



Usability Evaluation to design a user interface by implementing HCI design principles

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The authors declare that they are the sole authors of this thesis and that they have not used any sources other than those listed in the bibliography and identified as references. They further declare that they have not submitted this thesis at any other institution to obtain a degree.

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Abstract

This thesis presents how to redesign a website by applying a set of design principles to enhance the usability. The main objectives of the study are to find out the usability problems of the targeted interactive system in order to list out required suggestions to improve the website and to provide solutions by re-designing the existing interactive system. In order to implement the objectives of the project, we should initially evaluate the interactive system using usability evaluation. The outcome of the evaluation provides us information about the issues and requirements to design a new system. Based on the evaluation and its outcome, various methods will be used for resolving the problems while re-designing the website. This helps in identifying the problems which require usability improvements.

Background: For an interactive system to feel aesthetic and attractive, an optimal user interface should be provided which needs Usability. So we wanted to concentrate on this usability area and while we are going through various papers we find one and it's about the concepts of design principles. The current thesis idea has been derived from an existing thesis as a part of their future work. In the previous version, two interactive systems have been compared using HCI principles and in the future work of the thesis they have mentioned to apply the HCI principle to re-design the website and compare the old version with the new version by evaluating the usability.

Objectives: The aim of this thesis is to mitigate HCI principles in strengthening usability and accessibility of the interactive system.

Methods: The method for finding solutions and suggestions would include two research methods i.e. Case study and the Formal experiment method. In order to do the case study, more literature work has to be done regarding design principles and data is collected and finally analysis is done on the collected data. Case study helps in managing the tasks and it gives the implications for the interactive system, where as the other method is the formal experiment method in which the participants are used for the completion of tasks in the thesis draft .

Results. The results will be obtained from the Evaluation Criter HCI design principles on comparing the two websites and also be in the form of pie-charts depicting the responses for the survey conducted in order to evaluate the final output after implementing the design principles to the interactive system. A survey is conducted among students and online shoppers in order to evaluate the newly designed website. This survey evaluation helps in taking feedback directly from the end users to know their user experience.

Conclusions: As depicted by the study results and survey evaluation, the framework of the newly designed website successfully handles the purpose of usability evaluation. Therefore, the recommended design principles should be implemented in the process of usability design.

Keywords: re-design, evaluation, usability, interactive system, HCI design principles.

Acronyms

UI - User Interface

UX - User Experience

HTML - Hypertext Markup Language

CSS - Cascading Style Sheets

XHR - XML Http Request

XML - Extensible Markup Language

SQL - Structured Query Language

HCI - Human Computer Interaction

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The design opted as a thesis topic is chosen based on the revision of the past thesis work[29]. The concept of re-designing is from the previously done thesis. In the previous one they have addressed about the importance of the design principles for the usability of a website. For any informative website, the design of the interface are highly considerable. Design principles are an important measure of Web Designing. A software design has a greater impact because it may enable or interrupt users. Effective interaction design makes interacting and communicating with each other as well as with computers easier for people. This is what about a Human-Computer Interaction. So to make the interactive framework more elegant and appealing, an optimal user interface should be provided.

The motivation behind selecting this topic is while we are searching for the project ideas, we have come across several bad User Interfaces and incomprehensible navigation. So we wanted to focus on this field of usability and while we're looking through various articles we found one and it's about the concept of design principles[29]. Two interactive systems were contrasted in the previous version using HCI principles and the future work of the stated study was to apply the HCI principles to re-design the website and to compare the old version with the current version by testing usability. These design principles were used to facilitate the gathering, browsing and interaction of information with the systems for the users.

After getting to know the usefulness of user interface design we have determined to work on this and the very first step to do this is to find an informative website which has a bad user experience. In search for those websites, we have found the website "Sip Hawaii" which is an informative e-commerce website but we observed ambiguity in the usability of the website. The website has been selected as a part of personal experience by the authors, as it contains information more than required to be an excellent interactive system. Sip Hawaii is one such website which requires significant modifications to be an acceptable interactive system. Sip Hawaii is an e-commerce website that tackles organic products and ships products all over the world. The website is very informative but due to the lack of User Interface it doesn't reach to more number of users. This website is really tiresome and frustrating for consumers to buy the products. Thus the main reason behind the selection of this website is its improbable features.

Therefore, we would like to examine the improvements in the interactive system before and after adopting the design principles. For this we will conduct a survey

evaluation for both the websites regarding their usability.

1.1 Aims and Objectives

The aim for selecting this topic is :

1. To investigate on design principles and provide the importance of design principles for an interactive system to be well organized. Our contemplated result is to provide some feasible approach for designing an interactive system by following the design principles.
2. To examine the interactive system and to identify the changes does it possess after implementing the design principles. From this thesis we want to provide a good user interface design which gains more user attention and while navigating through the website the user should not face any disruption.

The objectives behind this project are:

1. Identifying an inadequate system and to figure out the usability problems by conducting a survey evaluation.
2. Analysing the gathered data, artefacts and selecting a design method to get an approved design.
3. Examining the design principles and creation of compelling and appropriate suggestions for Usability improvement.
4. After designing the website, to evaluate if the design principles have been implemented appropriately using Evaluation criteria of HCI design principles and by conducting a survey evaluation technique.

1.2 Research Questions

To achieve our goals, Research questions behind this project are:

RQ1. What is the necessity of design principles for an interactive system to be well organized?

RQ2. What changes does an interactive system possess after implementing the design principles and will it be more consistent compared to the previous one?

1.3 Scope

With the advancement of computing technology, the essence of user interaction with technology has changed – and the role of interface design has broaden accordingly. Since usability and user experience for an interactive system are very extensive, in this thesis we will be concentrating on the design principles.

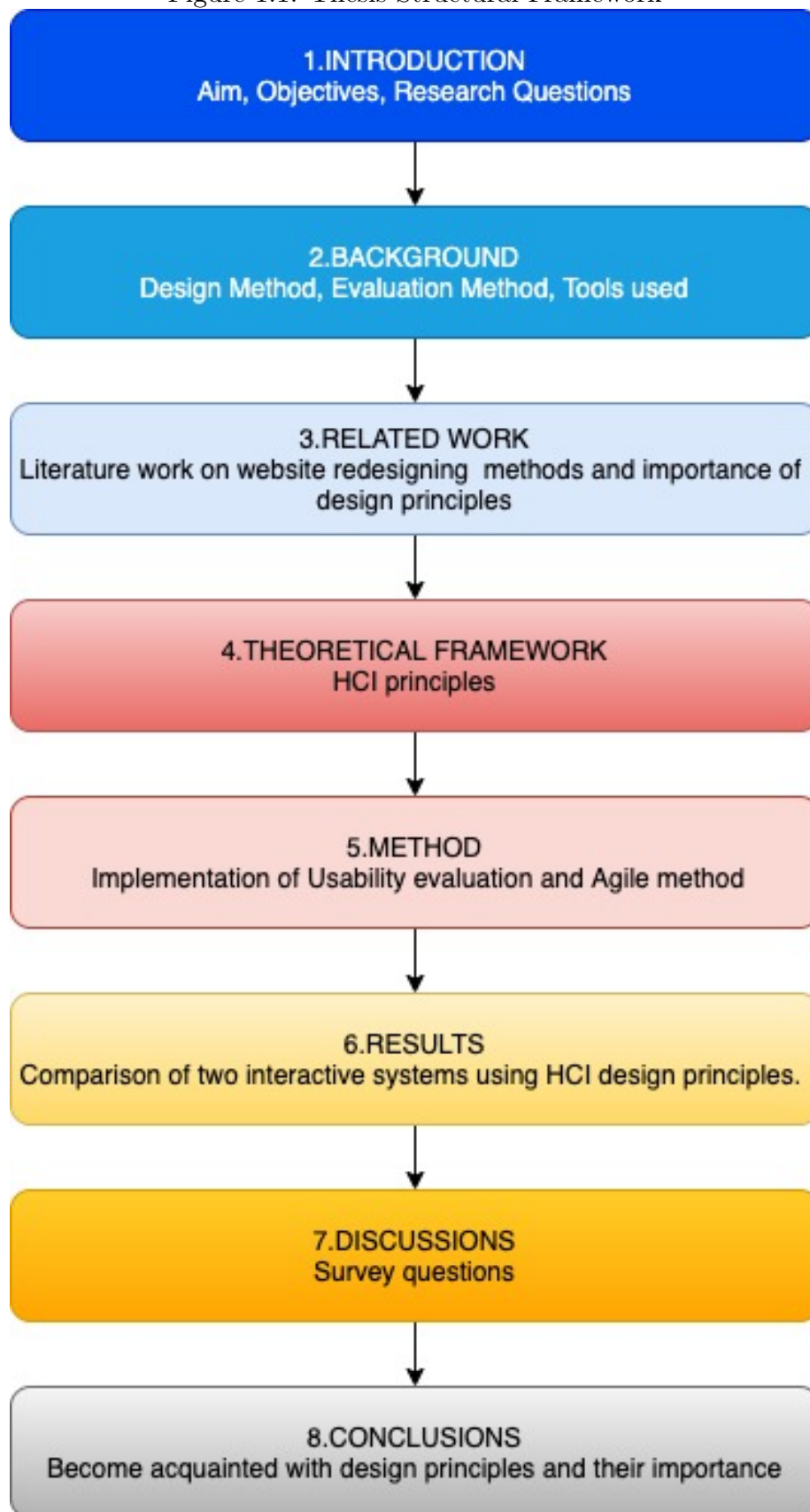
The study aims to examine the design principles and the necessity of the design principles for an interactive system to be well organised and consistent. Since we have very little time for redesigning the website we tried to follow most of the design principles which suits the website. In this thesis we choose to illustrate the importance of design principles to increase the usability and user experience of the website. After enforcing the design principles, we must determine what improvements does the interactive system acquire.

1.4 Outline

Through this study we are focusing on the concepts of HCI design principles and their significance through making it more acceptable for an interactive system. By doing so we should have acquaintance on design principles and we have to select a bad user interface. For examining a bad user interface one should be expertise in evaluation techniques. And for redesigning the interactive system, one should have the proficiency on design principles. The interactive system should be made acceptable and uncomplicated i.e. it should be simple , clean, intuitive and secure, and it should have a basic navigation framework. The interface should be straightforward and simple to understand, and many elements such as images, icons, text keys, etc. will make the User Interface clear.

The whole thesis is structured as follows:

Figure 1.1: Thesis Structural Framework



The user experience is something which is reliable on the end-user's requirements.

2.1 User-Experience and usability evaluation

The usability evaluation is required to evaluate an interface of the interactive system, the usability evaluation has a set of rules that have to be applied while evaluating the interactive system. In website designing , the process is generally divided into 5 stages[3] :

1. Requirements
2. Design
3. Construction
4. Testing
5. Production

2.2 Agile method over waterfall model

For designing the system and completion of tasks we need to adopt a design approach. There are two types of design approaches - waterfall model and Agile method.

Waterfall model: The waterfall model is a sequential development process in which progress would be seen as continuously rippling down through the phases similar to waterfalls. Each phase must be completed in a waterfall model till the next phase can begin, and the phases do not occur simultaneously.

Agile software development: Agile software development is a collective of iterative and progressive software development strategies where specifications and approaches emerge through collaboration between self-organizing, cross-functional teams.

2.2.1 Differences between Agile method and Waterfall method[6]:

1. In waterfall model the development is divided into several phases where as in agile method the development is segregated into sprints.

