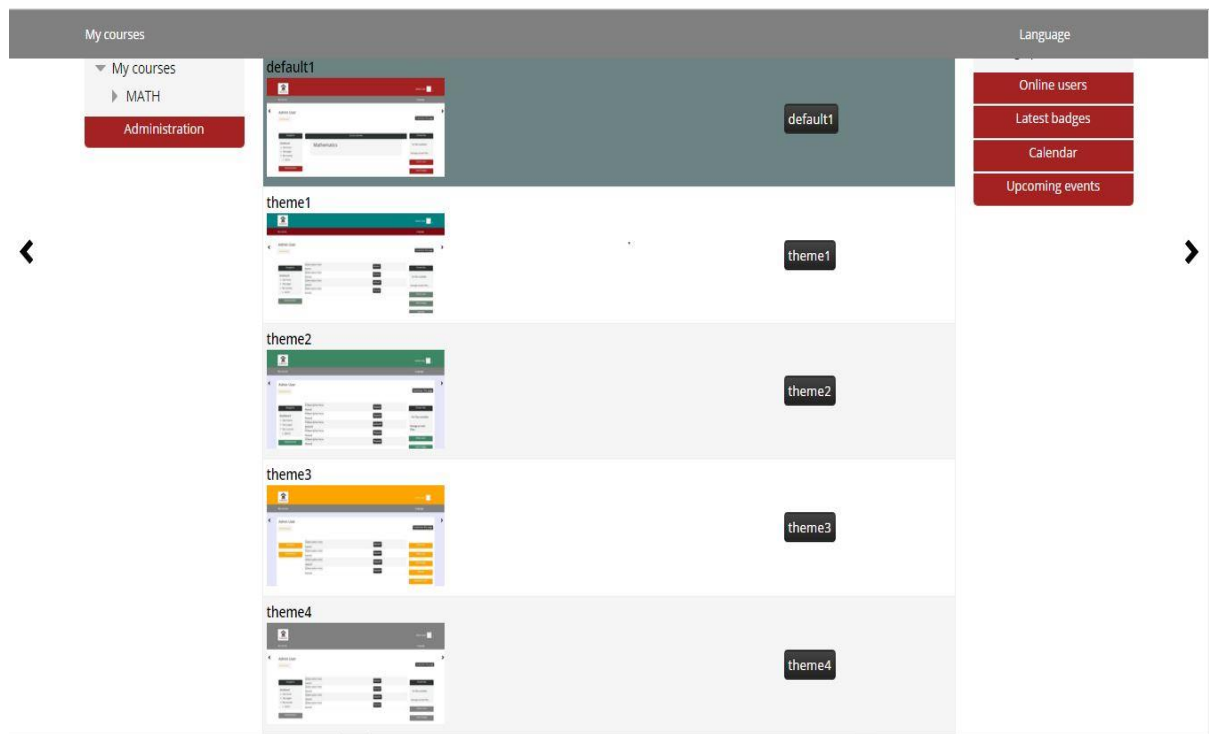

Figure 4.7 Theme Selection form

4.1.5 How users were assigned themes

The usernames of users were hashed in order to ensure anonymity and ensure themes were assigned to users randomly. The first stage of assigning themes was to group students based on their year groups. Students were randomly assigned themes. Stratified sampling was carried out with regards to the various year groups and thence was assigned various themes randomly.

4.2 Results

This section focuses on the results and deduction that have been made from the research that was conducted. The results that will be discussed in this chapter draws its data results from Google analytics, courseware and user feedback that was received from participants of the study through the use of a Google form.

4.2.1 Demographics of courseware visitors

The demographic courseware visitors after the color change were obtained from Google Analytics. The results showed that from the sessions that were recorded on the site, 46.3% of them were females while 53.7 representing 1692 sessions were males. The breakdown can be seen in the pie chart below.
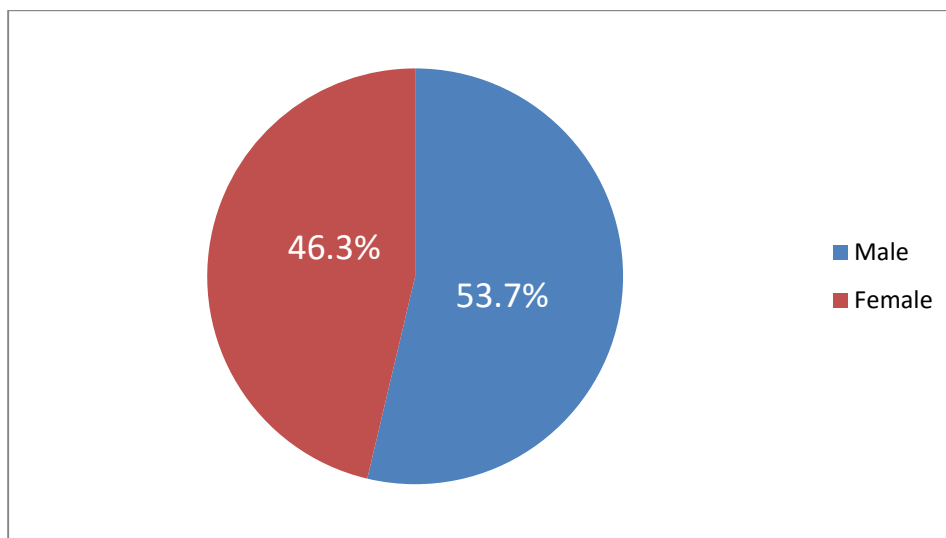

