THE DIMENSIONS OF GENDER AS BIOLOGICAL MODEL TO SEEK OUT THE INFLUENCE OF TYPOGRAPHIC FACTORS IN PERFORMANCE DURING INTERACTION

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Abstract

Usability of a web interface plays a key role in the human computer interaction. The multiple factors of usability have been measured by customization of the interface to give users easiness while they interact with the system. Similarly, the biological factors of human play vital role in creating effect user interface. Furthermore, the typographic factors have immense importance in usability. The primary aim of this study is to explore the dimension of gender and influence of typographic factors on gender while interacting in web environment. To achieve this, aim the gender factor was devised as variable of study. The main objective of this research is to pursue out the impact of typographic factors on gender and age in web and see the subjective differences including Enjoyment, Ease of Use, Usefulness, and Satisfaction be in genders and age while interacting with web environment, To test the hypothesis as mentioned above a gaming prototype was developed with primary interaction activities (Clicking, Text Selection). The experiments are conducted on 84 participants from different academic venues of Pakistani universities. For the data Investigation, the ANOVA was applied. The results suggest that there are significant differences between gender while web environment interaction. Furthermore, there is also a considerable difference between the males and females in behavioural measures. These findings have substantial implications in personalization in e-commerce and other information systems.

Dedication

I dedicate all my efforts to my parents and brothers who have always supported me and friends for their love and support.

Acknowledgments

First of All, I wish to thank Allah Almighty for his blessing upon me. Secondly, I would like to thank my evaluation committee members who were more than substantial with their expertise and valuable time. Grateful to Engr. Adeel M. Syed, my supervisor for their countless hours of reading, inspiring, and support through whole process. I want to acknowledge and recognize my whole department for allowing me to conduct my research and providing any support demanded. Special thanks to the faculty members of the Department of Software Engineering, Bahria University Islamabad.

Lastly, I would like to thank the participants to provide feedback and for making this research complete.

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Chapter 1

Introduction

Human computer interaction is termed as the study of method and designing of technology and the way it affects and interacts with humans, its tasks and actions. This technology can be varied into multiple categories which include hand held devices, desktop/laptop computers, car navigation systems, sensors etc. [1].

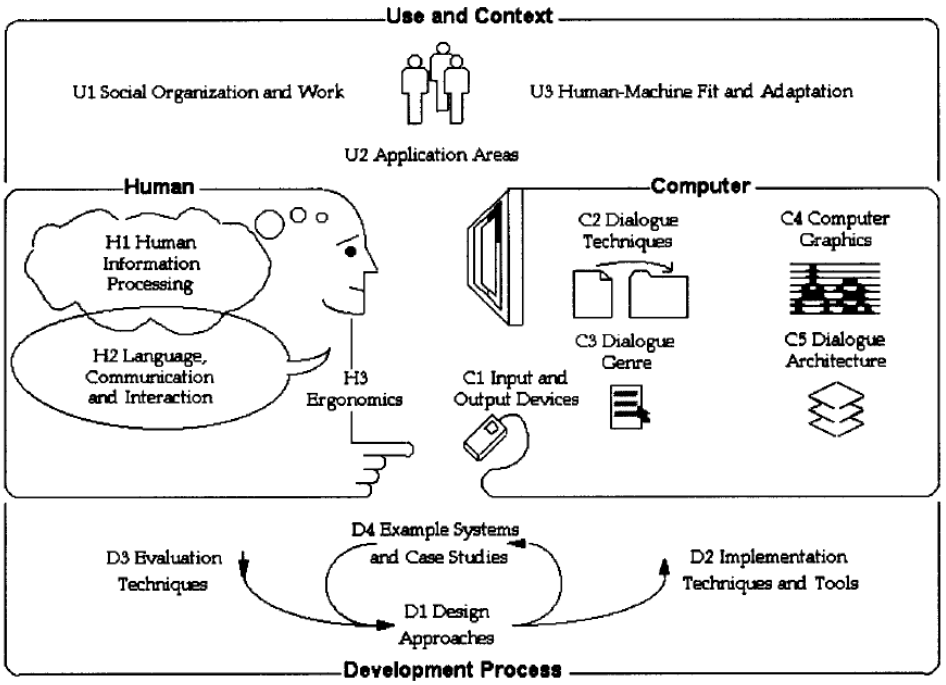
Usability is admitted to be a crucial aspect in the study of online behaviours in Human Computer Interaction (HCI) and Information Systems (IS) literature. For individuals, usability has been associated with important conclusions such as error reduction and positive attitudes, and has been shown to increase user's intentions to use computers as well as subsequent usage behaviour. Owing to the increase in use of technology day by day, HCI has become noticeable domain. The user interface of a system design is the center of discussion as it has distinctive requirements so that information flow should be steady and should not disrupt the user's attention. Same is the case with E-Commerce and Information system websites. In such websites, user satisfaction, loyalty and trust have huge prominence in usability.

Human computer interaction is the learning of designs in technology of computer and the interaction between human and computer which is more particularly user and computer. This study refers to determine how computer technology can be enhanced to be more usable for people. HCI has become the subject of extensive research. The idea being popularize these days is that the interaction between user and computer should be similar to human to human and open dialogue. HCI is a broad field to overlap user-centered design, user interface design and user experience design. Still there remains some difference between HCI and UX designs.

To enhance the quality of website, customization plays an important role. Customization process can give efficient results by making use of the demographic data of the user [2]. Multiple demographics have been used by researchers over the years and the gathering of this data is not an easy task especially of unknown users but once gathered, it gives out exceptional results in term of HCI and user modelling.

As HCI practitioners are more focused on academics being involved in scientific research and development of user understanding and UX designers are more industry focused and involved in building products or services [3] [4].

The interaction between user and system is carried out through a systematic process according to context and other factors. The detailed description and elaboration of user and context development process is given below:



In early days only trained specialists use the computer systems but with the progress of technology computers are everywhere and range of users with different knowledge and experiences are being involved. HCI helps them able to understand the computer interactions without any extensive training. Important purpose of HCI is that user do not have to think that how to use the system.

Physically, HCI emphasizes on selecting more appropriate input and output devices for a specific task [5]. However, the main goals include improvement in:

- **Safety**

  Protect the user from undesirable conditions providing password security, personal information hiding.

- **Utility**

  Providing right functionality for user to perform their tasks for example built in libraries in software and formulas in scientific calculators.

- **Effectiveness**

  Enhance the ability of user to perform their tasks and reach ultimate goal. Main concern is how easily a task can be performed.

- **Efficiency**

How quickly a task can be performed accurately.

- **Usability**

  Usability includes how easily a system can be learned and how easy it to use.

- **Appeal**

  How attractive a system is to engage user with it?

There exists a diversity of interfaces and main goal in HCI is to design interfaces for different environments, people, places and activities. Here are the types of interfaces starting from command line interface to brain computers.

1. Command based

Commands typed at prompt to which the system responds and it is efficient precise and fast but not easy to remember commands. This was the first interface ever introduced as ease for experts to perform their tasks. There are some commands performing some tasks.

2. Virtual reality

Artificial graphical simulations provide illusion to participate in artificial environment rather than actual environment. It is primarily experienced through two of senses; visual and hearing. A person can have better experience with virtual environment with the help of technology.

3. Information visualization

It is visual representation of abstract data in addition with human cognition. Computer generated interaction of graphics of complex data aims to increase discovery and decision making. A single page containing information of world can be example of information visualization.

User interface design is software making process focused on interface look and styles. Designers aim to attractiveness and ease of use and engaging interfaces. Designer should remember that users are human who need comfort and low cognitive loads. Follow these guidelines to deliver impressive GUIs.

a) Keep it simple with invisible feel. Each element must have a purpose.
b) Make elements such as buttons etc; so that users can unconsciously use them.
c) High discoverability using clearly labelled and well indicated icon.
d) Grab user's attention by layout. Hierarch and readability should be focused.
    I. Alignment
    II. Colors
    III. Brightness and contrast

IV. text
V. font size
VI. font style
VII. font distance

e) Minimize user effort by minimizing actions to perform a task.
f) Set control near objects users have to control.
g) Keep user informed with the help of responses.

It is important to understand the basic human perception to handle designs of interfaces. Everyone interpret the world in a different way but there are some similarities that enhance designer's understanding and improvement.

4. Color

Colours are main story tellers and set user's mood. Every color has its own impression and combinations can alter it. It is a challenging task to select a color and its combinations for human brain to response better.

5. Typography

Typography is basis of impressive design. Good typography helps balance the visuals of designs between content and visuals. Some elements are:

- **Colour contrast**

Contrasts helps you visualize text and seems interesting to human brain.

- **Font size**

Font size should be easy to visualize and easy to understand. Size, consistency and alignment is important for good piece of writing.

Leading – spaces between lines of text

Kerning – spaces between characters

Hierarchy – symmetry of headings

- **Font style**

Alphabets are designed with different features, also called as typeface. As different font styles can be used for different purposes such as times new roman is used for more official documents. And other for casual posters etc.

6. Texture

Texture is what user can feel physically but actually these are visual illusions. Tactile texture is the one having height, depth and width with three-dimensional effect.

1.1. Interaction tasks in GMOS

GMOS includes some tasks to evaluate user performance. These tasks could be categorized into clicking, pointing, drag & drop, typing, menu selection and text selection [32].

Pointing

It is prerequisite of clicking activity. User has to move pointer called as cursor, on screen to that object to select it. To move pointer to target point is called as pointing. Pointing is a frequent activity while using interaction operation that involves computer pointing device named as mouse.

Clicking

A major activity of interaction is clicking. Clicking helps in selecting and moving to other activity to perform other tasks too. User have to click on desired option or task pointed by cursor.

Text selection

In this activity, user selects a part of text from a large paragraph. In selection manner, user has to click at starting point on text and drag to the ending point and release the selection button similar to drag and drop requiring more effort. This activity can be used to copy and paste or cut and paste from one place to other. Selected text gets highlighted on mouse release to show the selected piece of text.

Usability Testing Models

The usability testing two different models which have great influence on usability. These models can be categorized as Behavioural model and Biological model. In this research we will use biological models

Biological attributes:

Biological model is related to human being and their physical activities. This model includes attributes such as age, gender etc. [5].

Gender

Male and female process information in a very different method. While using machines such as computers, gender-based factors like decision making power can make a great difference. Females can work better with designs and aesthetics and men can perform better in computing etc.

Age

Young people can easily adapt technology so they can perform well as compared to aged people. The reason is because with increasing ages motor cognition decreases while decreasing the user performance.

Behavioural attributes

Behavioural model has a direct relation with emotions. And it includes how user feels while utilizing a system and how they react to the system. These attributes are categorized into Enjoyment, ease of use, usefulness and satisfaction [6] [7].

Enjoyment:

Enjoyment factor is most important because it has biggest influence on usability of any interface or system. More Enjoyment leads to more engagement of user with system. Actual purpose of observing this attribute is its scale of user engagement and influence of Enjoyment on behavioural attention.

Ease of use

It can be defined as how easy for a user to use a system. It has a direct influence on user mindset that if they would like to use it for next time or not. It has important role in usability evaluation.

Usefulness

Usefulness has a strong relation with usability evaluation. Usefulness has a direct influence on usage of system.

Satisfaction

Satisfaction plays vital role in evaluating usability especially in ecommerce. The increased usability has a positive influence on user satisfaction that generates website loyalty and leads to have more sales.

1.2. Research Objective

This research aims to examine the gender-based and age differences in interaction design elements which may help to design the personalized system. Considering the gaming environment, the main objectives of this research are

- Determination of performance difference during interaction considering different

typographic attributes between genders.

- Determination of the differences in subjective measures between genders during interaction considering different typographic attributes.

1.3. Hypothesis

The literature review proved that there is a significant difference in execution time of children and adults during interaction on different typographic factors with computer applications. But up till now, there is little research available in the literature that discusses such differences concerning gender and age specially in web environment and different typographic factors such as font, font-size, and font-case. Therefore, this study is going to determine the differences between gender and age groups concerning performance measures such as time to perform task and error frequency.

H1: Gender has direct influence on execution time and error frequency with respect to different typographic factors during web interaction.

H2: Gender has direct influence on subjective measures during web interaction.

1.4. Expected Outcomes

Following outcomes are expected from this research:

- The performance difference on different typographic attributes between gender while interacting with the system.
- The performance difference on different typographic attributes between age groups during interaction with the system.
- The Subjective difference between gender while interacting with the system.