2. Waterfall method requires no customer intervention, because it is an internal operation. Agile method, however, focuses on user loyalty, and includes them in the development process.
3. Iterative waterfall model is ideal for projects with well specified specifications without expected changes. The Agile Software development allows in changing and evolving the specifications.
4. In waterfall method once the requirements are specified one cannot change the requirements. Agile is more versatile and allows for improvements in the requirements even after the planning was finished.
5. Testing process in Waterfall model comes after the building phase. As per Agile method testing can be concurrently done along with programming.
6. Due to the certainty and rigor, quality of product is higher in waterfall model than that of Agile method.

Any process can have both pros and cons. So there are both advantages and disadvantages of the above stated design methods. Much like, we can alter the requirements in Agile software development, so we have opted for it.

2.3 Choosing the Agile Method

We have 2 research methods in doing the thesis, A case study has been done and we studied the pros and cons of each method for developing the thesis. While searching for the methods, we have noticed that there are different approaches for designing the tasks in the thesis draft two of which are the Traditional development method (waterfall model) and the Agile Method. We studied various articles to compare and contrast the two approaches, we found that Agile method is way flexible than waterfall model[7]. There are certain features like this by which we ended up choosing the agile method. The agile method is highly flexible and helps in finishing the project within the scheduled deadline as the work is divided into sprints, it is easier to finish the tasks time-to-time[9].

In 2001 the Manifesto for Agile Software Development was drafted by a group of software developers. The manifesto called for the use of recursive approaches to produce goods and stressed the four possible principles[12]:

1. Individuals and interactions over process and tools
2. Working software over comprehensive documentation
3. Customer collaboration over contract negotiation
4. Responding to change over following a plan.

The agile manifesto is a rigid process in the development. As a part of good methodology during the development of the project, it is very common to use the construct, plan and organize during the entire process. The agile Scrum methodology has

been applied to our project. According to a study the scrum methodology has been divided into phases : Accessibility tests, Accessibility corrections and accessibility reviews.[25] The methodology process has been explained very clearly :

Planning:

1. Backlog planning
2. Time Estimation
3. Effort estimation
4. Identification of tasks

Sprint:

1. Analysis and design
2. Code
3. Accessibility tests
4. Accessibility Fixes
5. Accessibility Checks
6. Test
7. Deploy

Accessibility review:

1. Define evaluation scope
2. Explore the interactive system
3. Select an appropriate sample.
4. Analyze the selected sample
5. Update the report

2.4 Survey

End-User have a high expectation and tend to lose interest if the website is not measured up. The content of the websites should be optimized for search engines to find what they require.

In order to understand the user's perspective, regarding website it is important to take the feedback from the users to know their opinion on the usability of the website.

A study states that "a respective document from the website, and respective user feedback data indicative of user behavior relative to the respective document as a search result for the respective query"[14] It is important to know the objectives of the survey before conducting it. The survey is conducted in order to certify that newer version of the website has been approved by most of the audience. However, there are positive responses despite the negative responses. In order to improve the survey evaluation process, we have gone through few research work.[27]

Referring to websites in general, Nielsen[2000] concludes that a successful website has high-quality content, is often updated, has minimal download time, is easy to use and is relevant to the user's needs. Two other issues mentioned by Nielsen[2000] that impact on website success are that the site must not duplicate something that works well or better in the physical world and that it is necessary for government to back e-government initiatives to ensure success.[4]

2.5 Evaluation methods

It is important to evaluate an interactive system because evaluation helps in understanding the usability of an interface. Evaluation helps in determining the potential effectiveness of an interactive system. It helps in finding out the problems in the system in terms of usability. Evaluation helps in suggesting improvements and solving the problems which are identified during this process[28].

Evaluation techniques includes Formative Evaluation and Summative Evaluation[26]. The below context shows what they means:

1.Formative Evaluation: This evaluation will take place ahead of the implementation to control the product that will be produced.

2.Summative Evaluation: This evaluation takes place after the implementation, to test the exact functioning of the system.

The reason for choosing heuristic evaluation is to identify the issues in the design of a user interactive system.It helps in assessment of user interface and find usability problems that will occur when the end users interact with the user interface.

Some of the reasons for choosing heuristic method :

- It can provide designers with some fast and extremely cheap feedback.
- We can acquire feedback faster from the end-users.
- Applying the appropriate heuristic will help designers formulate the best corrective steps.
- Usability tests can be carried out to further examine the problems.
- Trained experts will evaluate the interactive system.

Evaluation techniques has its pros and cons despite the usability evaluation:

PROS:

- Improvement of the interactive system.
- Identifying the problems.
- Setting goals to fulfill the requirements of the end-users.
- Evaluation is for accountability.
- To determine the usefulness of the interactive system.

CONS:

- Evaluating an interactive system can create artificiality.
- It takes much time and it is expensive in some cases.
- Lacks quantitative metric while identifying the requirements of the users.
- Evaluating an interactive system can cause perception of unfairness.

Evaluating a system in the real world can cause some problems. These can be the challenges faced during the process of evaluation :

- **Poor Planning:** Poor planning in the process of evaluation, results in poor outcomes. We end up without having enough amount of time for the process of evaluation.
- **Lack of Preparedness:** Limited resources, lack of understanding and communication between the team will lead to lack of preparedness.
- **Inadequate Approaches:** If we do not use the correct methods for collecting data, we do not know how to identify the data correctly and accurately, we will not have a comprehensive understanding of goals and objectives.
- **Bad Data :** Quality of the data is important than quantity of the data. Unorganized data will result in poor outcomes.

2.6 Tools used

For designing the website, technology used were HTML, CSS, PHP, JavaScript and MySQL. Brief overview of the technology which we have used:

HTML: It is used as a front end for creating web pages.

CSS: To create an attractive layout for the HTML work CSS has been used in our website.

JavaScript: HTML was assisted by both JavaScript and CSS.

PHP: Back end of the website was done using PHP. It is the scripting language for web pages.

MySQL: For storing the images and the details MySQL is used. It is a database used for querying, accessing, updating and managing data in databases.

Thus for designing the website the front end technologies used were HTML, CSS and JavaScript. The Back end technologies used were PHP and MY SQL.

This chapter contains information regarding the research work done for doing the project. While searching for the usability of an interface, we learnt many different things about the user interaction, user interface, user experience, usability and User-centered design. All these relate to an interactive system.

ZACKARIAS MADSEN and ALEH TALSTOI Aleh have compared two websites based on their usability and explained the importance of design principles and stated their future work to achieve all the design principles. They have mentioned the importance of design principles for an User Interface that affects the User Experience and also included the factors that influence the design principles[29].

JANET WESSON have discussed about the role of HCI design principles in Software Development and the concept of a design pattern which is popular in several other fields including architecture and Software Engineering[31].

ANDERSON, POLINA have investigated on the usability changes and provides suggestions for improvements and demonstrated possible solutions by redesigning the original user interface and conducted a survey evaluation for the usability of the website with 30 thesis advisors and 148 students [5].

ROBERT L. TOLLIVER, DAVID S. CARTER, SUZANNE E. CHAPMAN, PHILLIP M. EDWARDS, JEANIE E. FISHER, ANNETTE L. HAINES, LANA E. KROLIKOWSI, REBECCA M. PRICE have conducted a case study by consulting with a usability expert during the design and implementation phases of the website. Their study confirms the value of usability testing as a tool to bring to light some of the ambiguities and complexities of a library website for users[30].

SHEILA KASPEREK have redesigned an academic library by applying basic design principles of contrast, alignment, and repetition. She has provided some basic elements of design and the process of redesigning the signs[17].

EVELINA PATSOULE, PANAYIOTICS KOUTSABASIS have presented a case study for the redesign of a touristic web portal in order for it to be senior-friendly. They have followed a set of seven design principles and proved that the redesign website was significantly more usable[21]

User Experience is being increasingly mandatory in the Human Computer Interaction (HCI) and User-interaction design. A theory by HASSENZAHN and TRACTINSKY in the year 2006 stated regarding the User experience " resourceful and continuously evolving technology behind the user experience design helps in designing products and tasks with more ease[18].

The Website quality, usability and user experience rely on each other internally. Disorientation, or the propensity to lose one's sense of place on a website, may cause users to become irritated, lose confidence and experience a noticeable decrease in efficiency. A number of papers have analyzed the connection between the structure of the website, the quality of the navigation and the usability of the website[22].

Heuristic evaluation is simple to implement, besides many problems will be identified easily and effectively. It is based on the assessment of the review experts. Jacob Nielsen has recommended the experts to use 10 principles out of his 249 questions framed for usability. NIELSEN and LANDAUER (1993) say that "5 users are adequate to capture 85 percent of the problems on nearly any website". DOMAS and REDISH concluded that in one study, 5 to 12 tests are appropriate[13].

4.1 Agile method

Agile software development promotes adaptive planning, evolutionary development, early delivery, continuous improvement, and encourages rapid and flexible response to change. It encourages rapid and flexible responses to change. The agile method ensures flexibility and a commutable process for outlining the tasks. The process of developing the agile method is metamorphic which allows us to correct or rectify the errors. The agile method provides quick completion of the tasks, time is a very crucial constraint in the development process. The agile method make sure for the faster completion of the project. There is a manifesto for the Agile Software development and in this manifesto they have proclaimed their values as[1]:

- Individuals and interactions over processes and tools
- Working software over comprehensive documentation
- Customer collaboration over contract negotiation
- Responding to change over following a plan

And in this manifesto there are twelve principles which upgrades the Agile software development and they are[2]:

1. Customer satisfaction by early and continuous delivery of valuable software.
2. Welcome changing requirements, even in late development.
3. Deliver working software frequently (weeks rather than months)
4. Close, daily cooperation between business people and developers
5. Projects are built around motivated individuals, who should be trusted
6. Face-to-face conversation is the best form of communication (co-location)
7. Working software is the primary measure of progress
8. Sustainable development, able to maintain a constant pace
9. Continuous attention to technical excellence and good design

10. Simplicity—the art of maximizing the amount of work not done—is essential
11. Best architectures, requirements, and designs emerge from self-organizing teams
12. Regularly, the team reflects on how to become more effective, and adjusts accordingly

In the agile method, the task is divided into sprints. Each sprint contains a set of tasks and a schedule timeline. A sprint is usually a short time length, i.e. a few days or a week[23]. The sprints are reviewed and updated time-to-time. Sprints involve timely reviews to ensure that the tasks should be completed by the allotted time. The team should be more communicative and there should be a short meeting approximately for 15 minutes and a stand up meeting to make necessary decisions by removing the obstacles. The team member or the stakeholder has to approve the project.

The sprints perform several tasks which include discovering, designing, developing, and testing. Two sprints cannot commence at a time. Agile method can be simultaneously performed and the members of the team should organize a meeting including the web designers, creators, and the decision-makers. All the requirements should be gathered by every member of the team so that the need for more time is shortened during the whole process. The tasks will be completed earlier than compared owing to the agile development.

The actors involved in this scrum method are:

- **Scrum master:** The scrum master guides the team to accomplish the goals and tasks. Scrum master acts as a team manager and supports the team and updates the project progress and organize the retrospectives. They reassure in protecting the team from the interruptions.
- **Product Owner:** The key goal of product owner is to control the backlogs by collaborating with the stakeholders. They elect all the requirements and controls the backlogs. They also help in guiding and supporting the team. They keep on updating with the project and gives the feedback.
- **Development Team:** The development team calculates the backlogs into tasks and then perform the tasks accordingly. The team is self-managed and self-organized and commits to the sprint goals. They keep track of progress and fix the problems by themselves and minimize communication interfaces.