Figure 4.8 Courseware users demographic

Information from the Google analytics showed the age bracket of visitors on the courseware site. Figure 4.9 below represents the age brackets of people who visit courseware. From Chart 2, it can be seen that a large percentage of courseware users fall between the age range of 18-25 years.
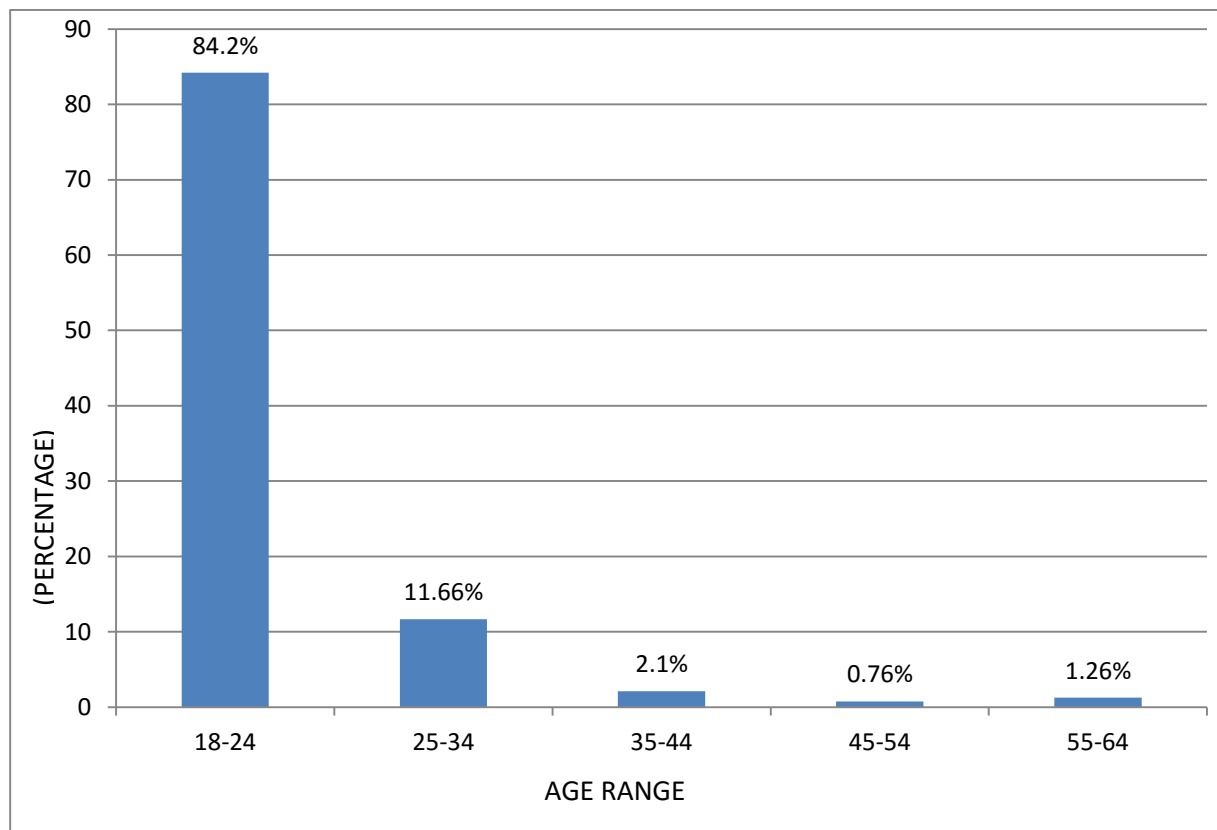

Figure 4.9 Age bracket Courseware visitors

4.2.2 Theme chosen by participants

Users were given the opportunity to choose from 5 main themes. Below are graphs showing the breakdown of the participants with respect to various strata. These strata include, gender, year group and nationality.

4.2 Table Participants Gender

Gender		
Male	Female	Unknown
84	74	15
	Total	173

4.3 Table Participants Major Breakdown

Major	Number of participants
Computer Engineering (CE)	3
Management Information Systems (MIS)	33
Business Administration (BA)	53
Computer Science (CS)	55
Electrical Engineering (EE)	6
Mechanical Engineering (ME)	8
Unknown	15
Total	173

The table above shows the number of students who participated in the research with regards to their majors. 19% of the participants were Management Information System students, 30.6% were Business Administration students and 32% of the participants where computer science students. However, 9.83% students fell within the engineering department.