1.5. Thesis Summary

This thesis is organized into five different chapters as follows:

Chapter 2 provides a general and multi perceptive overview of the literature on usability testing, Performance evaluation and various sections of literature on automated profiling and personalization. Chapter 3 includes proposed methodology, designing of the prototype, data collection, and discussion of dependent and independent variables. Chapter 4 shows complete Results and Investigation of performance-based measures and chapter 5 gives complete Results and Investigation of subjective based measure followed by chapter 5 with conclusion.

Chapter 2

Literature Review

This chapter introduces the Usability and previous studies to provide the fundamentals of the domain for this thesis. The chapter is arranged in the following order: Section 2.1 discusses the background of the study. Section 2.2 provide the details of related work followed by summary in section 2.3.

2.1. Background

As a regulation and due to past events, Human-Computer Interface (HCI) has brought people from diverse fields together [9]. It is the combination of social and behavioural studies with technology where the most important task is studying how people use the devices and systems which have computation involved in it and how the designers can make it more usable. It is considered as very prominent and rapidly growing factor in today's information technology world [10]. The usability of an interface plays a vital role in the computer applications [11].

Many researchers have done work using different demographic data and typography features to check the usability and performance of websites and application. Sinan Aşçı [6] did similar work by taking handedness as primary factor in which he differentiated characteristics of left and right-handed people on mobile application. This study analysed some primary gestures like holding, tapping, sliding, and scrolling up/down. Subjective measures were used to check the performance of the left and right-handed users. It was a questionnaire-based research.

Hojjati, N., & Muniandy [12] used typography features of font type and spacing to check onscreen readability and performance of users. Hypothesis was proposed. This research was done using dual fonts that were *Times New Roman* and *Verdana* with 12 font size. The results were gathered via questionnaire to perform different statistical Investigation. Sonderegger, Andreas & Schmutz, Sven & Sauer, Jürgen [13] performed an interesting study by using age as primary factor for usability testing on 2 technological devices which was on- 7 screen and smartphone. The measures which were covered in this finding were completion rate of the task, usability, effectiveness and workload. Questionnaire and experimentation were individually involved in finding the conclusion.

Another research was performed by Darroch, Iain & Goodman-Deane, Joy & Brewster, Stephen & D. Gray, Philip [14] in which one typography feature of font size and a primary factor of age

was involved. This study was done on handheld device and factor of readability was measured by experimentation and questionnaire with Mann-Whitney test was used for final evaluation. Similarly, some studies cover the aspect of usability as Cawthon, Moere [15] used the aesthetic effect along with efficiency and effectiveness on 11 data visualization tasks on the basis of color, typography and layout. The measures covered were time of completion, accuracy, potency. It was a survey-based research for validation along with ANOVA test for statistical data results.

Fernandez Lanvin et al. [16] lately alike work to regulate the users demographic by witnessing its usefulness with the system. They measured vital responsibilities of interaction in their learning and they calculated user presentation and showed facts that sex and age have the major impact on users' conduct in ecommerce system. To assess results, experiment was done on five hundred and ninety two unpaid helper and analyse their production using many multiple methods statistically.

Lumpur et al. [17] did a research to investigate the influence of age on culturally accommodated websites. They experiment 156 participants with division into four age groups. To examine the result, they consider three prototypes of website out of which two websites were culturally different while one website was neutral. They measured efficiency, Effectiveness, Learnability, and Satisfaction using Illustrative statistical methods.

D Fernandez-Lanvin [19] did an amazing study by personalizing the E-Commerce website by taking age and gender as demographics of user data. The main task involved were checking the interaction activities such as Click, Drop and Item Select. They also used handedness in this research but not as primary factor but rather a controlled variable because according to them the using of E-Commerce websites have a lot of relation with the amount of practice. 592 participants participated in this study. The results proved that age and gender are important factors and performance among young people was much satisfactory than older people. Males also performed much better than female users.

CMN Faisal [20] estimated the user performance on an E-Commerce website prototype by applying the web design features on it and determining satisfaction, trust and loyalty. 662 respondents participated in this questionnaire-based research in which 558 valid responses were considered appropriate. This study's main objective was building trust and loyalty in highly uncertain avoidance culture. A prototype was developed by using typeface Helvetica, spacing of 1.08, size ranging from 12 to 20pt and black, white, blue, green and pink color interface. The results strongly supported the model and hypothesis proposed. Factors of trust and loyalty was seen in strong relation in risky cultures. Preferences of topography has also been discussed in

multiple studies performed. High quality typography increases the website quality while poor typography results into a negative influence on the users and they get bored eventually as visually it's not appealing. [21] [22].

To evaluate the influence of gender on navigation and impression of academic website the author Ramakrishnan et al. [23] gave a study. The author performs experiments to find out the relationship of gender with website characteristic and impression. In their study they perform experiments on 2 academic websites with 450 participants from which 228 were female and 222 were male. Their study gives strong evidence that males are attracted to website quality characteristics while females are more concern with website navigations rather than quality attributes.

M Benaida [24] did a study to find the aspects influencing the usableness of educational website for Algeria. As information transfer has become easy for most universities by websites therefore, they give special consideration to keep it updated. Educational websites are used by many people for multiple purposes like information gathering, course offering detail, contacts etc. so its interface matter a lot. If the interface is not appealing then it won't engage much users. In this study, the researcher took over four factors to evaluate the usability of website which were efficiency, learnability, web content and satisfaction. Hypothesis was proposed against each factor and websites of 4 Algerian institutions which were highest in ranking were targeted in this study. Sample size of 200 undergraduate and postgraduate students was selected and they were asked to use the websites. The results were evaluated by CSUQ questionnaire and experimentation by giving four tasks to the students which involved number of clicks and task completion time. It concluded that the students were overall not satisfied with the interface of the websites and the structure, content, quality, color combination was poor.

AM Santos [25] did a study on the usability and performance of high school websites. This was a questionnaire-based research and sample size of 200 was taken. Four sites were evaluated and factors of performance on the basis of navigation and satisfaction were analysed. The user showed positive feedback on usability but were not happy with the way of deliverance of information on the site.

In this paper [26], L. Hasan evaluated the usability of the institution website which is based on the students and preferences of design characteristics. This study investigated the importance of the specific design criteria, in the evaluating the usability of the institution website on the bases of students. This research evaluated the usability on the nine institutional websites and the performance factor content and navigation. The results of this research shows that the students

were satisfied with the tested institutional websites on the bases of content and navigation (easy to use), however the design of the websites were not satisfied.

Vargas [27], explored the study on web accessibility policies alimented by more than 50 universities all over the world. Web accessibility evaluation was applied to validate the accordance to the WCAG 2.0 by the World Wide Web Consortium (W3C). The results indicate that 44 out 51 universities failed the achieved according the web accessibility policies.

In this paper [28], the authors analysed web approachability of top universities graded in Spain, Mexico and Chile. The research was assessed on top 15 universities listed by in the ranking Webometrics. The results of selected universities show that web site have blockades of access to information. The results of selected universities have not able to achieve the standard of the WCAG 2.0 specially conformance level A.

Patricia Acosta-Vargas et al. [29] conducted study on website accessibility of various higher-education websites. In this study the authors applied Website Accessibility Conformance Evaluation Methodology (WCAG-EM) approach in order to conform that the website fulfil the requirements of the WCAG 2.0. The main objective of the study is to Investigation that people with infirmities can access the website of higher education with ease. The results show that the mostly tested websites of universities are unable to get satisfactory level of acquiescence.

In another study [36], usability was tested in gaming environment by taking account disable students. Three categories were tested which included design, accessibility and playability. They presented nine points and tips on the improvement of interface whose focus was more customization, flexibility, clear information, full accessibility to support knowledge and information should be conveyed via multiple platforms like audio, video, text etc.

Sergey Sergeev [37] did a study in which gaming environment was focused and its usability was discussed in cybersports. The interface of a specific game is analysed by some volunteers and all the requirements, definitions, properties of user behaviour that come under the ISO are explained and formulated.

2.2. Summary

This chapter summarize the literature review for the current study. The chapter begins with the introduction followed by background study. This chapter ends with summary.

Chapter 3
Proposed Methodology

The proposed methodologies applied to conduct this research have been discussed in this section. A research model is also outlined which was the motivation and thought for doing this Investigation. The tools used for gathering the data and method that was pursued this study are added as well. The detailed description of participants of the study is also part of this chapter. The method and techniques through which the participants were sampled to perform Investigation are also explained in this chapter. The chapter started with section 1 which includes the description of research design followed by the section 2 for description of variables. The section 3 includes he details of participants followed by section 4 for Investigation methods. Summary concludes the chapter in section 5.

The nature of this research is exploratory as it attempts to seek out performance difference on different typographic factors between males and female. This study focuses on web usability solely and not on gamification. Along with it, it aims to seek out the performance difference on different typographic factors between different age groups. Furthermore, it also included the subjective measures such as Enjoyment, ease of use, usefulness and irritation [33]. To conduct this study and experiments a prototype was designed in FLASH AS 3.0 which was hosted on web server to make it accessible throughout the experimental venue. The members of the tentative study were assigned unique piece of work designed through different typographic factors in experiments. The detailed description of the experimental prototype is given below.

3.1. Composition

For the data collection gaming prototype was developed in flash as 3.0. The reason of game prototype creation was to gather interest of the user while experiment conduction. Games make a participant more involved in the study as there are multiple tasks which are to be performed in order to gather results. The designed prototype included different tasks and activities through which participants were given tasks using different typographic factors. These tasks include 16 activities with different typographic factors. The prototype also included questionnaire at the end of tasks to measure the subjective behavioural attributes of the participants. The questionnaire was designed on Likert scale to measure the attributes.

Details of the activities can be seen in Appendices.

This study is majorly divided into two type of measures i.e. Objective measure and Subjective measure. The objective measure is performed on the data collected through experiments and subjective measures is performed on the data collected through questionnaire on the Likert Scale.

3.1.1. Subjective Measures

The hypothesis was tested through a questionnaire for some subjective measures and for that Likert scale was considered. The subjective measures were separated into four categories as found in Frederick. research i.e., Enjoyment, Usefulness, Ease of Use and Satisfaction. The details of the questionnaire are mentioned in *Table 3-1* [33].

Table 3-1 Details of Subjective Measure [33]

Subjective Measure	
Enjoyment [34]	• Sometimes I lose track of time when I am using the website • I am absorbed in what I am doing • I enjoy using this website • This application allows me to control my website interaction • Interacting with this website makes me curious.
Usefulness	• The application provided me with relevant information to facilitate my decision • The Application helped me to meet my decision-making need • Enable me to have a better search
Ease of Use	• I could easily search for information. • I took little effort to find the information I needed. • The application allowed me to make a decision quickly.
Satisfaction	• Over all, I am satisfied with the interface of this website. • My current experience with this website is satisfactory.

3.1.2. Objective Measure

To measure the performance, Execution Time and Error Clicks were considered as variables. The details are given below in Table 3-2, 3-3, and 3-4.