The website and the draft must fulfill the requirements of the end-users. The usability of the interactive system should be modified accordingly to the ongoing requirements of the user.

The agile development process contains :

- Product Backlog
- Sprint time plan

Product backlog :

Product Backlog consists of a set of things designed that are required to be accomplished to complete the work. The list includes many things such as user-requirements, characteristics, properties, and tasks. The product backlog mainly describes the tasks and works that should be accomplished in order to finish the designing of the website and the completion of the draft. Sprint meetings are the ones which are useful for planning the tasks that have to be completed before the sprint time.

Sprint time plan:

In the 'Sprint planning meeting' the discussions are about the tasks to be completed in the time span of sprint. The sprint planning meeting will be attended by the product owner, Scrum Master and the entire Scrum team.

4.2 Human Computer Interaction

Human Computer Interaction is the design of interactive systems which is primarily about how the people can communicate with the machines. This is also considered to be the intersection of behavioral sciences, computer science, design and many other study areas. HCI design principles should be used accordingly to render an acceptable interactive system. The categories of HCI :

1. Design
2. Usability
3. Information Architecture
4. Software Engineering

4.2.1 HCI Principles

In this research project, HCI principles play the major role.

We studied the HCI principles from different articles. They are the basic fundamental to design and develop of all user interfaces including the web interface and the GUI.

Here are the design principles we looked at as a part of this study:

1. Accessibility
2. Operability
3. Simplicity
4. Aesthetics
5. Clarity
6. Availability
7. Consistency

8. Control
9. Safety
10. Flexibility
11. Predictability
12. Efficiency
13. Familiarity
14. Obviousness
15. Directness

We have elaborated these principles according to their characteristics and our understanding :

Accessibility: It promises to ensure the UI to be perfect, effective and productive for many people including the people with disabilities (color blindness). A good User Experience is a blend of Usability, Graphic Design and accessibility. An article "*Design Interactive Systems*" by the author David Benyon [8], stated 5 reasons for an inaccessible product :

1. Physical - it takes much effort to use.
2. Conceptual - Difficulty in understanding the instructions.
3. Economic- Very expensive.
4. Cultural - Difficulty for the users in understanding the personification of the product.
5. Social - Users don't understand the social etiquette.

There are more features in accessibility:

Operability : We can achieve operability by reducing the stress by performing repeated actions and assist physical effort. It should make sure that the devices can be compatible with convenient technology. This feature is important because operability can make more people to access the interactive system.

Simplicity : It is way difficult to make it simple as it will be obligated with many other principles. The interface should be simple and elegant enough for the end-user and the important elements should be displayed or prioritized to the top. The interface is confined to follow the visual hierarchy and should be consistent and irrelevant information should be removed.

Clarity: Clarity is one of the related concepts of Simplicity. It is also transparent and easily accessible when web page is basic. Clearness is attained when the web page is visually, theoretically and semantically transparent. To maintain clarity, a website should include the following characteristics:

1. Visual aspects
2. Metaphors
3. Functions
4. Text and words

Following all the above aspects will help in achieving a clear website, which helps the end-users to easily access the website with a clear, simple and cozy look which leaves the users with a positive impression.

Aesthetics : Aesthetics play the major role in the HCI, it refers to visual appearance of a product, it impacts the user-experience of an interface in several ways. When users visit a website, or an application, it is the aesthetics that attract the user. The user may lose interest in using the interface if the visual attractiveness of the website is not up to the user's expectation.

An article stated that visually attractive websites are more likely to be used, because the visual appearance evokes refreshing emotion in users. Don Norman, a developer of User-experience Design has written broadly about this theory in his book *Emotional Design: Why we love or hate everyday things*. [20]

An interactive system should apply the following design principles to be aesthetic:

1. The screen elements should be clearly differentiated.
2. Groupings should be created.
3. Teams and elements should be aligned.

Availability: The Availability means that all the functions in the website are ensured to be available to everyone all the time without any restrictions or interruptions that prevents the users from interacting with the website. Availability is highly essential because it is a fundamental framework that enables a great flow to the users. In case there were any restrictions in a system, the user would be probably losing their flow that could trigger in leaving the website. If user doesn't have time or willingness to acknowledge 'why that happened', this might lead them to prefer using other websites.

Consistency: This concept needs the web page to look and function in the same way. Elements with the same function should look identical, so users can know they are doing a similar thing without even knowing about it. It is essential that distinct flows have the same motive work in the same way. Those flows should also show the same results, so that the consumer does not get perplexed at the result of his decisions.

Control: It is about offering users the control about what the web page or framework does. Everything that users does will be disrupted or canceled at any moment. As it is one among the important principle for design but some Software Developers underestimate it.

Safety: Security is about to safe-guard the users against committing mistakes. There may be some of the user errors by a chance or by incoherence. It is one among the basic and important principle in which the user should not be allowed to write the data or information. In order to overcome this, creators should implement a way.

Flexibility: For a website to be flexible enough, it should respond to different users accordingly. The web pages have to be easily understood by the new users similarly to that of the experienced users. It should be concerned with user's customs, personal choices or particular action. It is difficult to achieve for the current requirements.

Efficiency: For a website to be efficient and accurate, it should follow certain design principles. The Efficiency plays an important role in a website with good user interface and to achieve the efficiency, one should try to implement ideas with layout that has less eye movements and hand gestures. These are some of the elements that effect the efficiency :

1. Transition amidst the user control.
2. Easy navigation paths should be implemented.
3. There should be sequential eye movements.

Predictability: Predictability is a principle that blends with Simplicity and Familiarity. This Principle ensures people to predict each individual's natural advancement of work.

Familiarity: Many web pages lack familiarity, to achieve this principle, the interactive system should apply context that are similar to the end-users. An efficient website will reduce the amount of time for user's to access the website. *The concept of progressive disclosure*[15] which means users are not habituated to systems initially but they the experience gradually.

Obviousness: User should know the following while browsing a web page :

1. What it is ?
2. When to do ?
3. Why to do ?
4. Where to do ?
5. How to do ?
6. What to look at ?
7. What to do ?

Directness: Directness is about to allow direct ways to perform tasks on the interactive system that could be accomplished by rendering the possible alternatives clear. Directness means that a user interface designer can start the process of evaluating or modifying user interface feature attributes, configuration and actions by referring to their graphical representations explicitly, as compared to navigating via an alternative representation.

4.3 PACT

After completion of our literature work on HCI design principles we selected a bad user interface. Working of the interactive system has been identified which is (PACT).

People(P)- Seller/Buyer/Client

Activity(A) - E-commerce website

Context(C) - Online Products marketing

Technology(T) - The technology behind Website1 are HTML5, CSS3, JavaScript, XHR(XML Http Request)

This chapter includes the overview of the usability evaluation which describes the HCI design principles that need to be implemented along with research methods i.e. Case Study and the formal experiment which describes the process and methods used for implementing the thesis.

Overview :

The following chapter briefly explains the techniques involved in the thesis in order to speculate the usability evaluation process for SIP HAWAII website. The methods deliberately helped in designing a perception of the factors behind the end-users dissatisfaction while interacting with the SIP Hawaii website. The usability and user interaction of the website is not up to the end-users standard. To overcome these problems, we need to apply HCI principles. The implementation of the design principles are not appropriate in this interactive system. While designers are creating many new concepts, they tend to face many design issues, so they use HCI principles that help them solve the design issues. In this approach, the problems that have appeared while designing an interactive system are resolved and a good design is developed. User experience mainly contributes to acquiring a thorough apprehension of end-users what the users require and what are their necessities and prerequisites. To redesign and for the completion of draft, we have opted for the Agile Method over the waterfall model. This method segments the whole work into individual tasks and these tasks are to be performed in a time of sprint. Dividing the tasks helps in identifying the problems and match them with the requirements to make the website with good usability design and to complete the thesis draft.

5.1 Usability evaluation

Usability evaluation is required to evaluate the interactive system which is redesigned[5]. In the usability evaluation we have various kinds of methods to evaluate the interactive system, for this particular thesis we chose heuristic and expert review. In this Heuristic evaluation, the website or the interactive system is evaluated against all the usability and HCI principles. This evaluation is done to test the usability of an interface that identifies the problems in the interactive system. One of the methods used in this evaluation is Nielsen's Heuristics which is developed in the year 1990.[19] This includes the following principles:

1. **System visibility:** The users should always be updated with the information regarding the system by taking accurate feedback within a reasonable period.

2. **Similarity between system and reality:** The system should be familiar with human languages such as speech recognition including several human languages with the context of words and phrases used by other end-user rather than using complex computer-oriented phrases or keywords. The information in the interactive system should be clear and understandable order to the end-user.
3. **User control:** The end users of the website or the interactive system often try to leave the website whenever a problem occurs. This is due to the lack of user control in the functionality of the website. Help options and support options should be provided to solve this problem.
4. **Consistency:** Repeated text and irrelevant images or usage of more colors leads to inconsistency which is not a part of the standard website. A website should follow certain principles to make it consistent for the end-user.
5. **Flexibility and efficiency:** The website should be flexible enough for all kinds of users including new users and old users. The website should provide enough instructions for end-users to be understandable.
6. **Aesthetics:** The website should follow a particular theme to look aesthetically good. It should often contain information which is relevant and necessary.
7. **Feedback:** Feedback from the end-users is compulsory because it helps to find the problems faced by the users and solve them to improve the usability of the website.
8. **Error messages:** Whenever an error occurs while accessing the website, the message should be printed on the screen to the users. The message should be in the form of a regular language other than code.

Expert Reviews : The expert reviews the design of the interactive system using Nielsen's Heuristics as a part of the evaluation process to conclude that all the principles are implemented to make it a perfect website.

5.2 Case Study

Case study is performed to gather the information from the multiple sources. We studied the design principles from different literature reviews and those design principles are stated in "Chapter 4". From the user's point of view, high quality means that the interface is friendly, consistent, easy to understand and has sufficient functionality to be able to perform all the defined tasks easily. To achieve all the above goals design principles are must.

Millions of users now depend on the interactive software. So the quality of the user interface is at most important. Approaches are well documented for user interface design, but few of them defined quality means in a way that determines the software development consequences. Design principles for Interactive Software addresses the crucial intersection of Human-Computer Interaction and Software Engineering

by knowing the requirements needed for users to build interactive systems and the needs for the developers to produce a well organized interactive system[10]. In the analysis of HCI principles, it has been shown that HCI is in a state of fragmentation. This leads to the problem of adopting a coherent and consistent set of principles by which to measure the HCI performance of an interface. To this effect many sets of principles have been put forward by many different authorities in this field. However, there is no consistent single set of principles accepted by all. The purpose of this study about HCI design principles is to normalise the range of principles which have been proposed and to determine the most significant set[16]. Thus this method helps in finding the usefulness of the design principles which helps in transforming the interactive system by assessing the aspects such as usability.