1) Comparison of the Nationality and color choice

A comparison was made on the nationality of students and the color themes they preferred. The default page was the most preferred theme by the Ghanaian participants, Kenyan participates preferred theme 1 and theme 4. However theme2 was the most preferred theme by Nigerians.
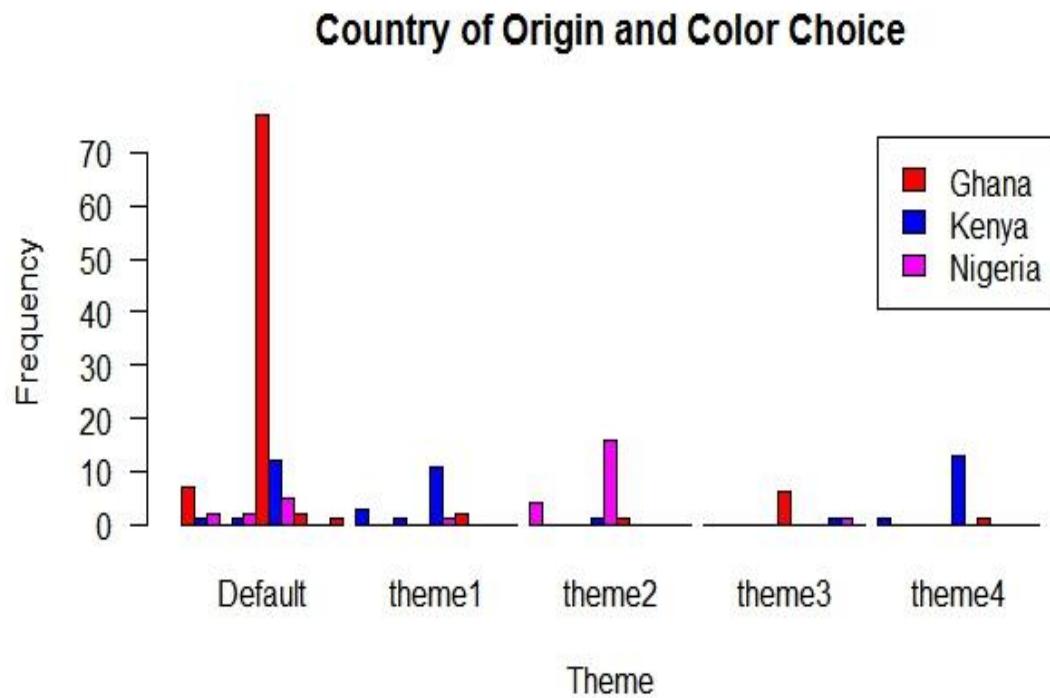
Country of Origin and Color Choice

Fig 4.10 Comparison of country of origin and color choice

2) Comparison of Gender of participants and color theme

A comparison made on the gender of participants and their theme preferences. All gender types preferred the default theme. Over 50% of the male participants preferred the Default theme. The second most preferred theme for females was theme2 and the second most preferred theme for the male participants was theme1 and theme 4.
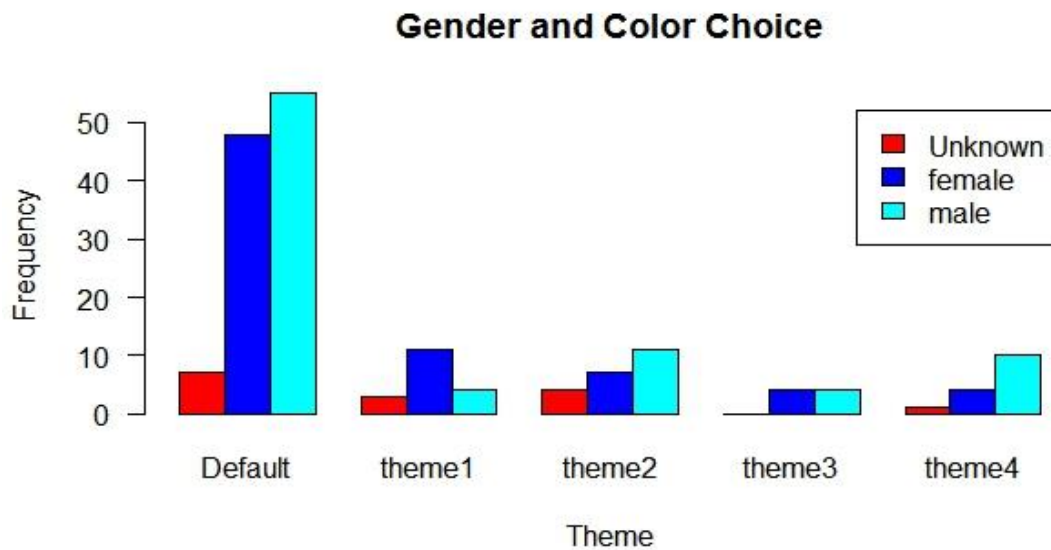

Figure 4.11 Comparison of Gender and color choice

The breakdown of Gender and their color choice with regards to their nationality

a) Ghana

The comparison of the color choices in Ghana by gender showed that more males appreciated the default theme to females. Fig 4.12 shows the comparison of theme choice by gender in Ghana
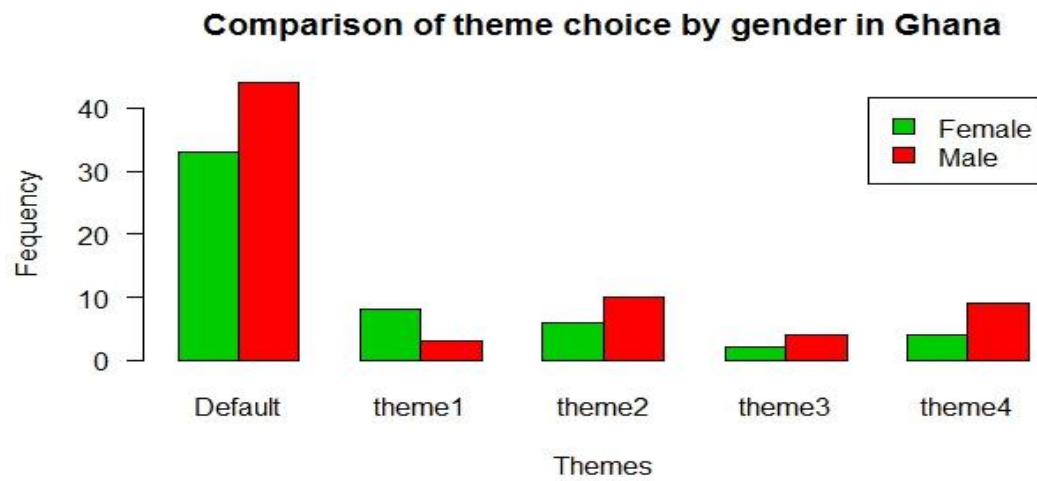
36