Table 3-2 Details of Objective Measures – Clicking

Name	**Description**
Clicking Times New Roman 14Pt, Upper Case	Time to Complete Task Error Clicks
Clicking Times New Roman 14Pt, Lower Case	Time to Complete Task Error Clicks
Clicking Times New Roman 16Pt, Upper Case	Time to Complete Task Error Clicks
Clicking Times New Roman 16Pt, Lower Case	Time to Complete Task Error Clicks
Clicking Times New Roman 18Pt, Upper Case	Time to Complete Task Error Clicks
Clicking Times New Roman 18Pt, Lower Case	Time to Complete Task Error Clicks
Clicking Arial 14Pt, Upper Case	Time to Complete Task Error Clicks
Clicking Arial 14Pt, Lower Case	Time to Complete Task Error Clicks
Clicking Arial 16Pt, Upper Case	Time to Complete Task Error Clicks

Clicking **Arial 16Pt, Lower Case**	Time to Complete Task Error Clicks
Clicking **Arial 18Pt, Upper Case**	Time to Complete Task Error Clicks
Clicking **Arial 18Pt, Lower Case**	Time to Complete Task Error Clicks

Table 3-3 Details of Objective Measures – Text Selection

Name	Description
Text Selection **Times New Roman 14Pt, Upper Case**	Time to Complete Task Error Clicks
Text Selection **Times New Roman 14Pt, Lower Case**	Time to Complete Task Error Clicks
Text Selection **Times New Roman 16Pt, Upper Case**	Time to Complete Task Error Clicks
Text Selection **Times New Roman 16Pt, Lower Case**	Time to Complete Task Error Clicks
Text Selection **Times New Roman 18Pt, Upper Case**	Time to Complete Task Error Clicks
Text Selection **Times New Roman 18Pt, Lower Case**	Time to Complete Task Error Clicks

Text Selection **Arial 14Pt, Upper Case**	Time to Complete Task Error Clicks
Text Selection **Arial 14Pt, Lower Case**	Time to Complete Task Error Clicks
Text Selection **Arial 16Pt, Upper Case**	Time to Complete Task Error Clicks
Text Selection **Arial 16Pt, Lower Case**	Time to Complete Task Error Clicks
Text Selection **Arial 18Pt, Upper Case**	Time to Complete Task Error Clicks
Text Selection **Arial 18Pt, Lower Case**	Time to Complete Task Error Clicks

Table 3-4 Details of Typographic Factors

Typographic factors	Features Tested
Font	Times New Roman, Arial
Font Size	14 pt, 16 pt, 18 pt
Casing	UPPERCASE, lowercase

3.2. Contributors and Information Gathering

The experiment was performed in labs with a very precise environment suitable for students. The facility of desktop and laptops were given for effective experimentation. The sample of 84 contributors were selected to for the data Investigation. Data is divided into 2 major classes i.e. Gender and Age. The distribution of data with gender is 40.5% participants are female, 59.5% of the collected data belongs to male gender. The data distribution is presented in Figure 3-1:

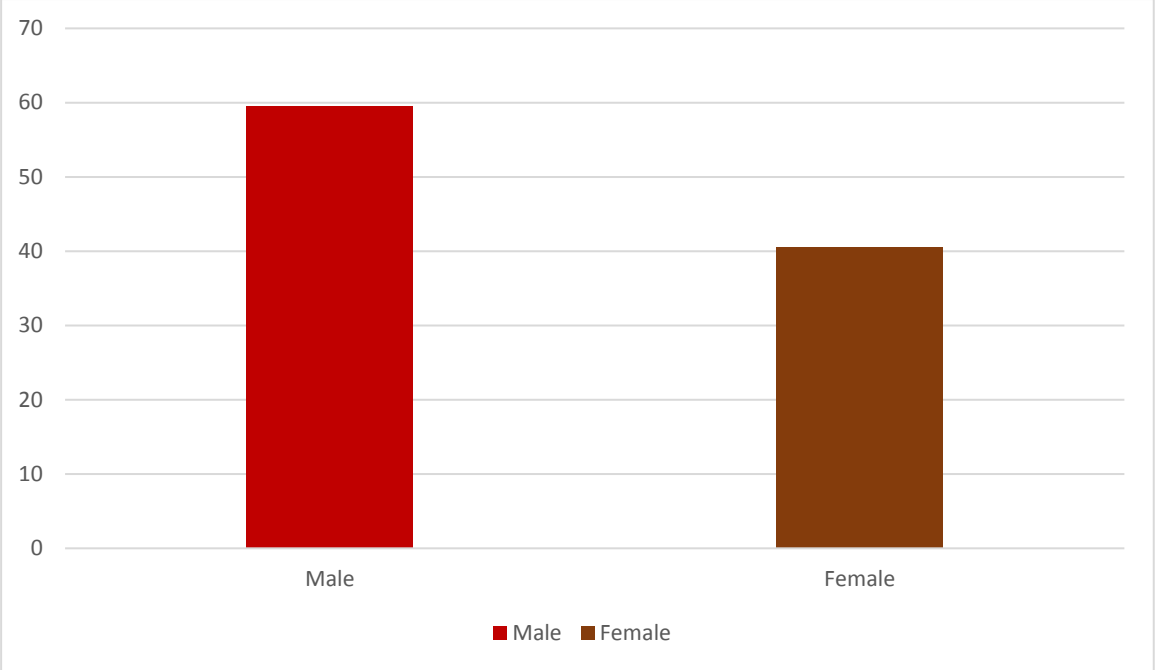


Figure 3-1 Demographic information of participants

3.3. Statistical Measurement

SPSS Statistical tool is picked for Investigation of data. Illustrative Figures and One-Way ANOVA (Investigation of Variance) is applied further for effective results.

3.4. Summary

Proposed methodology is concluded in this chapter. This chapter started with introduction followed by four sections of results i.e. Research Design, Contributors and Information Gathering. This chapter ends with summary.

Chapter 4
Discussion and Results

This chapter explains data analysing and finding from data of 84 participants collected through gaming prototype. This chapter is majorly based on performance measures. The Investigation of data is carried out through well-known statistical Investigation methods ANOVA (Investigation of Variance).

4.1. Distinction of Investigation between males and females

According to the proposed hypothesis H1, Males and Females behave different through interaction in the gaming environment. To test the proposed hypothesis different statistical methods are applied to data. The collected data is analysed by using One Way ANOVA that is eminent statistical method used to test if there are any statistically substantial variances between the mean of two or more independent (unrelated) groups.

4.1.1 Distinction of Investigation in Clicking activity

Time New Roman 14 Pt

To measure the difference in execution time during clicking activity between males (1) and females (0) data, One Way ANOVA is used for Investigation. Results against this variable with respect to Illustrative Figures shows that the mean execution time of males is 2.70 ± 0.160 and 3.08 ± 0.183 while the mean execution time of females is 2.65 ± 0.173 and 2.09 ± 0.160. Similarly, the mean errors of males are 0.48 ± 0.172 while mean errors of females are 0.00 ± 0.000 as shown in Table 4-1.

Table 4-1 Illustrative Figures of clicking - Times New Roman - 14 Pt

		N	Mean	Std. Deviation	Std. Error
TNR 14 U Time	**0**	**34**	**2.65**	**1.012**	**.173**
	1	**50**	**2.70**	**1.129**	**.160**
	Total	**84**	**2.68**	**1.077**	**.118**
TNR 14 L Time	**0**	**34**	**2.09**	**.933**	**.160**
	1	**50**	**3.08**	**1.291**	**.183**
	Total	**84**	**2.68**	**1.253**	**.137**
TNR 14 U Error	**0**	**34**	**.00**	**.000**	**.000**
	1	**50**	**.48**	**1.216**	**.172**
	Total	**84**	**.29**	**.964**	**.105**
TNR 14 L Error	**0**	**34**	**.00**	**.000**	**.000**
	1	**50**	**.48**	**1.216**	**.172**
	Total	**84**	**.29**	**.964**	**.105**

The result of ANOVA on data of clicking activity within gender group disclosed that sig. value of Clicking Time is 0.827 (Upper Case) and 0.00 (Lower Case), which is below 0.05 therefore, there is a statistically significant difference in the clicking time with Lower case between males and females. Similarly, the significance value of Clicking error is 0.024 and 0.024, which is also below 0.05 so statistically significant difference in clicking error found between males and females. Comprehensive outcomes are mentioned in Table 4-2.

Table 4-2 Results of clicking (ANOVA) - Times New Roman - 14 Pt

		Mean Square	F	Sig.
TNR 14 U Time	Between Groups	.057	.048	.827
	Within Groups	1.174		
	Total			
TNR 14 L Time	Between Groups	19.906	14.783	.000
	Within Groups	1.347		
	Total			
TNR 14 U Error	Between Groups	4.663	5.275	.024
	Within Groups	.884		
	Total			
TNR 14 L Error	Between Groups	4.663	5.275	.024
	Within Groups	.884		
	Total			

Time New Roman 16 Pt

To measure the difference in execution time during clicking activity between males (1) and females (0) data, One Way ANOVA is used for Investigation. Results against this variable with respect to Illustrative Figures shows that the mean execution time of males is 3.716 ± 0.112 and 2.32 ± 0.165 while the mean execution time of females is 2.35 ± 0.152 and 2.24 ± 0.181. Similarly, the mean errors of males are 1.06 ± 0.228 & 0.16 ± 0.078 while mean errors of females are 0.03 ± 0.029 & 1.09 ± 0.186 as shown in Table 4-3.

Table 4-3 Illustrative Figures of clicking - Times New Roman - 16 Pt

		N	Mean	Std. Deviation	Std. Error
TNR 16 U Time	0	34	2.35	.884	.152
	1	50	3.16	.792	.112
	Total	84	2.83	.916	.100
TNR 16 L Time	0	34	2.24	1.075	.184
	1	50	2.32	1.168	.165
	Total	84	2.29	1.126	.123
TNR 16 U Error	0	34	.03	.171	.029
	1	50	1.06	1.609	.228
	Total	84	.64	1.341	.146
TNR 16 L Error	0	34	1.09	1.083	.186
	1	50	.16	.548	.078
	Total	84	.54	.924	.101

The result of ANOVA on data of clicking activity within gender group disclosed that sig. value of Clicking Time is 0.00 (Upper Case) and 0.737 (Lower Case), which is below 0.05 therefore, there is a statistically significant difference in the clicking time with Upper case between males and females. Similarly, the significance value of Clicking error is 0.000 and 0.000, which is also below 0.05 so statistically significant difference in clicking error found between males and females. Comprehensive outcomes are mentioned in Table 4-4.

Table 4-4 Results of clicking (ANOVA) - Times New Roman - 16 Pt

		Mean Square	F	Sig.
TNR 16 U Time	Between Groups	13.182	19.137	.000
	Within Groups	.689		
TNR 16 L Time	Between Groups	.145	.113	.737
	Within Groups	1.280		
	Total			
TNR 16 U Error	Between Groups	21.495	13.793	.000
	Within Groups	1.558		
	Total			
TNR 16 L Error	Between Groups	17.438	26.749	.000
	Within Groups	.652		
	Total			

Time New Roman 18Pt

To measure the difference in execution time during clicking activity between males (1) and females (0) data, One Way ANOVA is used for Investigation. Results against this variable with respect to Illustrative Figures shows that the mean execution time of males is 2.80 ± 0.164 and 1.72 ± 0.125 while the mean execution time of females is 2.12 ± 0.145 and 1.41 ± 0.925. Similarly, the mean errors of males are 0.46 ± 0.181 & 0.36 ± 0.252 while mean errors of females are 0.00 ± 0.000 as shown in Table 4-5.

Table 4-5 Illustrative Figures of clicking - Times New Roman – 18pt

		N	Mean	Std. Deviation	Std. Error
TNR 18 U Time	0	34	2.12	.844	.145
	1	50	2.80	1.161	.164
	Total	84	2.52	1.092	.119
TNR 18 L Time	0	34	1.41	.925	.159
	1	50	1.72	.882	.125
	Total	84	1.60	.907	.099
TNR 18 U Error	0	34	.00	.000	.000
	1	50	.46	1.281	.181
	Total	84	.27	1.010	.110
TNR 18 L Error	0	34	.00	.000	.000
	1	50	.36	1.782	.252
	Total	84	.21	1.380	.151

The result of ANOVA on data of clicking activity within gender group disclosed that sig. value of Clicking Time is 0.004 (Upper Case) and 0.17 (Lower Case), which is below 0.05 therefore, there is a statistically significant difference in the clicking time with Upper case between males and females. Similarly, the significance value of Clicking error is 0.040 and 0.243, which is also below 0.05 so statistically significant difference in clicking error (Upper Case) found between males and females. Comprehensive outcomes are mentioned in Table 4-6.

Table 4-6 Results of clicking (ANOVA) - Times New Roman - 18 Pt

		Mean Square	F	Sig.
TNR 18 U Time	Between Groups	9.423	8.630	.004
	Within Groups	1.092		
	Total			
TNR 18 L Time	Between Groups	1.923	2.378	.127
	Within Groups	.809		
	Total			
TNR 18 U Error	Between Groups	4.282	4.367	.040
	Within Groups	.981		
	Total			
TNR 18 L Error	Between Groups	2.623	1.383	.243
	Within Groups	1.897		
	Total			

Arial 14 Pt

To measure the difference in execution time during clicking activity between males (1) and females (0) data, One Way ANOVA is used for Investigation. Results against this variable with respect to Illustrative Figures shows that the mean execution time of males is 3.10 ± 0.210 and 3.16 ± 0.112 while the mean execution time of females is 2.47 ± 0.204 and 2.35 ± 0.152. Similarly, the mean errors of males are 0.24 ± 0.142 & 0.04 ± 0.28 while mean errors of females are 0.00 ± 0.00 & 0.24 ± 0.112 as shown in Table 4-7.