5.3 Formal- experiment

5.3.1 Agile method for Thesis Draft

Product Backlog Product Backlog list for the implementation:

1. Worked on literature review regarding usability
2. Getting knowledge on Evaluation methods and design principles
3. Selecting a bad user interface for redesigning
4. Selection of tools for designing the layout of the interactive system
5. Evaluate the existing interactive system
6. HCI principles should have been opted according to necessity
7. Understanding the features and techniques of the software tools
8. Deep study of the interactive system and the contents in the website
9. A design layout should be created using the selected tools
10. Implementation of the new design in the website by following the HCI design principles
11. Evaluation of the newly developed website and check if the website follows all the requirements and HCI principles
12. Sort the data in the interactive system accordingly
13. Compare and contrast the older and new version of the website based on the design principles
14. Make the required changes to the system
15. Draft a report explaining the process carried out

Thus, the Product Backlog has been designed for the website and the thesis draft.

Sprint Time Plan:

The implementation is done in a sprint in which we completed the project within a limited time. The sprint is a time slot scheduled to perform the given work and tasks[11]. Work done in each sprint is stated below :

Sprint-1(Time span of 3 weeks)

1. A meeting with the group members has been organized and there were many discussions about the Usability of the website and the thesis draft.
2. The website to be redesigned has been opted and we examined the details of the interactive system based on the usability.
3. The website that has to be modified is " www.siphawaii.com". This is the website which should be redesigned with HCI principles.
4. The website has been classified as an e-commerce website so we started studying the articles related to usability evaluation for an e-commerce website.
5. After thorough research, we started the evaluation process of the interactive system.

Sprint-2(Time span of 2 weeks)

1. As the website is classified as an e-commerce website, from the usability evaluation, we gathered information regarding the website.
2. Problems and usability issues were identified and listed out.
3. After evaluation, we chose the research method - a case study of web development using the agile method.
4. The formal experiment using the agile method has also been examined.
5. We opted for the software and the tools required for the development of the website.
6. We made a sample of the new website to check if all the issues will be cleared.
7. We selected the HCI design principles to implement in the interactive system.

Sprint-3(Time span of 3 weeks)

1. By this time we started writing the report by drafting the introduction part.
2. We studied and analyzed various programming languages such as HTML, CSS, PHP, JavaScript, MySQL to develop the website.
3. We started implementing the code in the opted software.

The agile development methods include various steps:

1. Understanding the client's requirement: The requirements are gathered from the end-users because they act as the client for this product. And the requirements needed are selecting a bad user interface and evaluating it and redesigning by adopting the HCI design principles and finally reporting the thesis draft.
2. Product owner : A1 and A2 are the product owners for this project.
3. Product Backlog : The Product backlogs are the tasks that have to be accomplished to complete the Thesis Draft.
4. Development team: Since we are two people, both A1 and A2 acts as the development team.
5. Sprint planning meeting : Meetings have been conducted between A1 and A2 in which the information have been exchanged and updated accordingly. The sprint meetings are necessary to finish the work in given deadlines. Four sprint meetings have been scheduled and accomplished in the duration of 10 weeks.
6. Sprint Backlog : The tasks that were left over even after the deadline are known as the sprint backlogs and we have finished within the deadline. The tasks are accomplished on the basis of daily sprint meetings.
7. Designing the product: The product here is the website and the draft. They have been well-designed by following all the requirements provided.
8. Scrum Master : A1 and A2 plays the role of the scrum master who ensures that the team is working effectively i.e, on the completion of redesigning as well as reporting the thesis draft. The scrum master also deals with the obstacles in the team.
9. Review by Sprint expert : The sprint review is given by the expert, both A1 and A2 plays the role of sprint expert i.e, any changes needed for the correction of front end for the website and also corrections needed for the thesis draft. The reviews are helpful to improve the working of the website and the draft.
10. Feedback and preparing for maintenance: Continuous monitoring and feedback will be taken from A1 and A2 and vice versa to keep the website and the draft updated with changing needs and requirements. And the feedback from the end users will also be collected for improvements in the website.

Therefore, both the roles are shared between A1, A2 and the tasks were divided. For example if A1 plays the role of product owner then A2 will be scrum master and vice-versa. Thus we have exchanged the roles among us according to the tasks.

5.4 Survey Evaluation

Survey evaluation is processed to know the response of the newly designed website from the end-users since initially the requirements have been gathered from the audience. This section involves the study of various evaluation methods applied in the focus of an online survey. It determines the process of the survey and it also gives details regarding the questionnaire. The main objectives and research questions will play the back-end role in the survey. Survey responses are collected and analyzed accordingly, based on audience group. Segmentation of groups is necessary in order to achieve the outcomes from all kinds of end-users. The outcomes are analyzed and the issues are checked with requirements. The survey responses are confined to the most crucial and influential perceptions. This chapter outlines the end-users of the SIP HAWAII website and general online shoppers.

It contains information about the guidelines required to determine the kind of user-experience and the user-interaction with the newly designed portal source of the data and it may be based on:

1. Reasons behind using the website.
2. Familiarity with SIP HAWAII website.
3. The user experience of the website.
4. Credence on the context of the website.

SURVEY OBJECTIVES AND RESEARCH QUESTIONS:

The main aim of the survey is to wider the insights and understanding of the essence of usability of the website. The investigation has a prominent role in advancing the usability testing process and emphasizing the end-user problems.

Objectives:

1. How is the user experience with the SIP HAWAII website for its end users?
2. What is the user's perspective on the two versions of the website in terms of usability?
3. To know the user's problems in the old version of the website, and to know if the problems have been solved in the new version of the website.

QUESTIONNAIRE:

The survey questionnaire should be conducted in such a way that it gives the overall analysis of the re-designed website. The survey is conducted based on the comparison of the user-experience between the older version and the new version of the website. The questionnaire plays a key role in judging the results of the redesigned website as a part of the survey evaluation. The survey gathers all the qualitative and quantitative data from the end-users about the quality of the interface experience with the website and usability of the system. Apparently, graphic information such

as pie-charts which depict the data of the end-user response for the survey. This is done to understand the user's perception of the usability/accessibility of the end-product.

The survey has to be conducted in google forms. This website is chosen mainly due to the huge range of accessible functions, which can be adapted easily for the survey, analysis, and featuring of collected information. The survey focuses were effective during the period of 18th March 2020 to 10th April 2020.

SURVEY CONDUCTED :

The survey has been conducted through online process. A link along with the newly developed website has been shared with the audience.

The audience have been segmented into two groups :

Students

Online shoppers

There were 100 responses from each group. Most of the participants of the survey do no know about the website previously, About 67 percent of the people do not know about the website until they have taken the survey.

6.1 Comparison of interactive systems according to design principles

For intuitive understanding of both reader and writer we are willing to use the two websites as Website1 and Website2.

Website1 - Actual website (<https://www.siphawaii.com/>)

Website2 - Redesigned website (<https://unsaluted-alkalinit.000webhostapp.com/>)

As we have a very short time for designing the website we have followed the design principles according to the competence of the website. We have discerned several alterations of the previous website and redesigned website.

1. Clarity

- In Website1 there is a repetition of data i.e, in the left side panel coffee products are displayed and in the coffee section also same content has been repeated as shown in the Figure 5.1
- In website 2 there is no repetition of same data and provides clarity for the user as shown in the Figure 5.2

2. Aesthetics

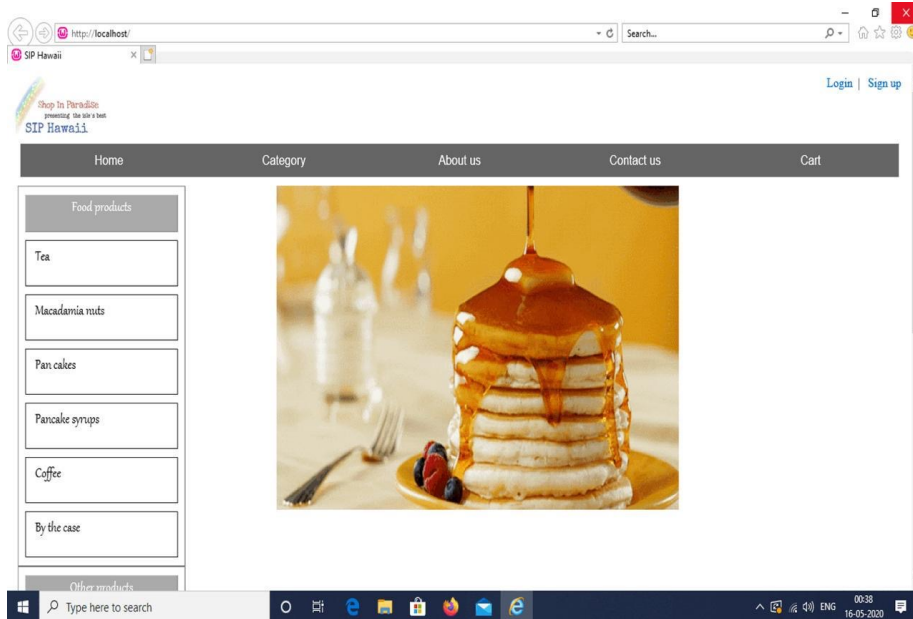
- In website1, the color scheme is unattractive as illustrated in Figure 5.1 . A website with a good interface design should have no more than four colors.
- In figure 5.4, we can observe the home page of Website2 contains only few colors which makes the interactive system more aesthetic.

3. Directness

Figure 6.1: The Home Page of the Old version of the website

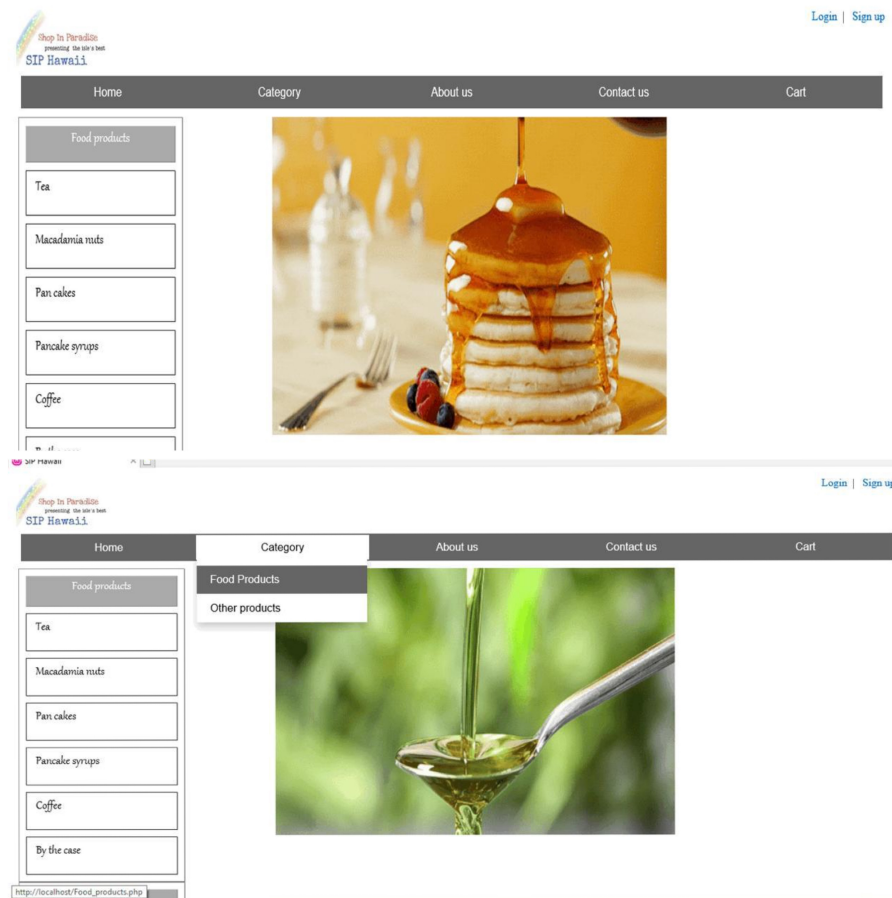


Figure 6.2: The Home Page of the newer version of the interactive system



- In Website1, there is no easy navigation for sign up in home page and there is only login button and later on clicking, it is directing to create account and the button is not highlighted.
- Directness should provide the easy navigation. In website2, we have both login and sign up options which provides directness, so that it stimulates in improving the user experience.
- In website1, in 'Add to cart section', on clicking a product some are directing to a product description page and for some products they have used BUY option which makes ponderous to the users.