Fig 4.12 Comparison of theme choice by gender in Ghana

b) Kenya

The comparison of the color choices in Kenya by gender showed that more males appreciated the default theme to females. Theme 1 and theme 2 were only chosen by females.
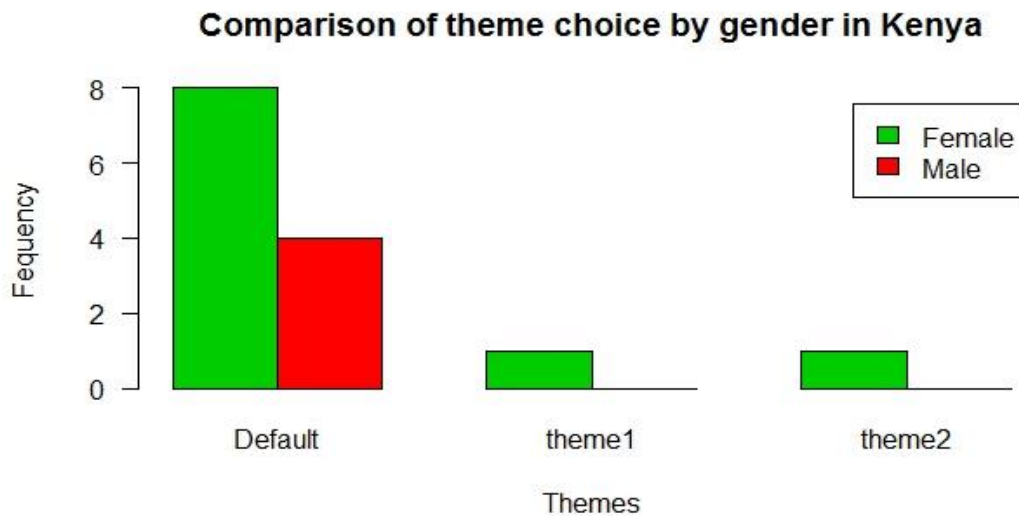

Fig 4.13 Comparison of theme choice by gender in Kenya

c) Nigeria

The comparison of the color choices in Nigeria by gender showed that more females appreciated the default theme than males. In addition only males preferred the default theme.
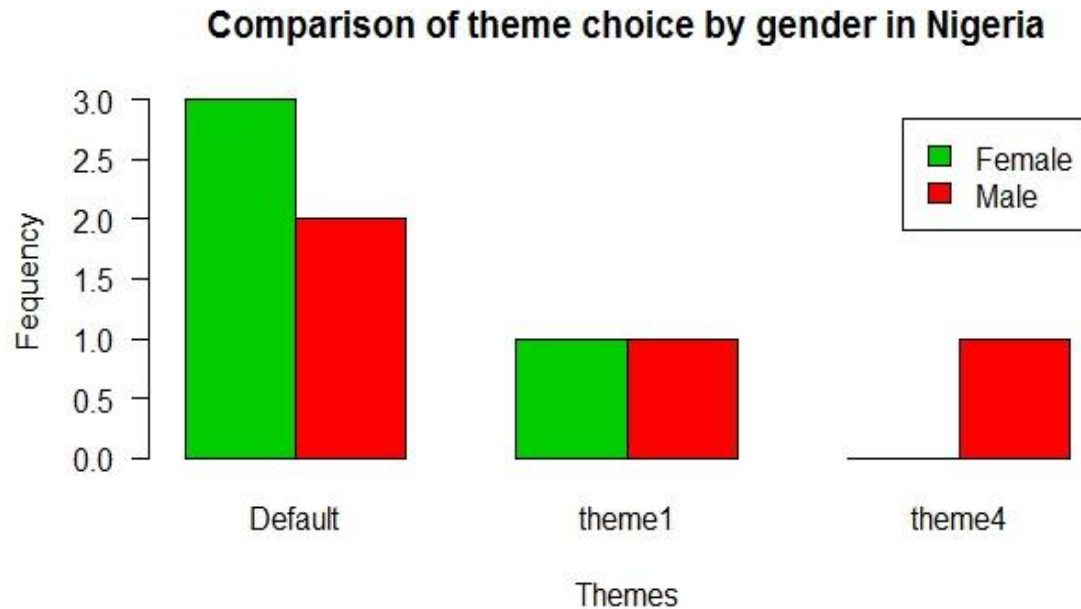