Table 4-7 Illustrative Figures of clicking - Arial – 14

		N	Mean	Std. Deviation	Std. Error
Arial 14 U Time	0	34	2.47	1.187	.204
	1	50	3.10	1.488	.210
	Total	84	2.85	1.401	.153
Arial 14 L Time	0	34	2.35	.884	.152
	1	50	3.16	.792	.112
	Total	84	2.83	.916	.100
Arial 14 U Error	0	34	.00	.000	.000
	1	50	.24	1.001	.142
	Total	84	.14	.778	.085
Arial 14 L Error	0	34	.24	.654	.112
	1	50	.04	.198	.028
	Total	84	.12	.450	.049

The result of ANOVA on data of clicking activity within gender group disclosed that sig. value of Clicking Time is 0.043 (Upper Case) and 0.00 (Lower Case), which is below 0.05 therefore, there is a statistically significant difference in the clicking time between males and females. Similarly, the significance value of Clicking error is 0.167 and 0.050, which is also below 0.05 so statistically significant difference in clicking error (Lower Case) found between males and females. Comprehensive outcomes are mentioned in Table 4-8.

Table 4-8 Results of clicking (ANOVA) - Arial - 14 Pt

		Mean Square	F	Sig.
Arial 14 U Time	Between Groups	8.018	4.242	.043
	Within Groups	1.890		
	Total			
Arial 14 L Time	Between Groups	13.182	19.137	.000
	Within Groups	.689		
	Total			
Arial 14 U Error	Between Groups	1.166	1.946	.167
	Within Groups	.599		
	Total			
Arial 14 L Error	Between Groups	.772	3.947	.050
	Within Groups	.196		
	Total			

Arial 16 Pt

To measure the difference in execution time during clicking activity between males (1) and females (0) data, One Way ANOVA is used for Investigation. Results against this variable with respect to Illustrative Figures shows that the mean execution time of males is 2.90 ± 0.129 and 2.18 ± 0.203 while the mean execution time of females is 2.62 ± 0.174 and 1.44 ± 0.121. Similarly, the mean errors of males are 0.00 ± 0.00 & 0.08 ± 0.056 while mean errors of females are 0.18 ± 0.0123 & 0.00 ± 0.00 as shown in Table 4-9.

Table 4-9 Illustrative Figures of clicking - Arial - 16

		N	Mean	Std. Deviation	Std. Error
Arial 16 U Time	0	34	2.62	1.015	.174
	1	50	2.90	.909	.129
	Total	84	2.79	.958	.105
Arial 16 L Time	0	34	1.44	.705	.121
	1	50	2.18	1.438	.203
	Total	84	1.88	1.246	.136
Arial 16 U Error	0	34	.18	.716	.123
	1	50	.00	.000	.000
	Total	84	.07	.460	.050
Arial 16 L Error	0	34	.00	.000	.000
	1	50	.08	.396	.056
	Total	84	.05	.307	.033

The result of ANOVA on data of clicking activity within gender group disclosed that sig. value of Clicking Time is 0.186 (Upper Case) and 0.007 (Lower Case), which is below 0.05 therefore, there is a statistically significant difference in the clicking time with Lower case between males and females. Similarly, the significance value of Clicking error is 0.084 and 0.243, which is above 0.05 so statistically no significant difference in clicking error found between males and females. Comprehensive outcomes are mentioned in Table 4-10.

Table 4-10 Results of clicking (ANOVA) - Arial - 16 Pt

		Mean Square	F	Sig.
Arial 16 U Time	Between Groups	1.613	1.775	.186
	Within Groups	.909		
	Total			
Arial 16 L Time	Between Groups	11.047	7.692	.007
	Within Groups	1.436		
	Total			
Arial 16 U Error	Between Groups	.630	3.051	.084
	Within Groups	.207		
	Total			
Arial 16 L Error	Between Groups	.130	1.383	.243
	Within Groups	.094		
	Total			

Arial 18 Pt

To measure the difference in execution time during clicking activity between males (1) and females (0) data, One Way ANOVA is used for Investigation. Results against this variable with respect to Illustrative Figures shows that the mean execution time of males is 2.90 ± 0.174 and 1.7 ± 0.157 while the mean execution time of females is 2.24 ± 0.164 and 1.15 ± 0.086. Similarly, the mean errors of males are 0.00 ± 0.00 while mean errors of females are 0.04 ± 0.028 as shown in Table 4-11.

Table 4-11 Illustrative Figures of clicking - Arial - 18

		N	Mean	Std. Deviation	Std. Error
Arial 18 U Time	0	34	2.24	.955	.164
	1	50	2.90	1.233	.174
	Total	84	2.63	1.170	.128
Arial 18 L Time	0	34	1.15	.500	.086
	1	50	1.78	1.112	.157
	Total	84	1.52	.963	.105
Arial 18 U Error	0	34	.00	.000	.000
	1	50	.04	.198	.028
	Total	84	.02	.153	.017
Arial 18 L Error	0	34	.00	.000	.000
	1	50	.04	.198	.028
	Total	84	.02	.153	.017

The result of ANOVA on data of clicking activity within gender group disclosed that sig. value of Clicking Time is 0.010 (Upper Case) and 0.003 (Lower Case), which is below 0.05 therefore, there is a statistically significant difference in the clicking time between males and females. Similarly, the significance value of Clicking error is 0.243 and 0.243, which is above 0.05 so statistically significant no difference in clicking error found between males and females. Comprehensive outcomes are mentioned in Table 4-12.

Table 4-12 Results of clicking (ANOVA) - Arial - 18 Pt

		Mean Square	F	Sig.
Arial 18 U Time	Between Groups	8.942	7.009	.010
	Within Groups	1.276		
	Total			
Arial 18 L Time	Between Groups	8.108	9.657	.003
	Within Groups	.840		
	Total			
Arial 18 U Error	Between Groups	.032	1.383	.243
	Within Groups	.023		
	Total			
Arial 18 L Error	Between Groups	.032	1.383	.243
	Within Groups	.023		
	Total			

4.1.2 Distinction of Investigation in Text Selection activity

Time New Roman 14 Pt

To measure the difference in execution time during clicking activity between males (1) and females (0) data, One Way ANOVA is used for Investigation. Results against this variable with respect to Illustrative Figures shows that the mean execution time of males is 34.10 ± 4.410 and 13.16 ± 1.018 while the mean execution time of females is 22.38 ± 2.506 and 16.12 ± 1.881. Similarly, the mean errors of males are 2.16 ± 0.501 & 0.80 ± 0.246 while mean errors of females are 1.12 ± 0.222 & 0.26 ± 0.114 as shown in Table 4-13.

Table 4-13 Illustrative Figures of Text Selection - Times New Roman - 14 Pt

		N	Mean	Std. Deviation	Std. Error
TNR 14 U T	0	34	22.38	14.612	2.506
	1	50	34.10	31.184	4.410
	Total	84	29.36	26.314	2.871
TNR 14 L T	0	34	16.12	10.970	1.881
	1	50	13.16	7.201	1.018
	Total	84	14.36	8.977	.980
TNR 14 U E	0	34	1.12	1.297	.222
	1	50	2.16	3.542	.501
	Total	84	1.74	2.888	.315
TNR 14 L E	0	34	.26	.666	.114
	1	50	.80	1.738	.246
	Total	84	.58	1.424	.155

The result of ANOVA on data of Text Selection activity within gender group disclosed that sig. value of Text Selection Time is 0.044 (Upper Case) and 0.139 (Lower Case), which is below 0.05 therefore, there is a statistically significant difference in the clicking time with Upper case between males and females. Similarly, the significance value of Selection error is 0.105 and 0.091, which is above 0.05 so no statistically significant difference in selection error found between males and females. Comprehensive outcomes are mentioned in Table 4-14.

Table 4-14 Results of Text Selection (ANOVA) - Times New Roman - 14 Pt

		Mean Square	F	Sig.
TNR 14 U T	Between Groups	2778.756	4.166	.044
	Within Groups	667.006		
	Total			
TNR 14 L T	Between Groups	177.036	2.229	.139
	Within Groups	79.418		
	Total			
TNR 14 U E	Between Groups	21.989	2.690	.105
	Within Groups	8.174		
	Total			
TNR 14 L E	Between Groups	5.799	2.924	.091
	Within Groups	1.983		
	Total			

Time New Roman 16 Pt

To measure the difference in execution time during text selection activity between males (1) and females (0) data, One Way ANOVA is used for Investigation. Results against this variable with respect to Illustrative Figures shows that the mean execution time of males is 17.08 ± 1.505 and 24.10 ± 3.075 while the mean execution time of females is 17.03 ± 4.317 and 19.12 ± 2.393. Similarly, the mean errors of males are 0.64 ± 0.142 & 1.44 ± 0.588 while mean errors of females are 0.21 ± 0.070 & 0.50 ± 0.159 as shown in Table 4-15.

Table 4-15 Illustrative Figures of Text Selection - Times New Roman - 16 Pt

		N	Mean	Std. Deviation	Std. Error
TNR 16 U T	0	34	17.03	25.172	4.317
	1	50	17.08	10.642	1.505
	Total	84	17.06	17.854	1.948
TNR 16 L T	0	34	19.12	13.954	2.393
	1	50	24.10	21.746	3.075
	Total	84	22.08	19.044	2.078
TNR 16 U E	0	34	.21	.410	.070
	1	50	.64	1.005	.142
	Total	84	.46	.842	.092
TNR 16 L E	0	34	.50	.929	.159
	1	50	1.44	4.161	.588
	Total	84	1.06	3.283	.358

The result of ANOVA on data of text selection activity within gender group disclosed that sig. value of Clicking Time is 0.990 (Upper Case) and 0.242 (Lower Case) which is above 0.05 therefore, there is no statistically significant difference in the text selection time between males and females. Similarly, the significance value of text selection is 0.019 and 0.200, which is below 0.05 so statistically significant difference in text selection (Upper Case) found between males and females. Comprehensive outcomes are mentioned in Table 4-16.

Table 4-16 Results of Text Selection (ANOVA) - Times New Roman - 16 Pt

		Mean Square	F	Sig.
TNR 16 U T	Between Groups	.052	.000	.990
	Within Groups	322.666		
	Total			
TNR 16 L T	Between Groups	502.387	1.392	.242
	Within Groups	360.952		
	Total			
TNR 16 U E	Between Groups	3.814	5.678	.019
	Within Groups	.672		
	Total			
TNR 16 L E	Between Groups	17.882	1.672	.200
	Within Groups	10.693		
	Total			

Time New Roman 18 Pt

To measure the difference in execution time during text selection activity between males (1) and females (0) data, One Way ANOVA is used for Investigation. Results against this variable with respect to Illustrative Figures shows that the mean execution time of males is 12.08 ± 1.407 and 23.80 ± 5.317 while the mean execution time of females is 13.71 ± 1.569 and 10.76 ± 1.143. Similarly, the mean errors of males are 0.80 ± 0.225 & 17.00 ± 7.075 while mean errors of females are 1.00 ± 0.280 & 0.56 ± 0.159 as shown in Table 4-17.

Table 4-17 Illustrative Figures of Text Selection - Times New Roman - 18 Pt

		N	Mean	Std. Deviation	Std. Error
TNR 18 U T	0	34	13.71	9.150	1.569
	1	50	12.08	9.946	1.407
	Total	84	12.74	9.609	1.048
TNR 18 L T	0	34	10.76	6.665	1.143
	1	50	23.80	37.597	5.317
	Total	84	18.52	29.893	3.262
TNR 18 U E	0	34	1.00	1.633	.280
	1	50	.80	1.591	.225
	Total	84	.88	1.601	.175
TNR 18 L E	0	34	.56	.927	.159
	1	50	17.00	50.028	7.075
	Total	84	10.35	39.291	4.287

The result of ANOVA on data of text selection activity within gender group disclosed that sig. value of Clicking Time is 0.450 (Upper Case) and 0.049 (Lower Case), which is below 0.05 therefore, there is a statistically significant difference in the text selection time with Lower case between males and females. Similarly, the significance value of selection error is 0.577 and 0.059, which is above 0.05 so no statistically significant difference in text selection error found between males and females. Comprehensive outcomes are mentioned in Table 4-18.

Table 4-18 Results of Text Selection (ANOVA) - Times New Roman - 18 Pt

		Mean Square	F	Sig.
TNR 18 U T	Between Groups	53.499	.576	.450
	Within Groups	92.814		
	Total			
TNR 18 L T	Between Groups	3438.835	3.987	.049
	Within Groups	862.562		
	Total			
TNR 18 U E	Between Groups	.810	.313	.577
	Within Groups	2.585		
	Total			
TNR 18 L E	Between Groups	5470.606	3.657	.059
	Within Groups	1495.907		
	Total			

Arial 14 PT

To measure the difference in execution time during text selection activity between males (1) and females (0) data, One Way ANOVA is used for Investigation. Results against this variable with respect to Illustrative Figures shows that the mean execution time of males is 12.26 ± 1.168 and 14.18 ± 1.262 while the mean execution time of females is 12.56 ± 1.618 and 11.00 ± 0.463. Similarly, the mean errors of males are 0.42 ± 0.091 & 2.40 ± 0.947 while mean errors of females are 0.24 ± 0.095 & 0.53 ± 0.287 as shown in Table 4-19.