Figure 6.3: The Home Page of the newer version



- In website2, for every product we have displayed the product and used add to cart button for user understandability in purchase of the product.

5. User control

- In Website1, Categorization of products were in a single section and the home page is very clumsy. We can observe the Flimsiness in home page in Figure 5.1
- In Website2, in the header section a panel with home, category, about us, feedback and cart were clearly inclined. We have separated the products into two sections- Food products and Other products which can be seen in Figure 5.4

6. Consistency

- In website1, the interactive system has unnecessary information on the

home page which is not useful for the customers.

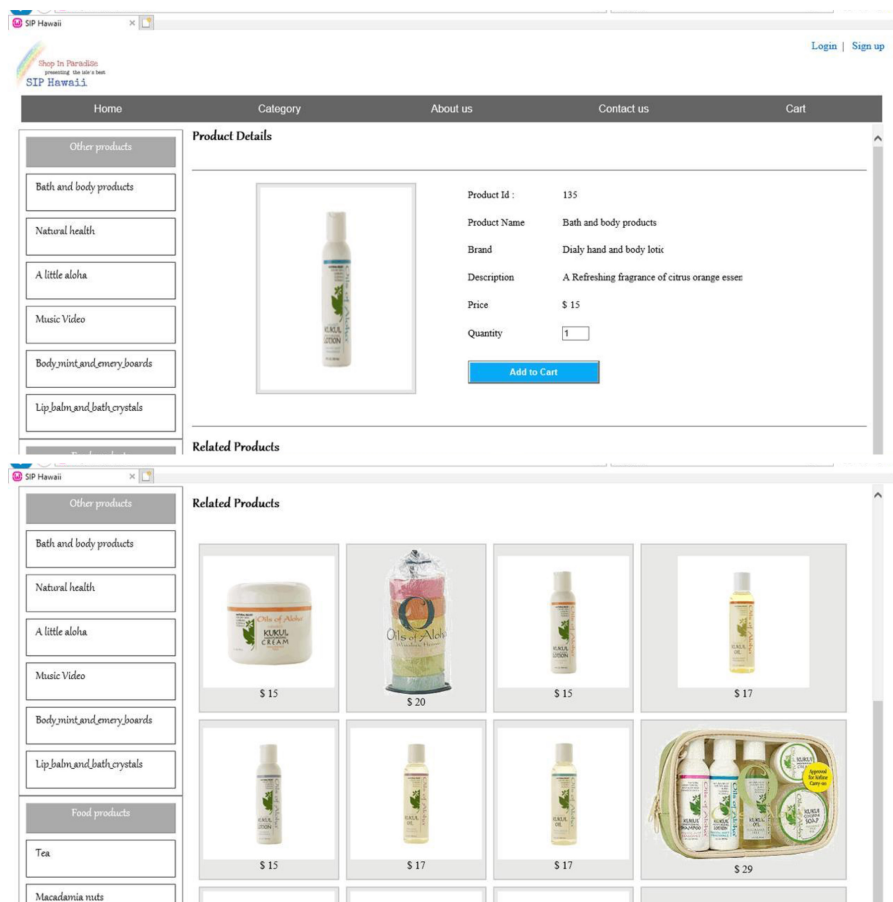
- In website2, the details were straight forward and transparent.
- In website1 on searching the products, they are displaying in the home page as shown in Figure 5.5 ,which makes unwisely to the users and in the right side below the products a particular section of products are displaying(coffee).
- In website2, the products display has been navigated to the other page as shown in Figure 5.6.

Figure 6.4: The products page of the old version of the website

The screenshot shows the product page for 'Oils of Aloha Kukui Oil Skin Care products'. The page layout includes a top navigation bar with 'Log In / Out' and 'Contact' links. A left sidebar menu lists various product categories: Coffee, Tea, Macadamia, Pancake, Bath and Body, and Natural Health. The main content area features a header with the brand name and a list of product types: Moisturizing Cream, Hand & Body Lotion, Body Oil, Cleanser, Massage Oil, Travel - Gift sets, and Glycerin Soap. Below this, there are two columns of text: 'What is Kukui oil?' and 'Benefits of Kukui oil.' The 'What is Kukui oil?' section explains that the oil is derived from the Kukui nut, which is rich in Omega-3s and is native to Hawaii. The 'Benefits of Kukui oil.' section highlights its effectiveness for treating eczema, psoriasis, dry scalp, and dandruff, and notes that it is safe for babies and free of parabens and preservatives.

7.

Figure 6.5: The products Page of the new version of the website



Availability

- In website1, the footer part contains all the products at the copyright license part and in every page it is repeating which is not feasible as shown in Figure 5.7.
- In website2, in footer section only the copyright license has been comprised as shown in Figure 5.8.

8. Obviousness

- In website1 there are multiple words for a single link i.e, in the home page different coffee types were given and these repeated words are routed to the same page by clicking on them which is extraneous and confuse users to choose.
- In website2, there are no different terms used for a single link.

Figure 6.6: The Copyrights and footer section of the old version of the website

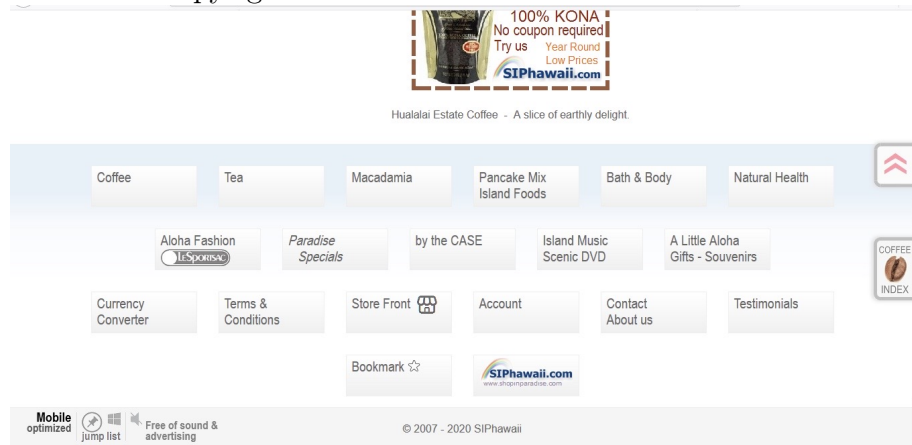


Figure 6.7: The copyrights and footer section of the new version of the website



9. Operability

- In website1, we can observe the flimsiness in the home page. On clicking the products they remain in the same page and too much of information was specified for the products.
- In Website2, we have directed to another page on clicking the products which is user understandable.

10. Simplicity

- In website1, for the appearance of the products in home page they made the UI very clumsy.
- In website2, we have used a GIF as shown in Figure 5.4 and displayed short list of products which were available and home page is very simple

and obvious.

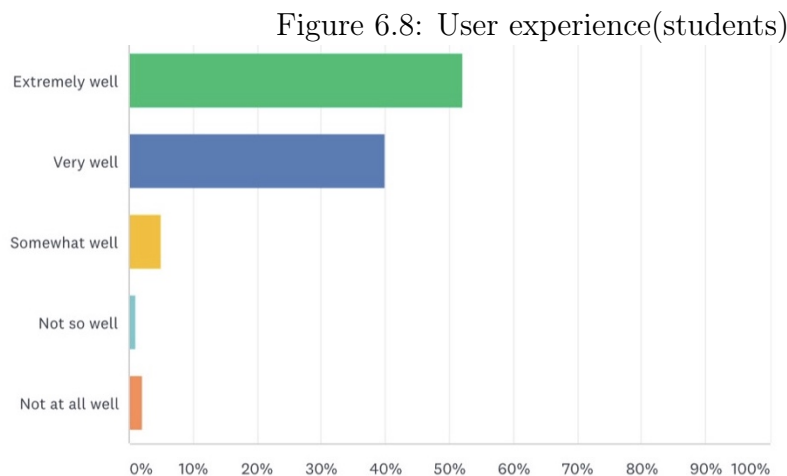
11. Predictability

- In website1, related products are not displayed.
- In website2, in the product description page we have placed the related products section for user appliance in purchasing the product as presented in Figure 8.6. The user may search for the related products.

6.2 Survey- Responses and Analysis

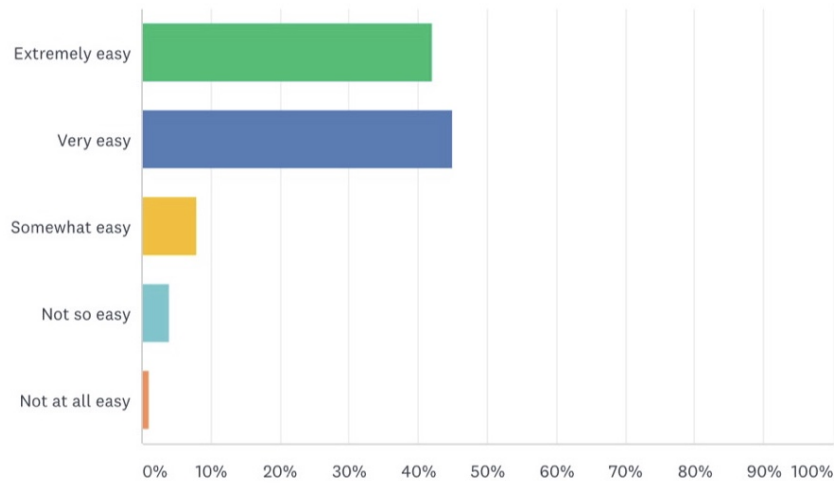
The survey has been conducted among 2 groups i.e. Students and Online shoppers. Below are the graphs depicting the responses of the survey.

STUDENTS: Students can have a basic knowledge regarding the insights of a website, so their perception towards this survey results in different ailments. They can analyse the UX, usability of the website.



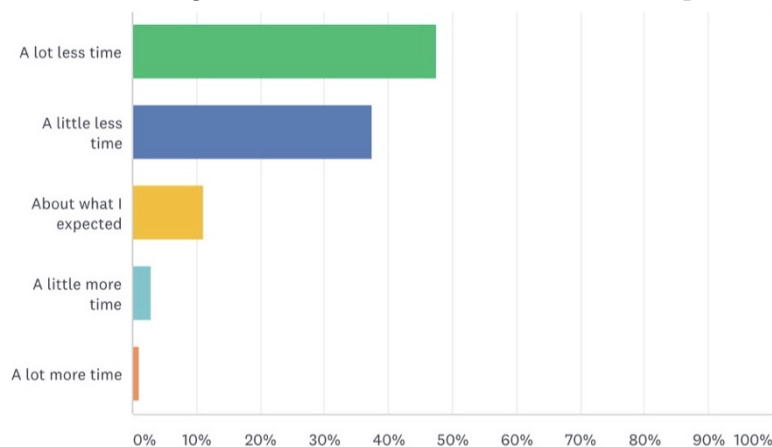
The graph depicts the user experience of the new website in which the responses say that 52 percent of the students agreed on extremely well, while 40 percent of the students say that the website's UX is very well. On the other hand, 5 percent of the students rely on the response that the user experience is somewhat well and two responses with very bad UI and one response with bad UI.