Fig 4.14 Comparison of theme choice by gender in Nigeria

3) Comparison of Majors of participants and color theme

A comparison of the educational background of participants to the themes showed that all the participants preferred the default theme. However computer science majors ranked the highest for preferring the default theme as well as theme3. However was mostly preferred by Business Administration students. Fig 2.1 is a graphical representation of the relationship between majors of participants and color preferences.
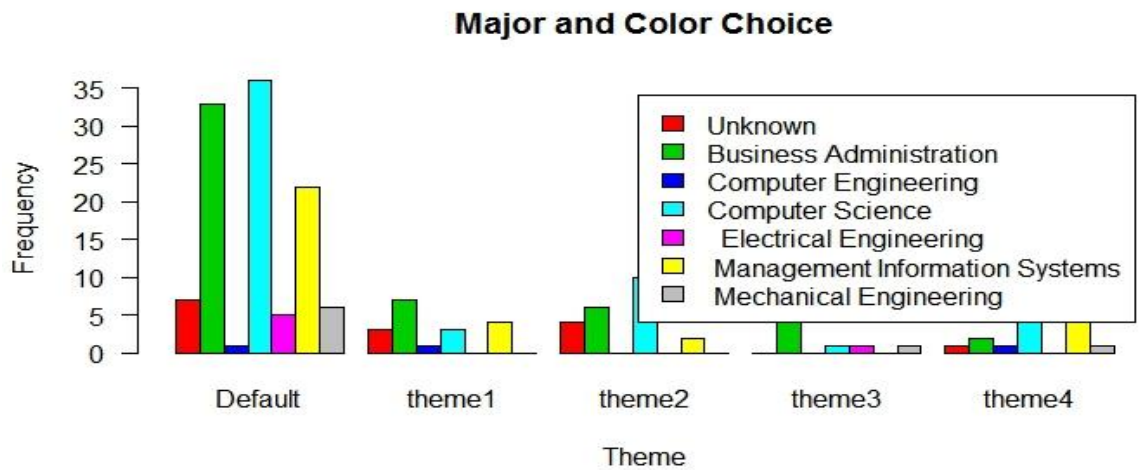
Major and Color Choice

Fig 4.15 Comparison of majors and color choices

The breakdown of Gender and their color choice with regards to their majors

a) Management Information System

The breakdown of gender choices by the MIS majors showed that males preferred the default and theme 4 while theme 2 was only chosen by the females in the MIS class.

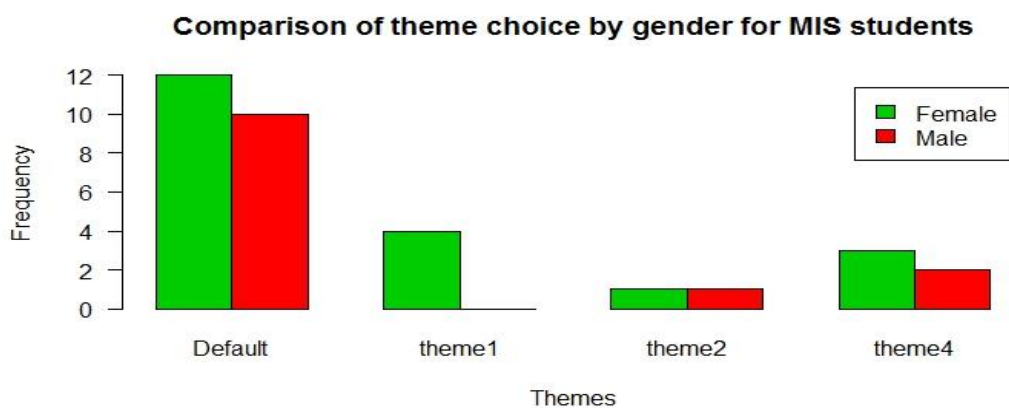**Comparison of theme choice by gender for MIS students**

Fig 4.15 Comparison of theme choice by gender for MIS students

b) Business Administration

The breakdown of gender choices by the Business Administration majors showed that females

preferred the default as compared to their male counterparts and theme 4.
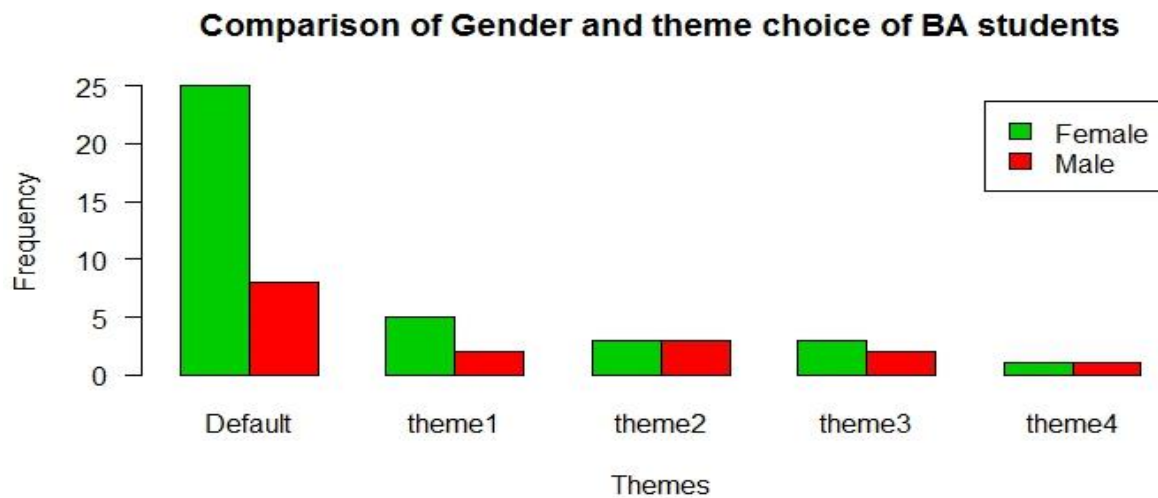