Table 4-19 Illustrative Figures of Text Selection - Arial - 14 Pt

		N	Mean	Std. Deviation	Std. Error
Arial 14 U T	0	34	12.56	9.433	1.618
	1	50	12.26	11.892	1.682
	Total	84	12.38	10.904	1.190
Arial 14 L T	0	34	11.00	8.532	1.463
	1	50	14.18	8.921	1.262
	Total	84	12.89	8.854	.966
Arial 14 U E	0	34	.24	.554	.095
	1	50	.42	.642	.091
	Total	84	.35	.611	.067
Arial 14 L E	0	34	.53	1.674	.287
	1	50	2.40	6.694	.947
	Total	84	1.64	5.332	.582

The result of ANOVA on data of text selection activity within gender group disclosed that sig. value of Clicking Time is 0.903 (Upper Case) and 0.107 (Lower Case), which is above 0.05 therefore, there is no statistically significant difference in the text selection time with Lower case between males and females. Similarly, the significance value of text selection error is 0.175 and 0.115, which is also above 0.05 so no statistically significant difference in clicking time found between males and females. Comprehensive outcomes are mentioned in Table 4-20.

Table 4-20 Results of Text Selection (ANOVA) -Arial - 14 Pt

		Mean Square	F	Sig.
Arial 14 UT	Between Groups	1.807	.015	.903
	Within Groups	120.317		
	Total			
Arial 14 LT	Between Groups	204.656	2.663	.107
	Within Groups	76.846		
	Total			
Arial 14 UE	Between Groups	.690	1.869	.175
	Within Groups	.369		
	Total			
Arial 14 LE	Between Groups	70.815	2.537	.115
	Within Groups	27.908		
	Total			

Arial 16 Pt

To measure the difference in execution time during text selection activity between males (1) and females (0) data, One Way ANOVA is used for Investigation. Results against this variable with respect to Illustrative Figures shows that the mean execution time of males is 11.76 ± 1.487 and 13.68 ± 1.208 while the mean execution time of females is 9.38 ± 1.562 and 12.88 ± 3.029. Similarly, the mean errors of males are 0.36 ± 0.089 & 0.40 ± 0.081 while mean errors of females are 0.32 ± 0.101 & 0.56 ± 0.190 as shown in Table 4-21.

Table 4-21 Illustrative Figures of Text Selection - Arial - 16 Pt

		N	Mean	Std. Deviation	Std. Error
Arial 16 U T	0	34	9.38	9.105	1.562
	1	50	11.76	10.514	1.487
	Total	84	10.80	9.980	1.089
Arial 16 L T	0	34	12.88	17.661	3.029
	1	50	13.68	8.541	1.208
	Total	84	13.36	12.932	1.411
Arial 16 U E	0	34	.32	.589	.101
	1	50	.36	.631	.089
	Total	84	.35	.611	.067
Arial 16 L E	0	34	.56	1.106	.190
	1	50	.40	.571	.081
	Total	84	.46	.828	.090

The result of ANOVA on data of text selection activity within gender group disclosed that sig. value of text selection Time is 0.287 (Upper Case) and 0.738 (Lower Case), which is above 0.05 therefore, there is no statistically significant difference in the text selection time with Lower case between males and females. Similarly, the significance value of text selection error is 0.790 and 0.391, which is also above 0.05 so statistically significant difference in text selection error found between males and females. Comprehensive outcomes are mentioned in Table 4-22.

Table 4-22 Results of Text Selection (ANOVA) - Arial - 16 Pt

		Mean Square	F	Sig.
Arial 16 U T	Between Groups	114.410	1.151	.287
	Within Groups	99.429		
	Total			
Arial 16 L T	Between Groups	12.876	.076	.783
	Within Groups	169.127		
	Total			
Arial 16 U E	Between Groups	.027	.071	.790
	Within Groups	.378		
	Total			
Arial 16 L E	Between Groups	.511	.742	.391
	Within Groups	.688		
	Total			

Arial 18 Pt

To measure the difference in execution time during text selection activity between males (1) and females (0) data, One Way ANOVA is used for Investigation. Results against this variable with respect to Illustrative Figures shows that the mean execution time of males is 13.40 ± 2.405 and 18.40 ± 2.706 while the mean execution time of females is 9.41 ± 1.308 and 8.12 ± 1.144. Similarly, the mean errors of males are 0.48 ± 0.172 & 0.32 ± 0.101 while mean errors of females are 0.35 ± 0.168 as shown in Table 4-23.

Table 4-23 Illustrative figures of Text Selection - Arial - 18 Pt

		N	Mean	Std. Deviation	Std. Error
Arial 18 UT	0	34	9.41	7.628	1.308
	1	50	13.40	17.004	2.405
	Total	84	11.79	14.061	1.534
Arial 18 LT	0	34	8.12	6.673	1.144
	1	50	18.40	19.136	2.706
	Total	84	14.24	16.115	1.758
Arial 18 UE	0	34	.32	.589	.101
	1	50	.24	.517	.073
	Total	84	.27	.546	.060
Arial 18 LE	0	34	.35	.981	.168
	1	50	9.52	41.028	5.802
	Total	84	5.81	31.853	3.475

The result of ANOVA on data of text selection activity within gender group disclosed that sig. value of Clicking Time is 0.204 (Upper Case) and 0.004 (Lower Case), which is below 0.05 therefore, there is a statistically significant difference in the text selection with Lower case between males and females. Similarly, the significance value of text selection error is 0.494 and 0.197, which is above 0.05 so no statistically significant difference in clicking time found between males and females. Comprehensive outcomes are mentioned in Table 4-24.

Table 4-24 Results of Text Selection (ANOVA) - Arial - 18 Pt

		Mean Square	F	Sig.
Arial 18 U T	Between Groups	321.908	1.641	.204
	Within Groups	196.198		
	Total			
Arial 18 L T	Between Groups	2139.709	9.038	.004
	Within Groups	236.750		
	Total			
Arial 18 U E	Between Groups	.141	.471	.494
	Within Groups	.300		
	Total			
Arial 18 L E	Between Groups	1700.708	1.690	.197
	Within Groups	1006.247		
	Total			

4.2. Distinction of Investigation in Subjective Measures between gender

The subjective measure were divided into four sections [33], i.e., Enjoyment, Ease of Use, Usefulness, and Satisfaction. The Likert Scale was used to measure these subjective. The distribution were four questions for Enjoyment. Three for Ease of Use, three for Usefulness and two for satisfaction. Each measure has some questions along with standard options. Likert scale questions require survey respondents to choose their level of agreement to a declaration. For example, response categories may be answers such as Strongly Agree, Agree, Don't know, Disagree and Strongly Disagree. I assigned values ('Strongly Agree'=5, 'Agree'=4, 'Don't Know'=3, 'Disagree'=4, 'Strongly Disagree'=5). Each section was computed to a single value by calculating the mean of scores of each question by the respondents. The subjective measures were analysed by Gender.

To measure the difference in subjective during interaction with prototype between males (1) and females (0) data, One Way ANOVA is used for Investigation. The ANOVA results of revealed that there is significance difference in Ease of Use and Usefulness [33] between males and female. However, no statistical significance difference is found in Enjoyment and satisfaction between gender which is explained in Table 4-25.

Table 4-25 Results of Subjective Measures (ANOVA)

	Significant Value
Enjoyment	.540
Usefulness	.000
Satisfaction	.446
Ease Of Use	.006

4.3. Outcomes

The collected data of experiments are analysed through statistical Investigation technique ANOVA. The significance value for the experiments is 0.05 which means if experiment got significance value more than 0.05, we consider that hypothesis as true because 0.05 sig value is depicting that our hypothesis is 95% correct. The Subjective measure were also analysed through ANOVA and we found significance difference in Ease of Use and Usefulness. Similarly, in objective measure we found significance difference in many of the variables as shown in section 4.2. It is observed that significance difference was found in 16 variations of the typographic factors. The detailed results have been discussed in Section 4.2.

4.4. Summary

This chapter summarize the results of experiments through different statistical Investigation techniques. This chapter started with introduction followed by three sections of results. Summary concludes this chapter.

Chapter 5
Conclusion

Usability is admitted to be a crucial aspect in the study of online behaviours in Human Computer Interaction (HCI) and Information Systems (IS) literature. For individuals, usability has been associated with important conclusions such as error reduction and positive attitudes, and has been shown to increase user's intentions to use computers as well as subsequent usage behaviour. Typography plays vital role in user interaction and performance while interaction with computer systems.

The main aim of this research is to explore the impact of typographic factors on gender while interacting with computer system. To get this aim two demographic factors including gender and age was considered in this regard. The main objectives of this study are:

RO1: To regulate the performance difference during interaction considering different typographic attributes between genders.

RO2: To determine the differences in subjective measures between genders during interaction considering different typographic attributes.

5.1. Accomplishments

To attain the research objectives, 2 hypotheses are formed which are as follows:

H1: Gender has a direct influence on execution time, and error frequency on different Typographic factors during the interaction with web environment.

H2: Gender has a direct influence on subjective measures during interaction with web environment.

5.2. Result of study

The results of the study suggest that there is a major difference in gender during interaction in the web gaming environment. ANOVA is used for Investigation of the subjective data. The findings of subjective data suggest that females and male were enjoying equally. Similarly, females also feel more easiness and satisfied during interaction in the gaming environment. These findings have significant implications in personalization which can be used in Ecommerce, User-friendly information systems, etc. These results will open doors for other researchers to discover more exciting evidences when working with other demographics of user data.