Figure 6.9: Ease to find a product(students)



The graph depicts the ease to find a product in the website since the older version has findability issue. 42 percent of the students felt it extremely easy to find their necessary product and 45 percent people said that it is very easy while 8 percent said that it is not so easy to find while 5 people said that it is difficult. We have implemented the products into categories unlike the older version of the website.

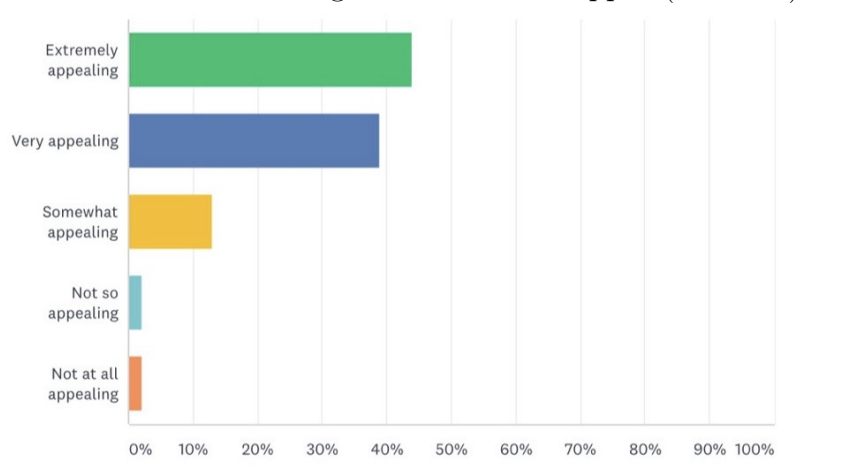
Figure 6.10: Estimated time to find a product(students)



While surveying regarding the time taken to find a product in our website, we

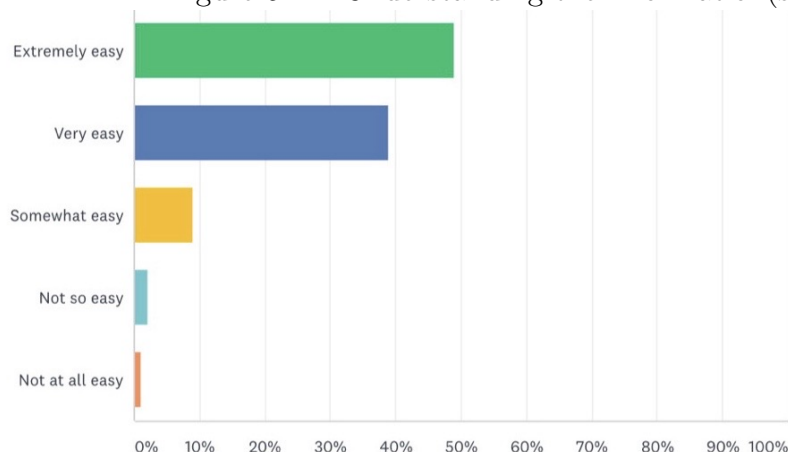
got a good response with 47.47 percent with a lot less time, 37.37 percent people with a little time , 11.11 percent reached the required product within the expected time while 3.03 percent people too little more time than expected and 1.42 with a lot more time than the expected.

Figure 6.11: Visual appeal(students)



The visual appearance of the website is very important. The survey regarding the visual appeal depicted the following results : 44 percent extremely appealing, while 39 percent students felt that the website is very appealing, 13 percent people said that it is somewhat appealing while 4 people did not approve the visualization.

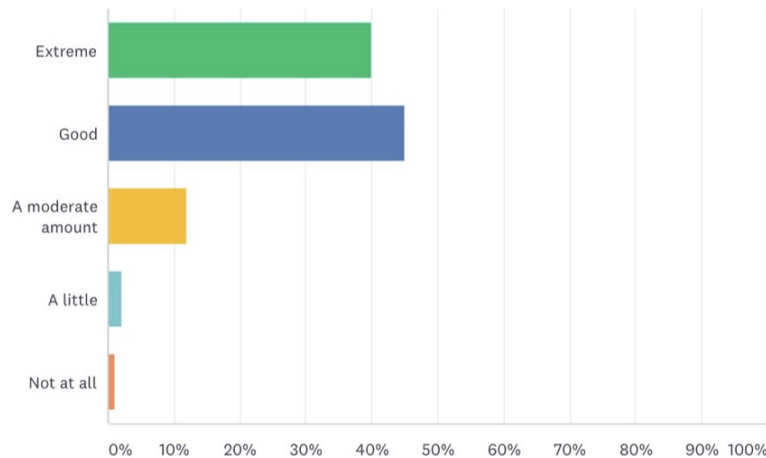
Figure 6.12: Understanding the information(students)



The ease of understanding the information in the website is depicted by the students as follows : 49 percent people voted for extremely easy option while 39 percent

said that the information in the website is very easy to understand while 9 people said that it is somewhat easy whereas 3 people did not approve the ease of understanding the information in the website.

Figure 6.13: Changes in the new website(students)

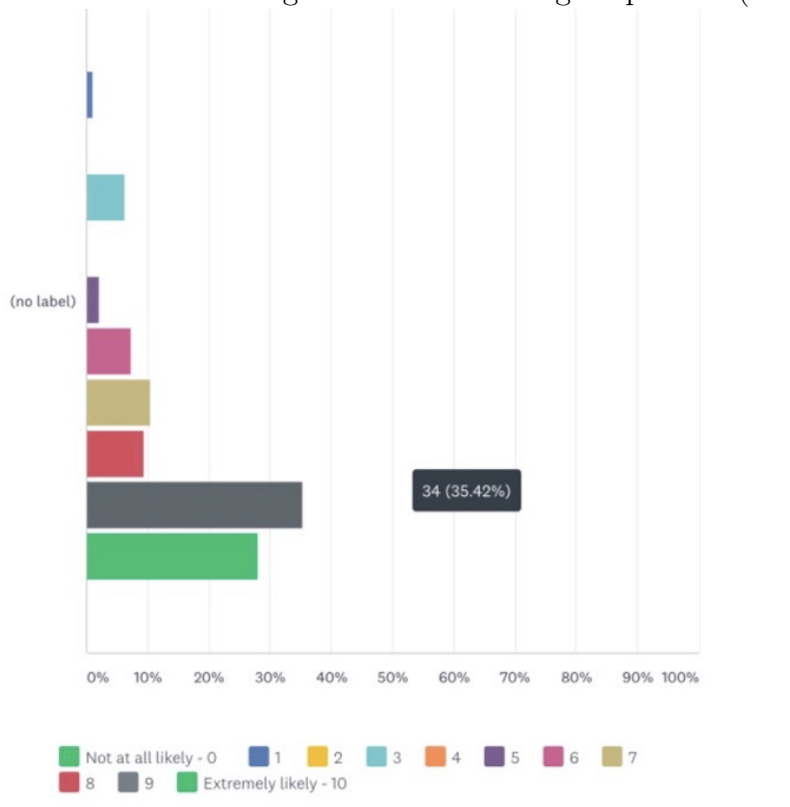


The percentage of major changes in the new website while compared to the older version is given by the students as follows: 40 percent people said that the changes are extreme while 45 percent people said that the changes are good, 12 percent people said that changes are moderate while 3 percent said that there no changes in the newly designed website.

The Home Page experience when compared to older version is way modified finely and was asked by the students to rate it on the scale of 0-10 where 0 is not at all likely and 10 is extremely likely and the results are as follows:

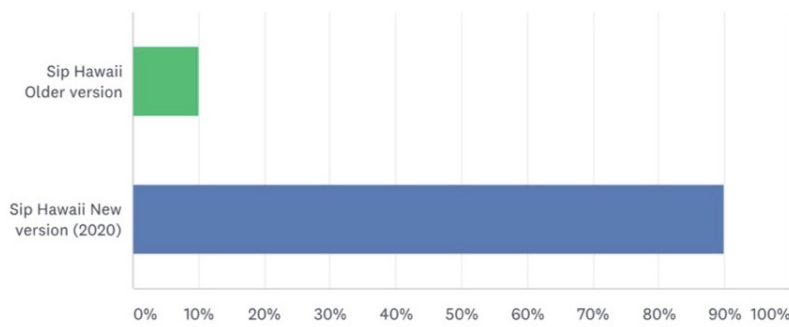
- 1 - 1.04
- 2 - 0.00
- 3 - 6.25
- 4 - 0.00
- 5 - 2.08
- 6 - 7.29
- 7 - 10.42
- 8 - 9.38
- 9 - 35.42

Figure 6.14: Home Page experience(students)



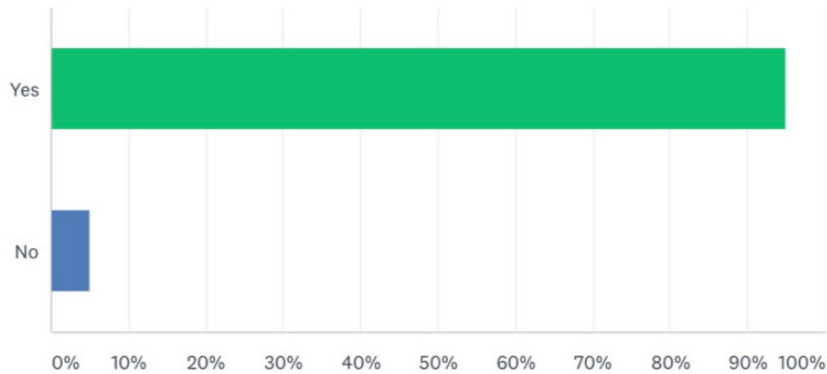
10 - 28.13

Figure 6.15: Best Version(students)



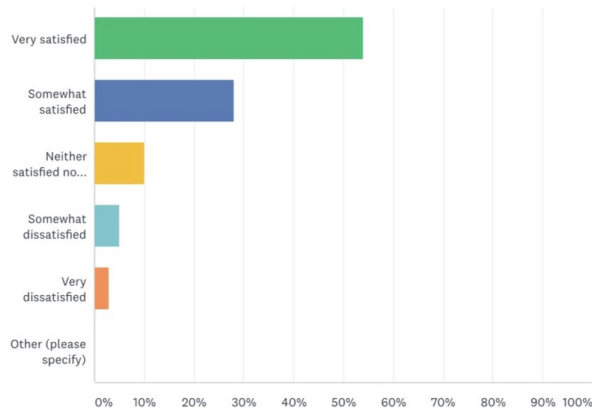
The students are given the option to choose the best version of the website in which 90 percent of the students chose the new version as the best version while 10 percent of the students chose the older version.

Figure 6.16: Mobile Optimization(students)



The mobile optimization feature for the website has a good response from the students with 95 percent as "yes" that means the website is suitable for mobiles and 5 responses "no", the website is not optimized for mobile phones.