Fig 4.15 Comparison of theme choice by gender for Business Administration students

c) Computer science

The breakdown of gender choices by the computer science majors showed that males preferred

the default as compared to their female counterparts. Theme 4 was also only appreciated by the

males.
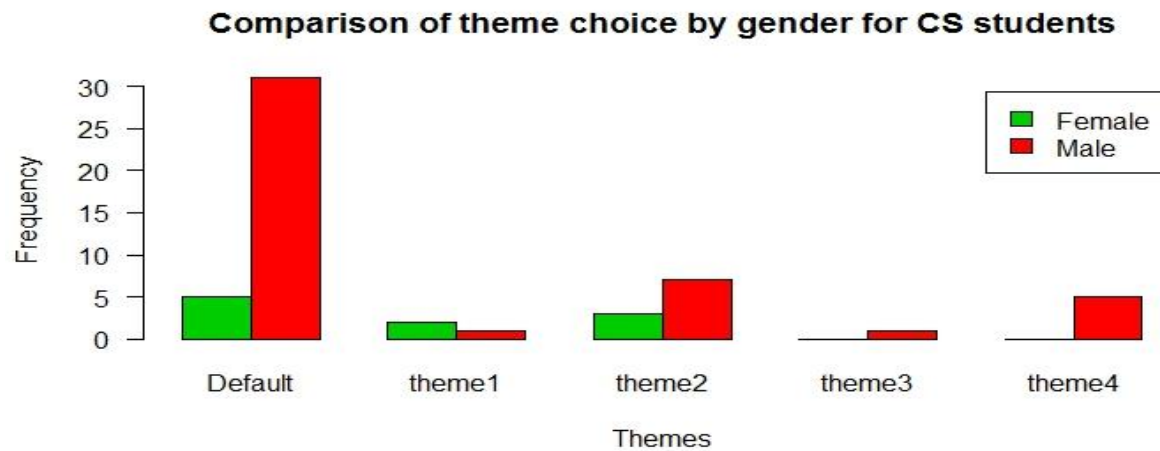
Fig 4.16 Comparison of theme choice by gender for Computer Science students

4) Comparison of year group and color choice

A comparison made between the various year groups and their color preference showed that all year groups preferred the default theme to other themes. The 2019 year group recorded the highest preference for the default theme. The 2016 year group also recorded the highest preference for theme2, theme1 and theme4. Figure 4.17 shows the comparison between year group and color preference.

Year Group and Color Choice

Figure 4.17 Comparison of year group and color preference.
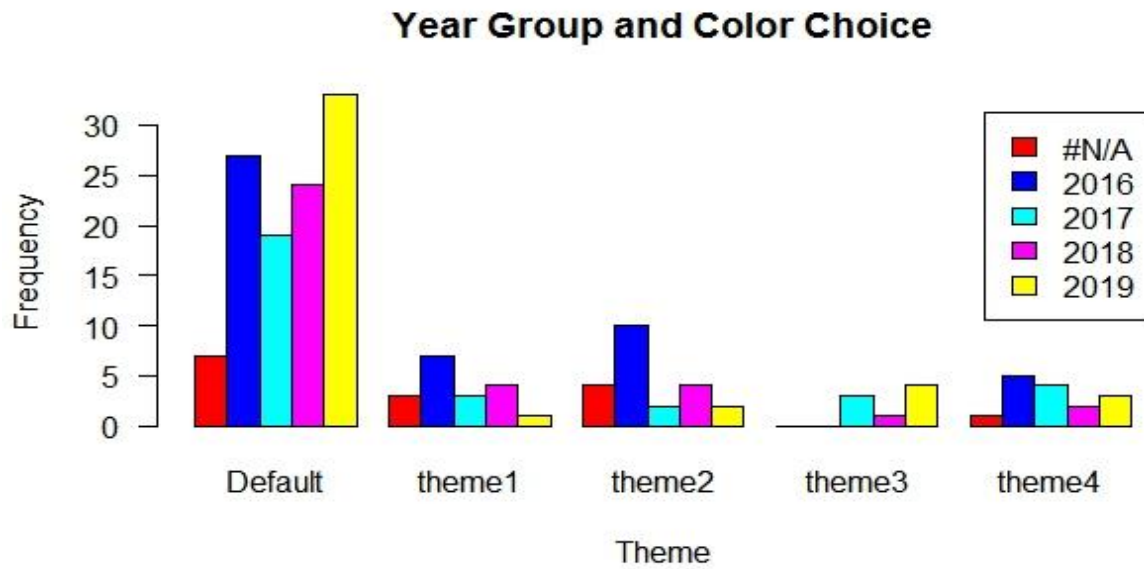
5) Popular theme of the sample size

The experiment conducted that the most preferred theme was the default theme for all groups in the sample. The most popular theme was the default followed by theme 2 and then theme1. Figure 2.3 is a graphical representation of users' popular theme.