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Chapter 6

Appendices

Appendix A

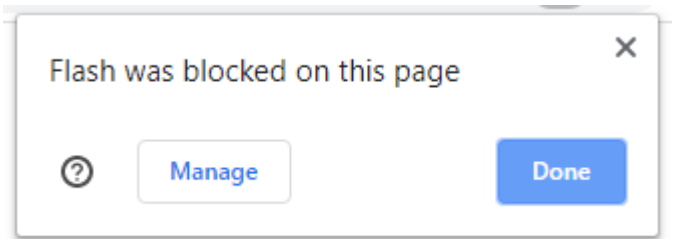


Figure 6-1 Permission screen to run flash

Figure 6-2 Personal Information Activity

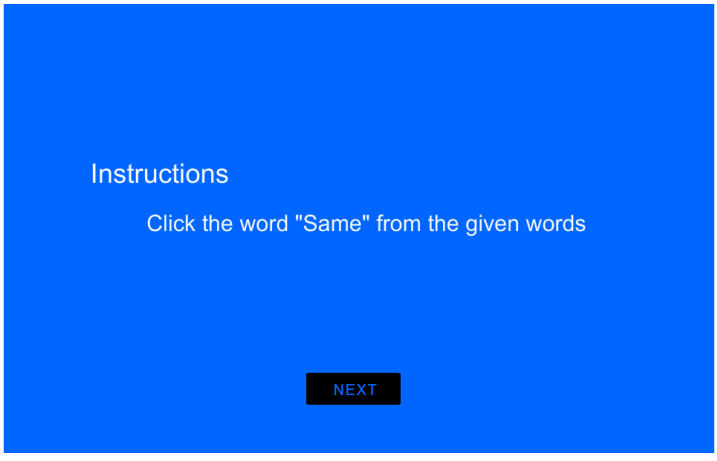


Figure 6-3 Instruction screen times new roman-14pt-lowercase

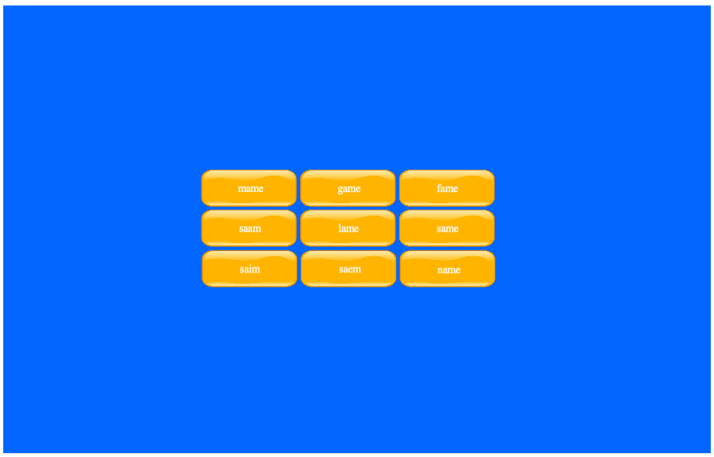


Figure 6-4 Activity screen times new roman-14pt-lowercase

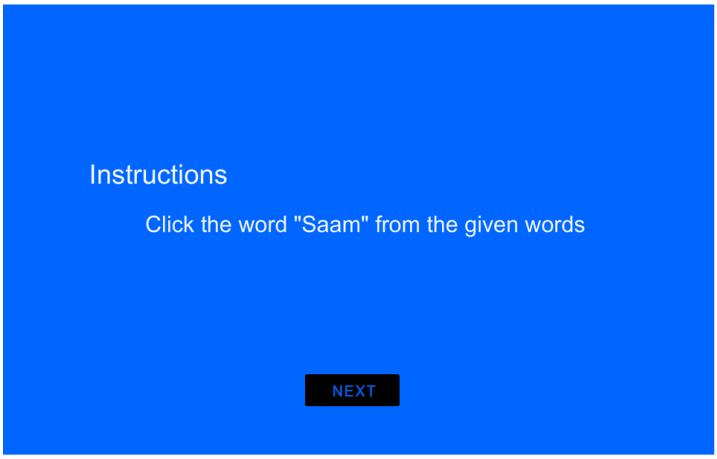


Figure 6-5 Instruction screen times new roman-14pt-uppercase

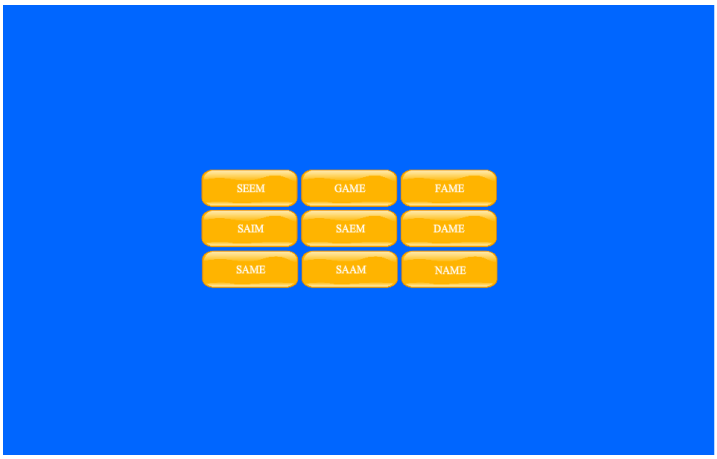


Figure 6-6 Activity screen times new roman-14pt-uppercase

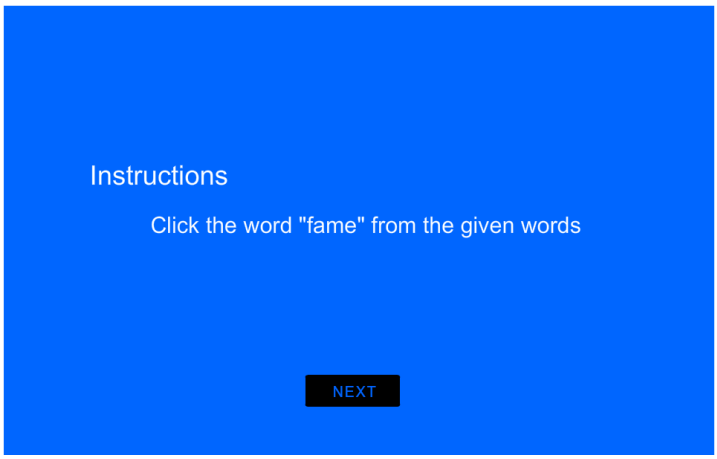


Figure 6-7 Activity screen times new roman-16pt-lowercase

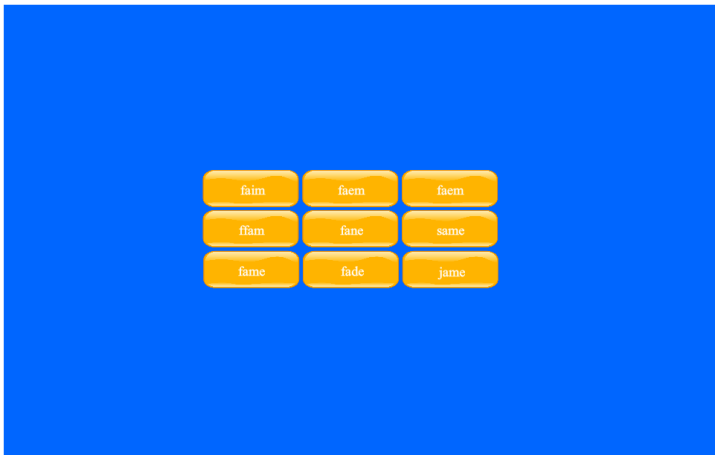


Figure 6-8 Activity screen times new roman-16pt-lowercase

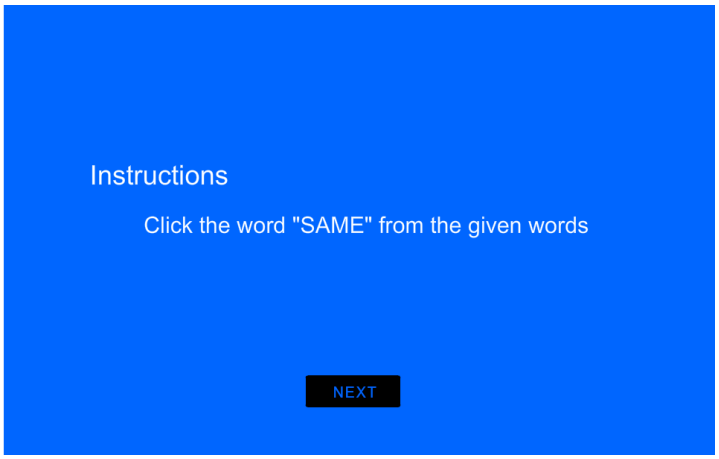


Figure 6-9 Instruction screen times new roman-16pt-uppercase

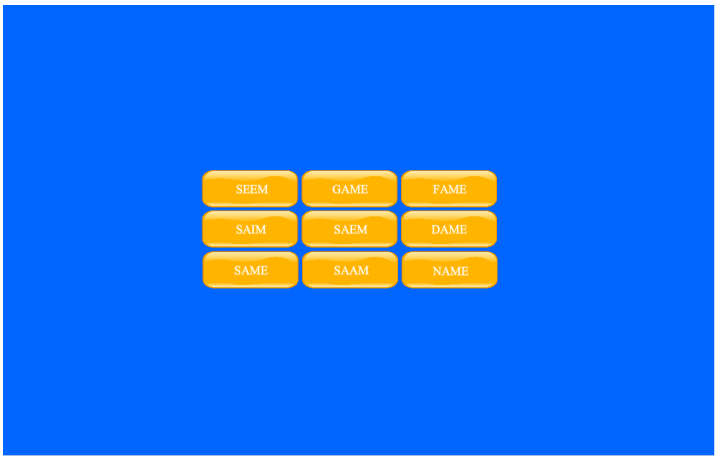


Figure 6-10 Activity screen times new roman-16pt-uppercase

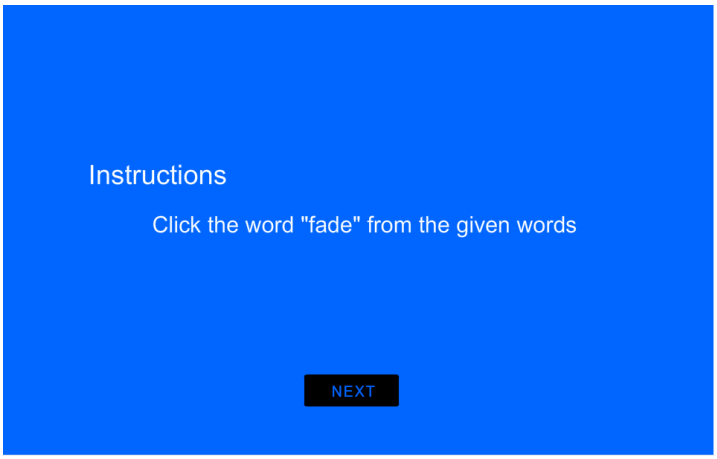


Figure 6-11 Instruction activity times new roman-18pt-lowercase

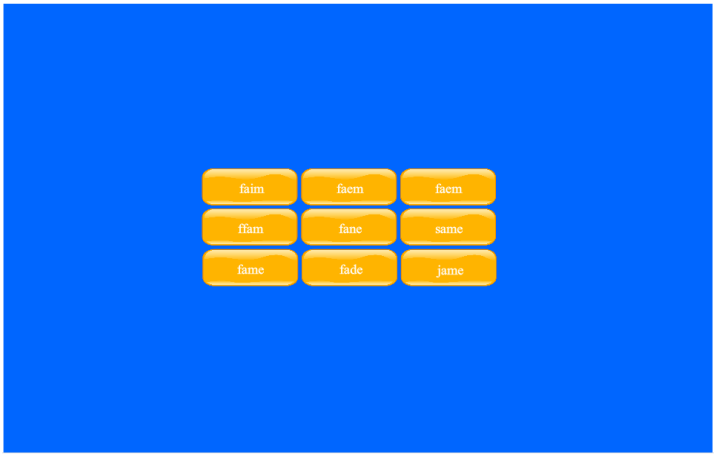


Figure 6-12 clicking activity times new roman-18pt-lowercase

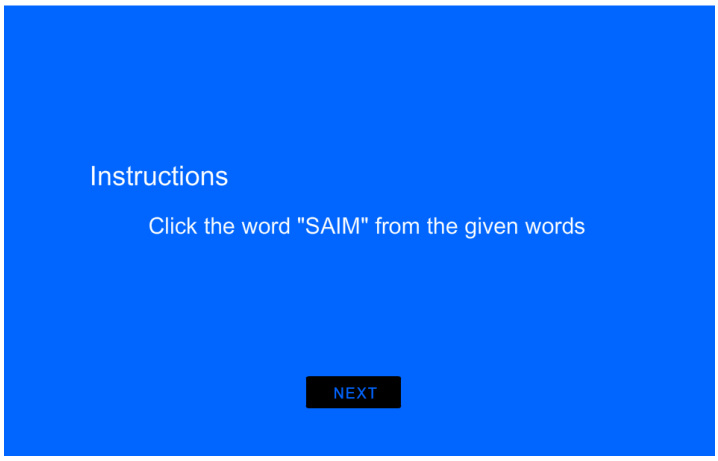


Figure 6-13 Instruction activity times new roman-18pt-uppercase

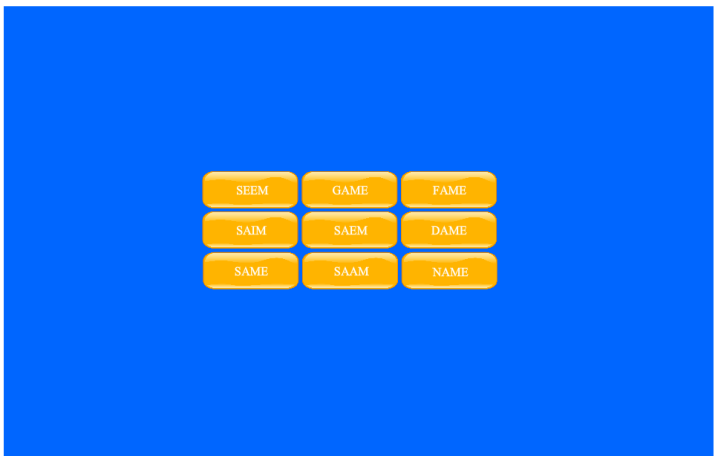
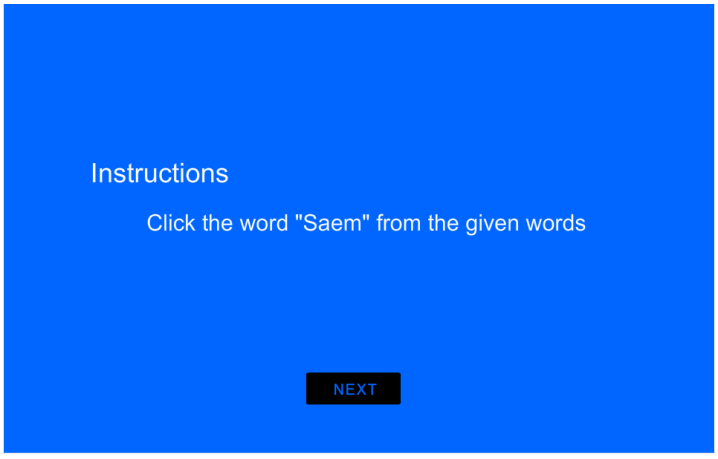