Figure 6.17: Overall User Satisfaction with new website(students)



The students were asked about the overall satisfaction with the usage of the newly designed website, whether the website is up to a satisfactory mark or unsatisfactory mark. The results are as follows:

Very satisfied - 54 percent

Somewhat satisfied - 28 percent

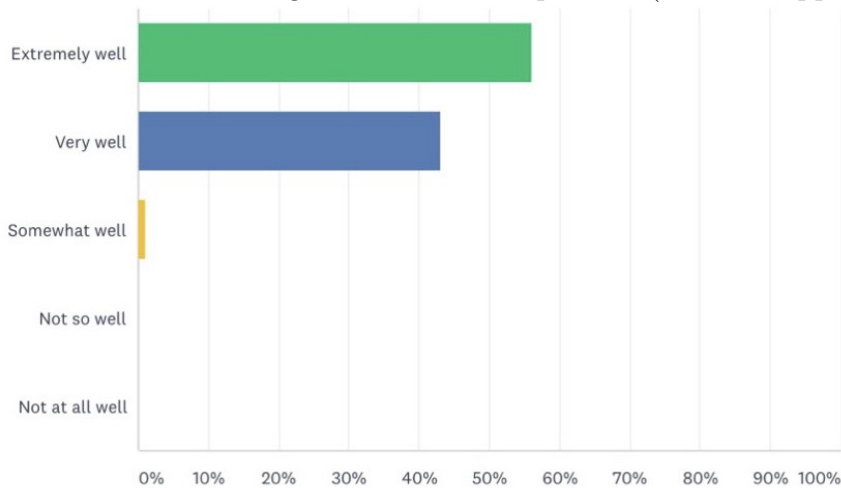
Neither satisfied nor dissatisfied - 10 percent

Somewhat dissatisfied - 5 percent

Very dissatisfied - 3 percent

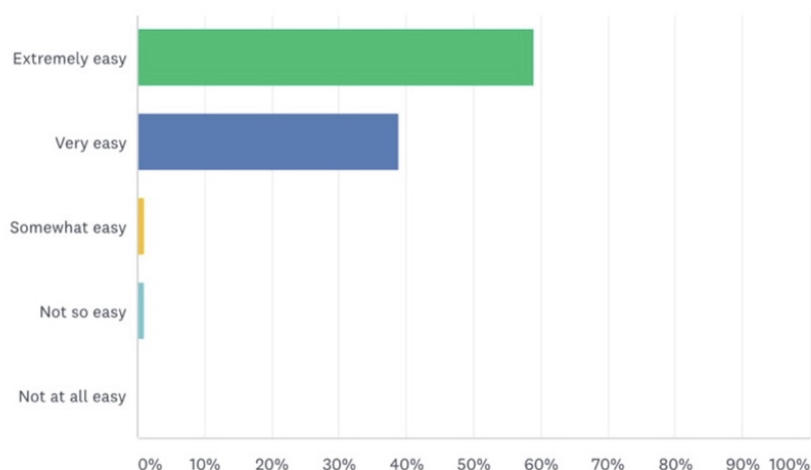
ONLINE-SHOPPERS: Online shoppers are the one who frequently does online shopping, they are the main audience for the website. The end users know what they require for the shopping to be done with an ease.

Figure 6.18: User experience(online-shoppers)



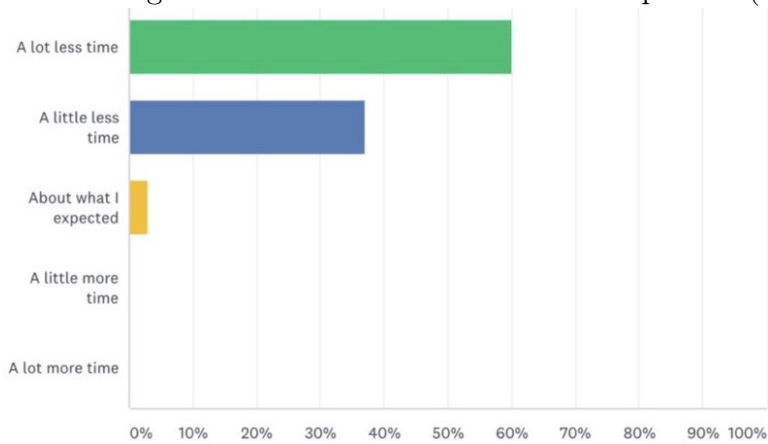
The graph depicts the user experience which accessing the new website in which the responses say that 56 percent of the shoppers agreed on extremely well, while 43 percent of the students say that the website's UX is very well. On the other hand, 1 percent of the students rely on the response that the user experience is somewhat well.

Figure 6.19: Ease to find a product(online shoppers)



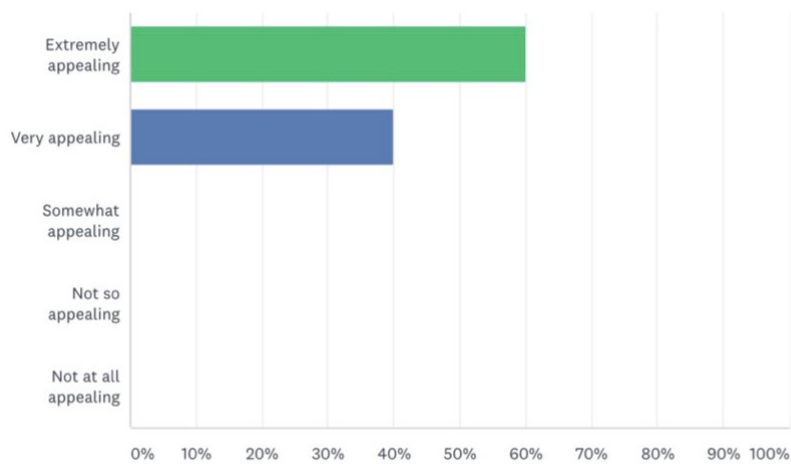
The graph depicts the ease to find a product in the website since the older version has findability issue. 59 percent of the online shoppers felt it extremely easy to find their necessary product and 38 percent people said that it is very easy while 2 percent said that it is not so easy to find while 1 people said that it is difficult. We have implemented the products into categories unlike the older version of the website.

Figure 6.20: Estimated time to find a product(online-shoppers)



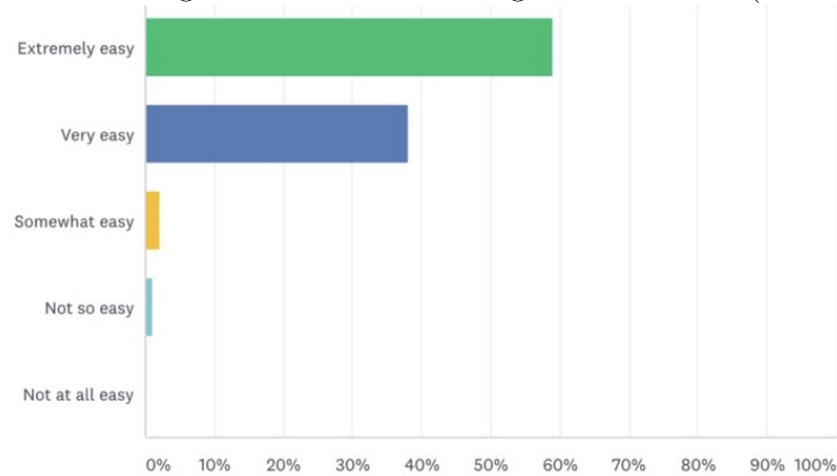
While surveying regarding the time taken to find a product in our website, we got a good response with 60 percent with a lot less time, 37 percent people with a little time , 3 percent reached the required product within the expected time.

Figure 6.21: Visual appeal(online-shoppers)



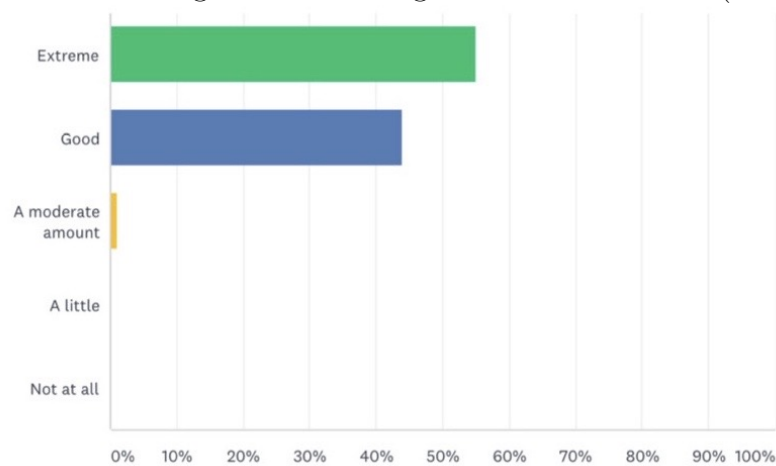
The visual appearance of the website is very important. The survey regarding the visual appearance appeal depicted the following results : 60 percent extremely appealing, while 40 percent students felt that the website is very appealing.

Figure 6.22: Understanding the information(online-shoppers)



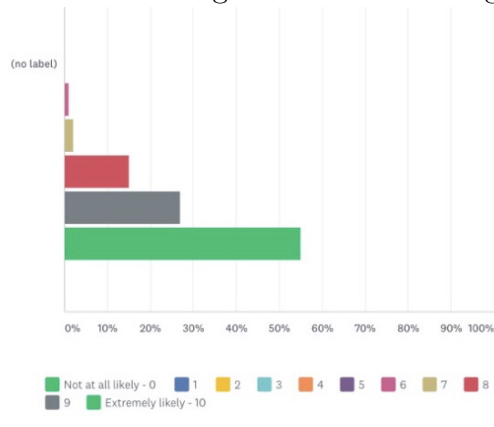
The ease of understanding the information in the website is depicted by the online shoppers as follows: 59 percent people voted for extremely easy option while 39 percent said that the information in the website is very easy to understand while one person reviewed that it is somewhat easy whereas one person did not approve the ease of understanding the information in the website.

Figure 6.23: Changes in the new website(online-shoppers)



The percentage of major changes in the new website while compared to the older version is given by the online shoppers as follows: 55 percent people said that the changes are extreme while 44 percent people said that the changes are good, 1 percent people said that changes are moderate in the newly designed website.