Theme Users
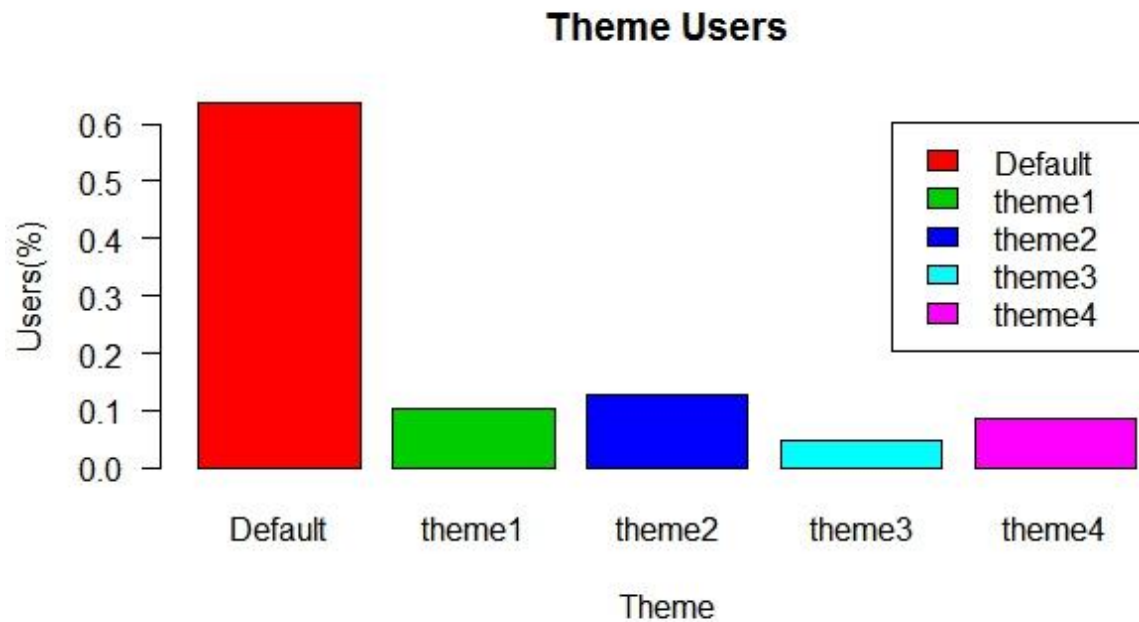
Figure 4.18 Popular theme

4.2.3 Hypothesis Testing

1) The cultural background of users will affect their color preference

H_0= The cultural background of users will affect their color preference

H_1= The cultural background of users has no effect on their color preferences

X-squared = 68.044, df = 48, p-value = 0.02998

The null hypotheses has been rejected because the p-value is less than the significant value = 0.05. Hence in relation to this research, there is no relationship between the nationality of

students and their color preference since the p-value is 0.02998 lower than significant value. In conclusion we accept the alternate hypothesis.

2) The educational background of users influences their aesthetic preferences

H_0= The educational background of users influences their aesthetic preferences

H_1= The educational background of users has no effect on their color preference

X-squared = 29.608, df = 24, p-value = 0.1981

The null hypotheses has been accepted because the p-value is more than the significant value = 0.05. Hence in relation to this research, there is a relationship between the educational background of students and their color preference since the p-value is 0.2 greater than significant value. In conclusion we retain the null hypothesis.

3) There is a correlation Gender and colors hence proving that Gender has an effect on color preference.

H_0= The gender of users influences their aesthetic preferences

H_1= The gender of users has no effect on their color preference

X-squared = 11.764, df = 8, p-value =0.162

The null hypotheses has been accepted because the p-value is more than the significant value = 0.05. Hence in relation to this research, there is a relationship between the gender of students and

their color preference since the p-value is 0.16 greater than significant value. In conclusion we retain the null hypothesis.

4.3 Results Discussion

A questionnaire was offered to participants to understand the rational for their theme choices and also know how the change has affected usability of the site. Most users expressed that they liked the change in the site and the introduction of colors has greatly improved their experience on the site making it more appealing to visit. People also found the feature of changing the colors on the site as fun and found that as an opportunity of expressing themselves increasing their desire to visit the site often. Users found the site to be user friendly after the incorporation of colors and some addressed the fact that the site looked organized after the introduction of color. People chose certain colors because they felt comfortable using.

However, some users complained of the limited color and font choices. Others did not also like the colors presented to them.

4.4 Experiment limitation

There are a number of limitations that were encountered during the research. The first limitation that was encountered during this research was time constraints. The research was conducted within a short period of time because of the time constraints attached to this research. The time constraint can have an effect on the results obtained because users were not monitored over an extended period of time.

Also since different devices were used during the experiment, users did not have the chance to view the colors in the same way due to the difference in screen resolutions used. This limitation may have an effect on the results received since users viewed the colors in different ways.

Lastly, the results received may be biased because; users were exposed to the default theme for a longer time than the rest of the other themes. This could have resulted in the biased preference for the default theme because they had grown accustomed to it. However, the default theme could be an accurate preference for users since the majority of participants fell within the 18-25 age bracket, which is a youthful population. With research done showing that red expresses youthfulness, enthusiasm and energy, this color resonates with the youthful population of Ashesi's courseware users.

Chapter 5: Conclusion and Recommendation

This section discusses the results received for this research. Analysis done in this paper provides fresh insight into the study of how colors and fonts affect web usability with a large emphasis placed on a youthful population and how wed designers can better design their user interface to suit their desired audience.

5.1 Conclusion

From the analysis done in this paper, it can be deduced that there is a correlation between the gender of users and their aesthetic preference that is their color choice. This shows that there is a need for web designers to focus on the aesthetic appeal of their websites to suit their target audience. The chi-square test also showed a correlation between the educational background of users and their aesthetic preferences. Educational background of users also has an effect on their aesthetic appeal. However, unlike past researches done that show a correlation between culture and aesthetic preference, with the same size used, there was no correlation between the sample size used and their cultural background. This could be as a result of being influenced by other cultures because of the education setting the sample group find themselves in.