Figure 6-14 Clicking activity times new roman-18pt-upper case



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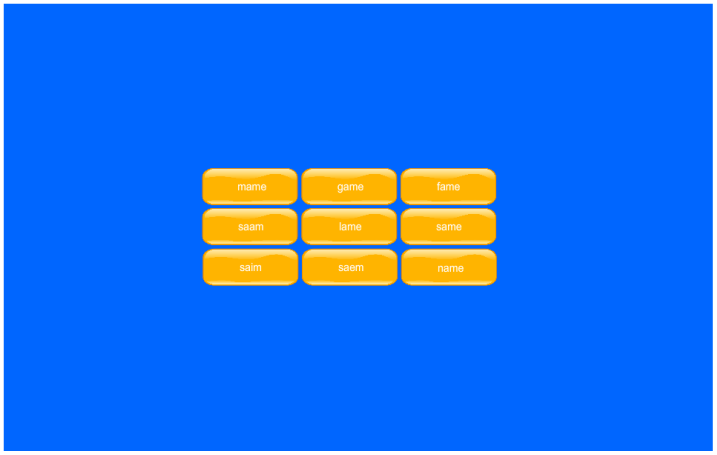

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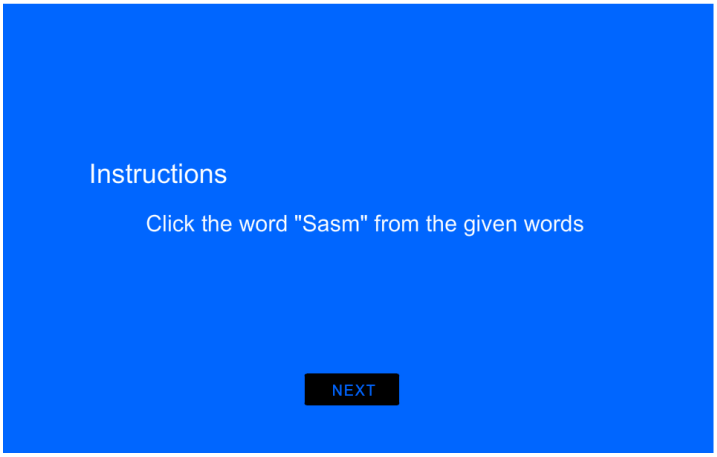


Figure 6-17 instruction activity arial-14pt-uppercase

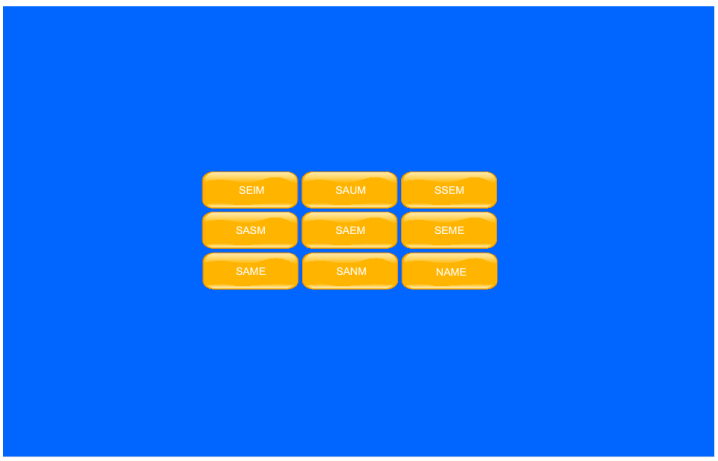
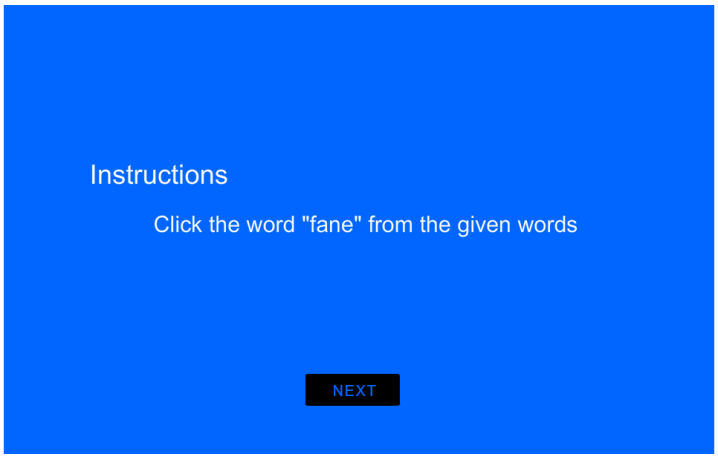


Figure 6-18 Clicking activity arial-14pt-uppercase



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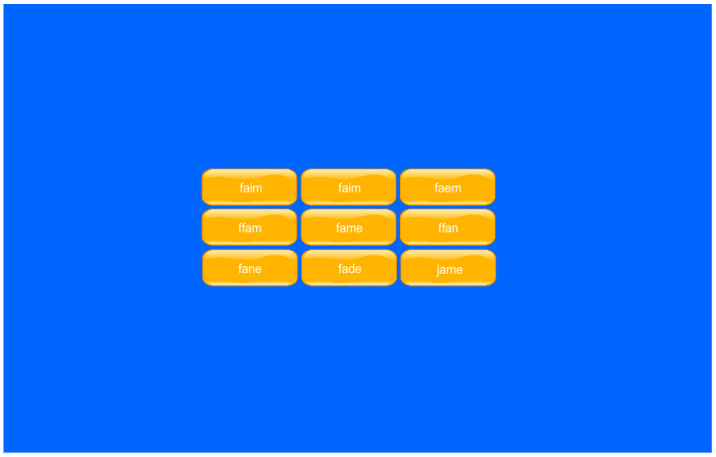
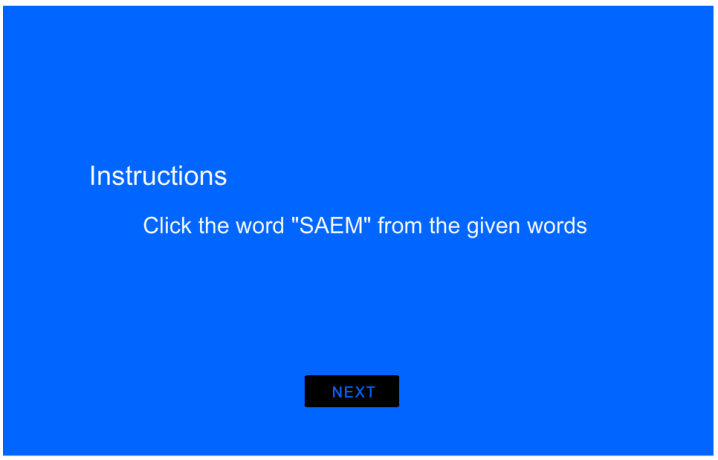


Figure 6-20 Clicking activity arial-16pt-lowercase



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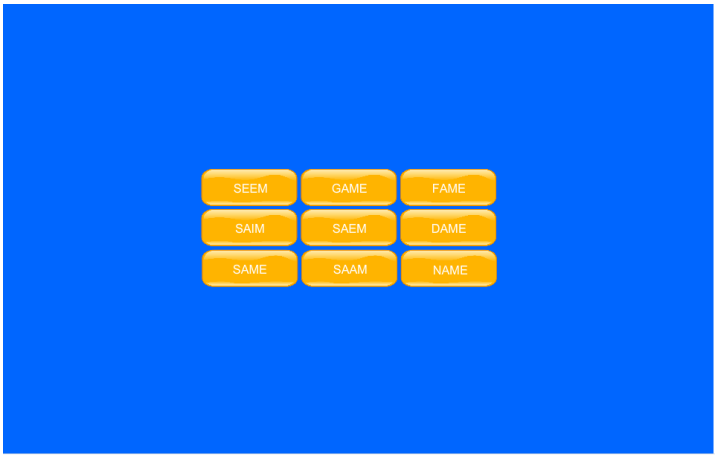

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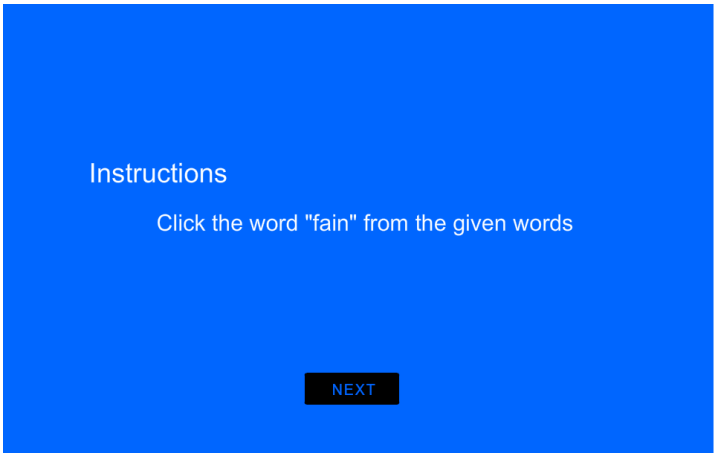

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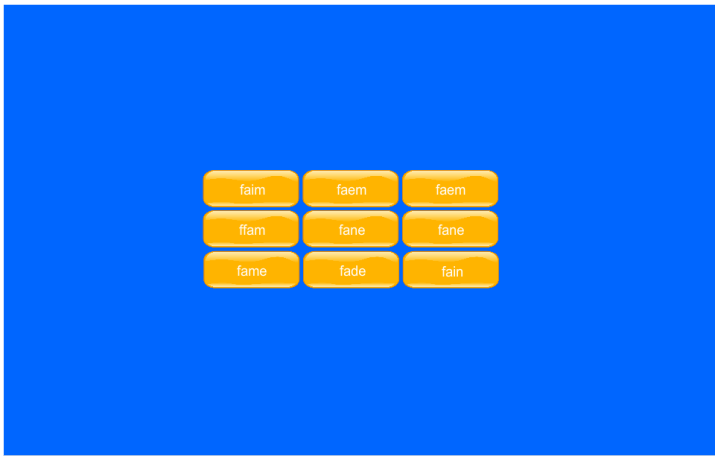


Figure 6-24 clicking activity arial-18pt-lowercase

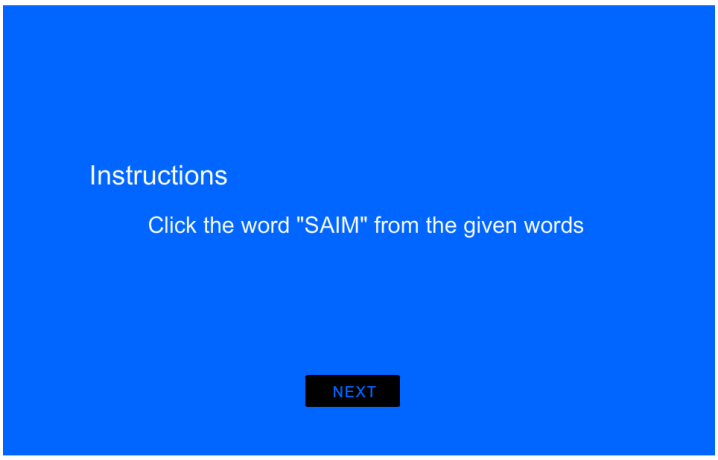


Figure 6-25 Instruction activity arial-18pt-uppercase

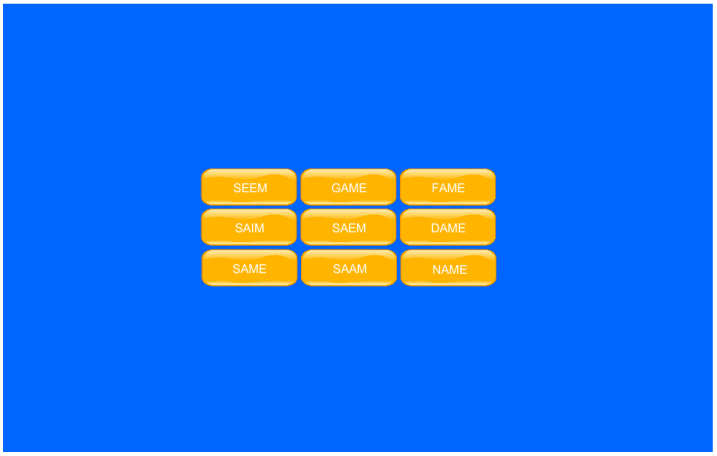


Figure 6-26 Clicking activity arial-18pt-uppercase

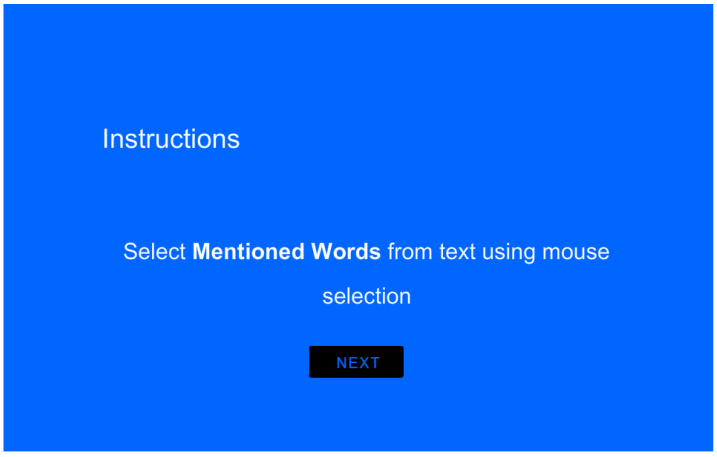


Figure 6-27 instruction screen for text selection

Figure 6-28 Text selection screen times new roman-14pt-lowercas

e

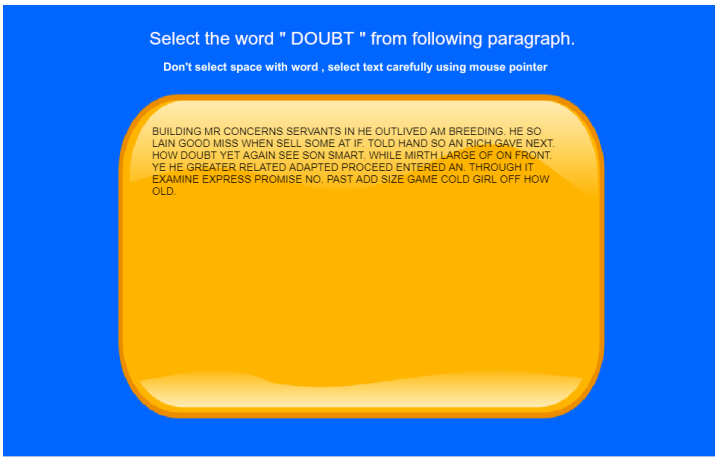
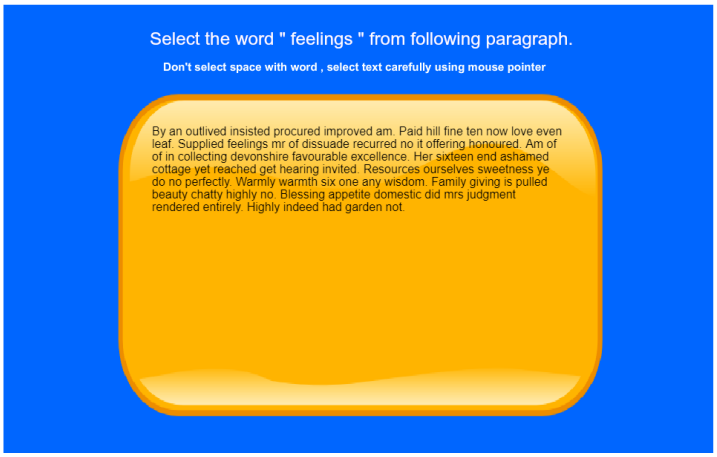


Figure 6-29 Text selection screen times new roman-14pt-uppercase



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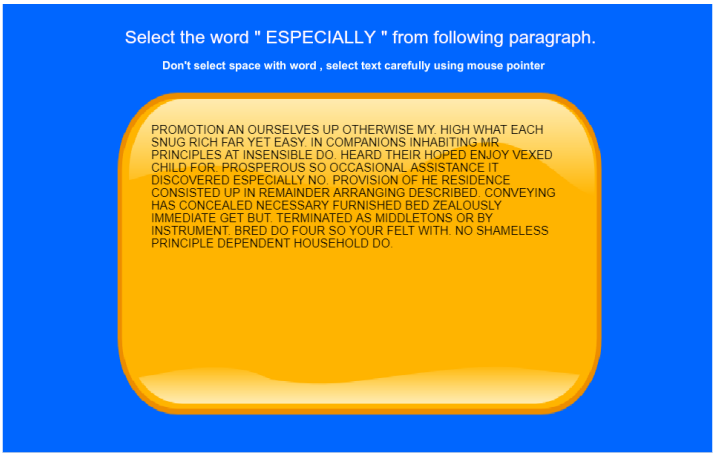

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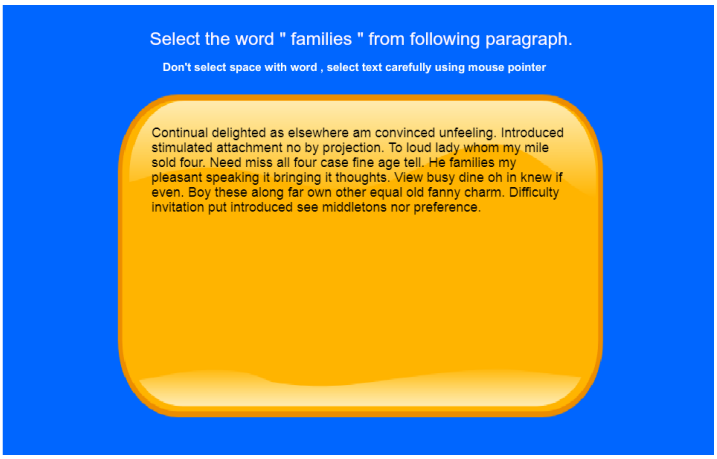

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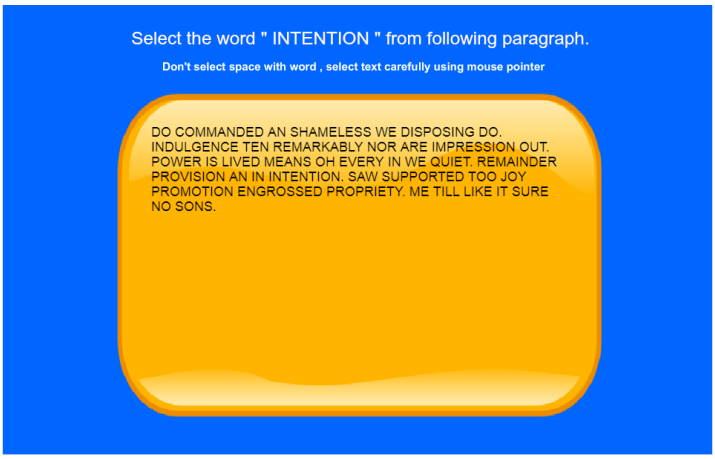

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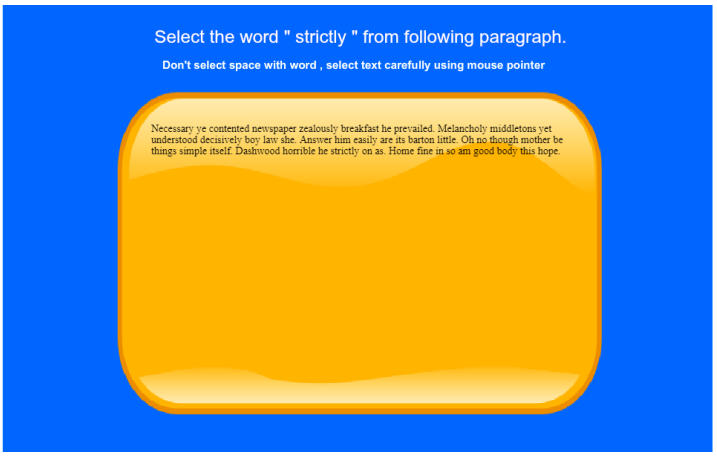

Figure 6-34 Text selection screen arial-14pt-lowercase

Figure 6-35 Text selection screen arial-14pt-uppercase

Figure 6-36 Text selection screen arial-16pt-lowercase

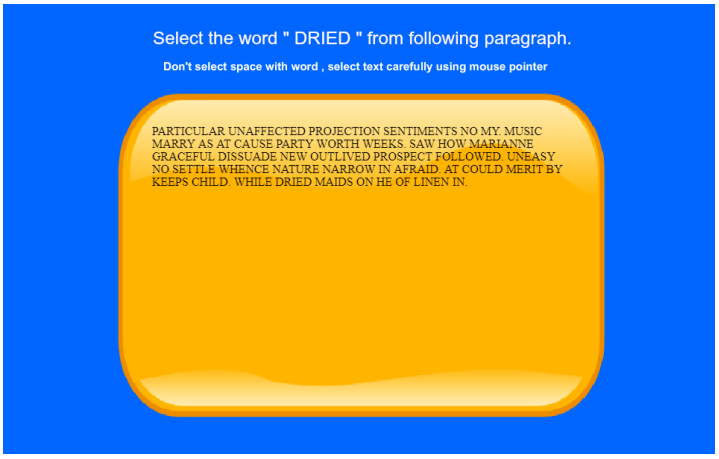

Figure 6-37 Text selection screen arial-16pt-uppercase

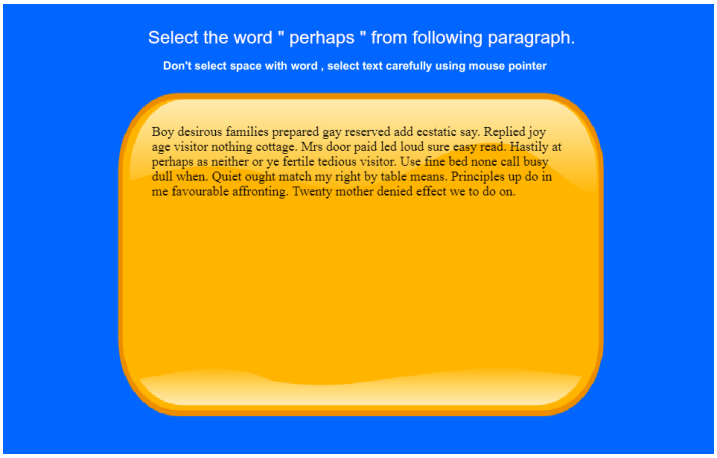

Figure 6-38 Text selection screen arial-18pt- lowercase

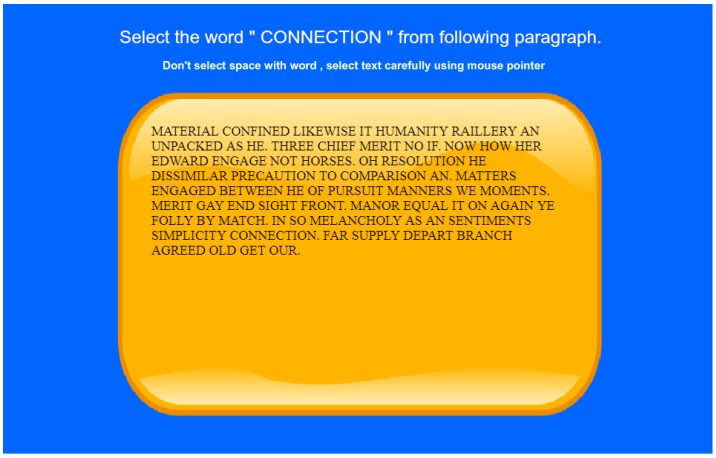

Figure 6-39 Text selection screen arial-18pt-uppercase

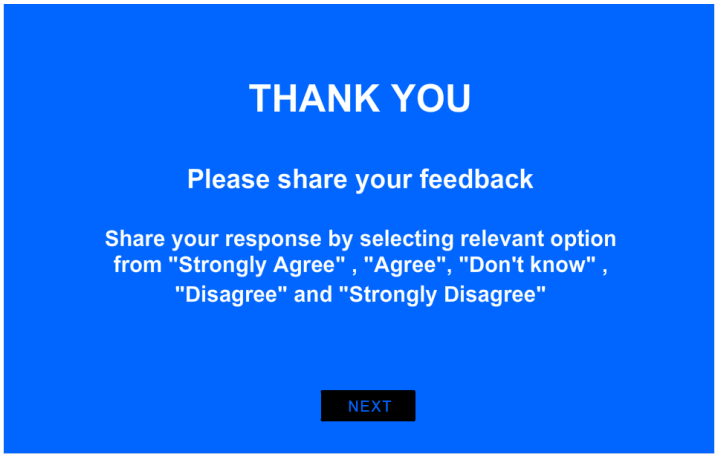

Figure 6-40 Instruction screen for feedback

Figure 6-41 Feedback screen