5.2 Limitations

The sample size was not evenly distributed among the various strata used in the experiment because the random sampling method was employed. This could have resulted in biased results for a high preference of the default theme.

47

Additionally, there was a limited set of colors that was used in the experiment. Because of this, users were forced to make choices from a limited pool of colors. Users not given the option of choosing a font type is another limitation to this experiment. The fonts were combined in the theme hence users were not able to select their preferred theme.

The experiment conducted was open to external users as well and hence the demographics of external users were not recorded since the only information available in the database was that of the students. This led to 15 participants whose details were untracked.

Courseware can be accessed on the mobile devices however, this experiment only focused on people who use the mobile version of the application, thus depriving the experiment of additional data which could have been captured from the mobile version users.

5.3 Future Research

This field has a lot of opportunities that can be explored. In the future, more colors can be explored and users can even be given the chance to personally customize their sites in order to know what their aesthetic preferences will be. This research was done using only the Ashesi population. This experiment can be extended to other universities in order to gain more data for analysis. Also, the mobile users can be tracked in order to gain more data for analysis.

Works Cited

Alsudani, F., & Casey, M. (2009). The effects of asthetics on web credibility. *British HCI Group Annual Conference on People and Computers* (pp. 512-519). British Computer Society.

Bernard, M., Bonnie, L., Riley, S., Hackler, T., & Janzen, K. (2002). A Comparison of Popular Online Fonts: Which Size and Type is Best? *Usability News*, 1-8.

Bevan, N. (2000, October). *ISO a*nd industry standards for user centered design. Retrieved from Userbilitynet.org:

http://www.usabilitynet.org/trump/documents/Usability_standards.ppt.pdf

Beymer, D., Russell, D., & Orton, P. (2008). An Eye Tracking Study of How Font Size and Type Influence Online Reading. *British Computer Society*, 1-4.

Bonnardel, N., Piolat, A., & Le Bigot, L. (n.d.). The impact of colour on Website appeal and users' cognitive processes.

Boryaski, D., Neuwirth, C., Forlizzi, J., & Reglie, S. H. (1998). A study of fonts designed for screen display. *CHI '98 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 87-94). New York: ACM Press/Addison-Wesley Publishing Co.

Cheng, F.-F., Wu, C.-S., & Yen, D. C. (2009). The effect of online store atmosphere on consumer's emotional responses – an experimental study of music and colour. *Behaviour and Information Technology*, 323-334.

Coursaris, C. K., Swierenga, S. J., & Watrall, E. (2008). An Empirical Investigation of color temperature and gender effects on web aesthetics. *Journal of Usability Studies*, 103-117.

Cyr, D. (2008). Modelling websites across cultures. *Journal of Management Information Systems*, 47-72.

Cyr, D., Head, M., & Larios, H. (2010). Clour appeal in website design within and across cultures: A multi-method evaluation. *International Journal ofHuman-Computer Studies*, 1-21.

Cyr, D., Head, M., & Lariosc, H. (2010). Colour appeal in website design within and across cultures:A multi method evaluation. *International Journal of Computer- Human studies*, 1-21.

Falola, T., & Salm, S. J. (2002). *Culture and Customs of Ghana.* Connecticut: Greenwood Publishing Group.

Ganguly, B., Cry, D., & Bhusan, S. D. (n.d.). The influence of website characteristics on trust in online travel portals in India: The moderating role of demographic and psychographic variables. 30.

Hall, R. H., & Hanna, P. (2004). The impact of web page text-background colourcombinations on readability, retention, aesthetics and behavioural intention. *Behaviour and information technolgy*, 183-195.

Kole, S. (2013, March 15). *Serif vs. sans: The final battle*. Retrieved from Web designer depot: http://www.webdesignerdepot.com/2013/03/serif-vs-sans-the-final-battle/

Lindgaard, G., Fernandes, G., Dudek, C., & Brown, J. (2006). Attention web designers: You have 50 milliseconds to make a good! *Behaviour and information technology*, 115-126.

Mellas, C. (2015, November 20). *Typography and whi it is improtant for your website*. Retrieved from webinsation.com: http://www.webinsation.com/typography-and-why-it-is-important-for-your-website/

Mitra, A., Willyard, J., Platt, A. C., & Parsons, M. (2006). Exploring wen usage and selection criteria among male and female students. *Journal of computer- mediated communication*, 00.

Nielsen, J. (2012, January 4). *Nielsen Norman Group.* Retrieved from Usability 101: Introduction to Usability: https://www.nngroup.com/articles/usability-101-introduction-to-usability/

Nurlelawati, A. J., Yunusb, R. M., & Said, N. S. (2012). Environmental colour impact upon human behaviour: A review. *Procedia- Behavioural and social sciences*, 54-62.

Supanat, C. (n.d.). Application of the theory of reasoned action to On-line shopping.

Thorlacius, L. (2008). The role of aesthetics in web design. *Nordicom Review 28*, 63-76.

Tornetta, S., Fox, T., & Blackbird, J. (2013). *Publications Projects.* Retrieved from University of Delaware: http://udel.edu/~rworley/e412/Psyc_of_color_final_paper.pdf