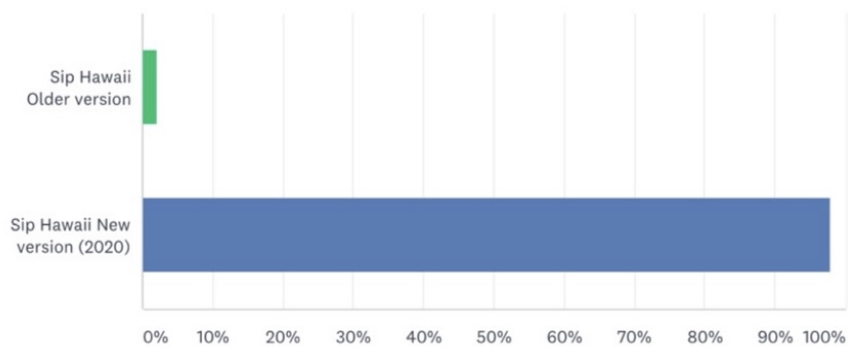
Figure 6.24: Home Page experience(online-shoppers)



The Home Page experience when compared to older version is way modified finely and was asked by the online shoppers to rate it on the scale of 0-10 where 0 is not at all likely and 1 is extremely likely and the results are as follows:

- 1 - 0
- 2 - 0
- 3 - 0
- 4 - 0
- 5 - 0
- 6 - 1
- 7 - 2
- 8 - 15
- 9 - 27
- 10 - 55

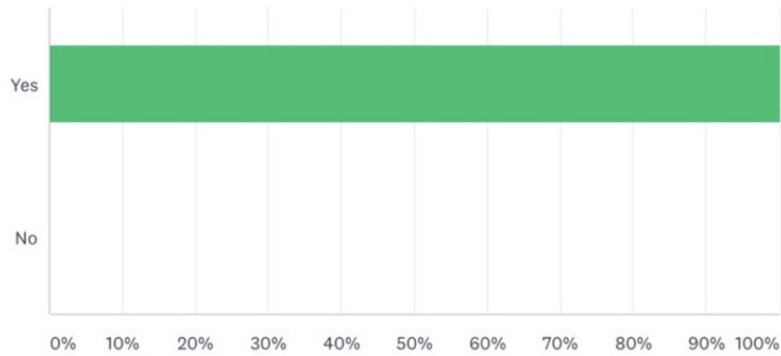
Figure 6.25: Best Version(online-shoppers)



The users are given the option to choose the best version of the website in which 98

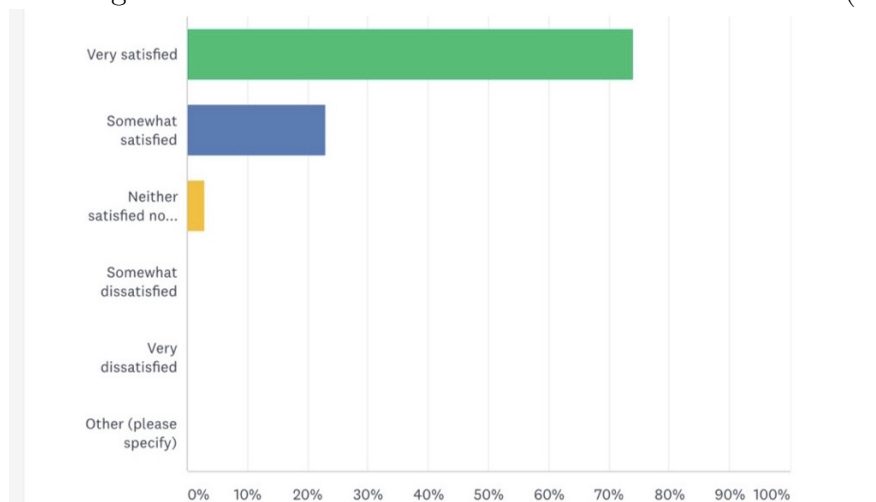
percent of the shoppers chose the new version as the best version while 2 percent of the students chose the older version.

Figure 6.26: Mobile Optimization(online-shoppers)



The mobile optimization feature for the website has a good response from the online customers with 100 percent as "yes" that means the website is suitable for mobiles and 0 responses for "no", the website is not optimized for mobile phones.

Figure 6.27: Overall User Satisfaction with new website(online-shoppers)



The end-users were asked about the overall satisfaction with the usage of the newly designed website, whether the website is up to a satisfactory mark or unsatisfactory mark. The results are as follows :

Very satisfied - 74 percent

Somewhat satisfied - 23 percent

Neither satisfied nor dissatisfied - 3 percent

Somewhat dissatisfied - 0

Very dissatisfied - 0

6.3 Validation

These results from the surveys helped us to analyse that the features, characteristics and aesthetics of the website have got an improved response overall on the survey. The HCI design principles were applied to the new website and they made the working of the website more reliable. Widespread evaluation methods such as usability evaluation, heuristic evaluation, open-ended questions, agile method and surveying have been used to ensure the reliability.

Qualitative data has been gathered through the surveys. The results are proved to be consistent by the analysis of the gathered information and data. Reliable methods such as survey evaluation and agile method establish and calculate the survey results.

Discussions regarding the reliability may be raised as the authors played the role of developer and tester but more number of people getting involved in one design project make the work into less subjective one. However, we followed the best methods to ensure accuracy in designing the project.

The survey evaluation method is to know the audience perspective towards the website however, We validated the website using the HCI principles. We compared and contrasted each HCI principle with the features implemented in the website to validate the newly designed website. Validation of the website is important to check if the website maintains compliance at all stages of design process.

7.1 Survey Questionnaire

7.1.1 Questions related to the survey conducted for new version of website:

1. Overall, how is the user experience of the SIP Hawaii Website ?
2. How easy was it to find a product on our sip hawaii (2020) website?
3. Did it get you more or less time than estimated to find the products on our newly designed website (sip hawaii 2020) ?
4. How visually appealing is our sip hawaii (2020) website?
5. How easy is it to understand the information on our new website (sip hawaii 2020) ?
6. Did you find major changes in the usage of the website when compared to the older version?
7. How well understandable is the home page of sip hawaii ?
8. Which version do you like the best?
9. Is the Sip Hawaii (2020) website well optimized for your mobile ?
10. Overall, are you satisfied or dissatisfied with your experience using our new website (sip hawaii 2020)?

7.1.2 Questions related to the survey conducted for old version of website

1. How attractive is the website ?
2. Do you think that any changes should be made to this website ?
3. Rate the Understanding of the website on the scale 1-5!
4. How easy is the user experience ?

5. Is the website mobile friendly ?
6. How easy are the products to find in the website ?
7. How is the shopping experience ?

7.2 Survey Results for the older version

Earlier, after the usability evaluation, we have conducted a survey for the older version of the SIP Hawaii to know the user experience and feedback from the audience. The old website got bad response for its user interface and now after designing the new website, we again conducted the survey and got a positive response for the survey. The survey had been conducted among the same set of audience and we received the response as follows.

Here is the analysis of the older version:

Figure 7.1: Attractiveness of the website

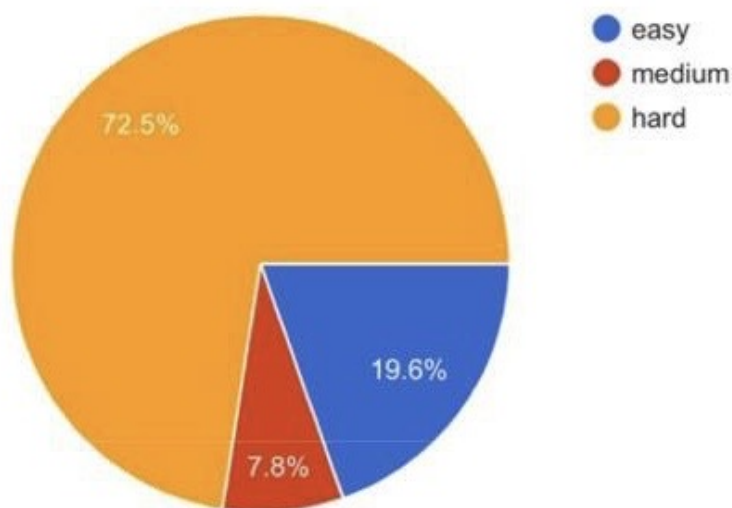


Figure 7.2: Any changes required

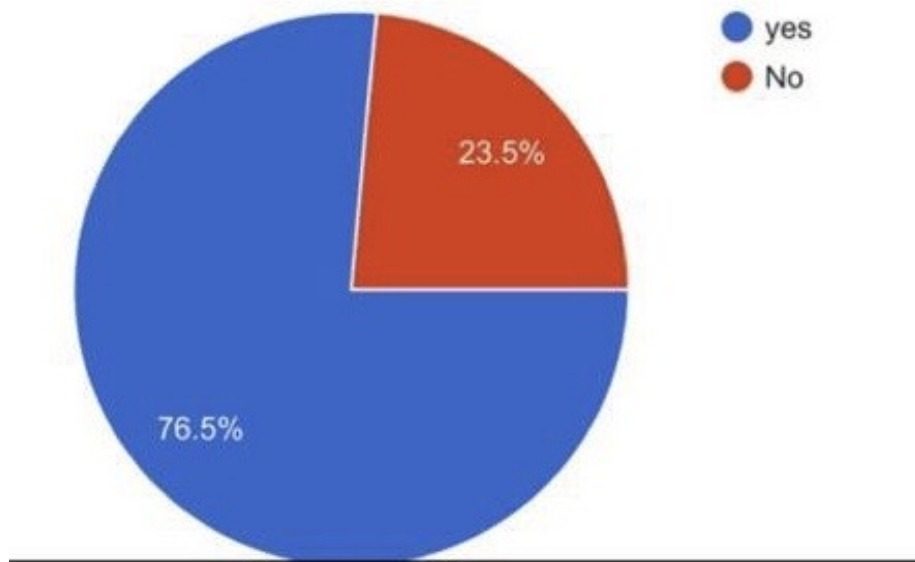


Figure 7.3: Understanding of the interface

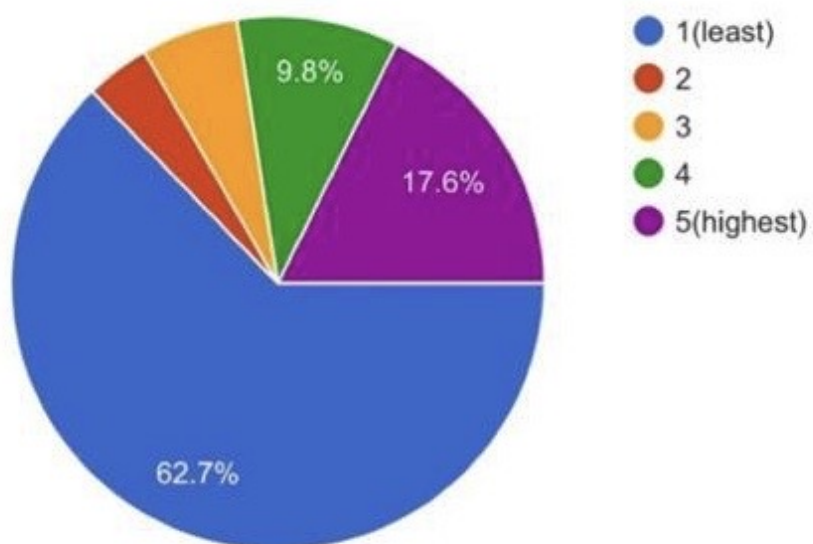


Figure 7.4: user experience

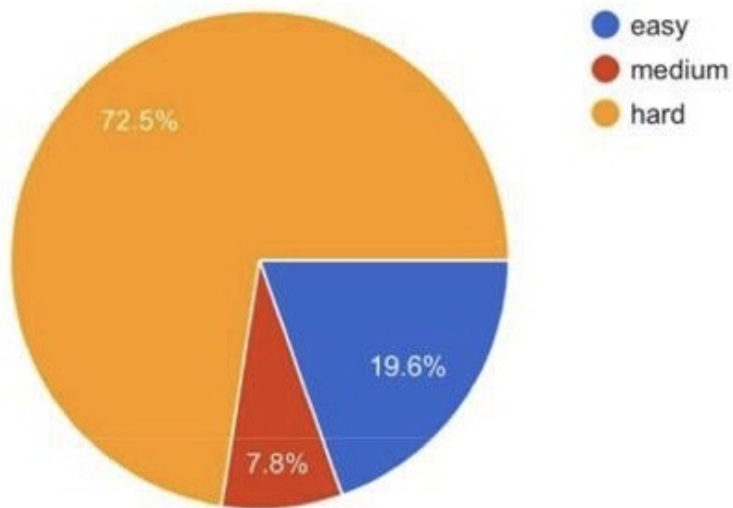


Figure 7.5: mobile optimized

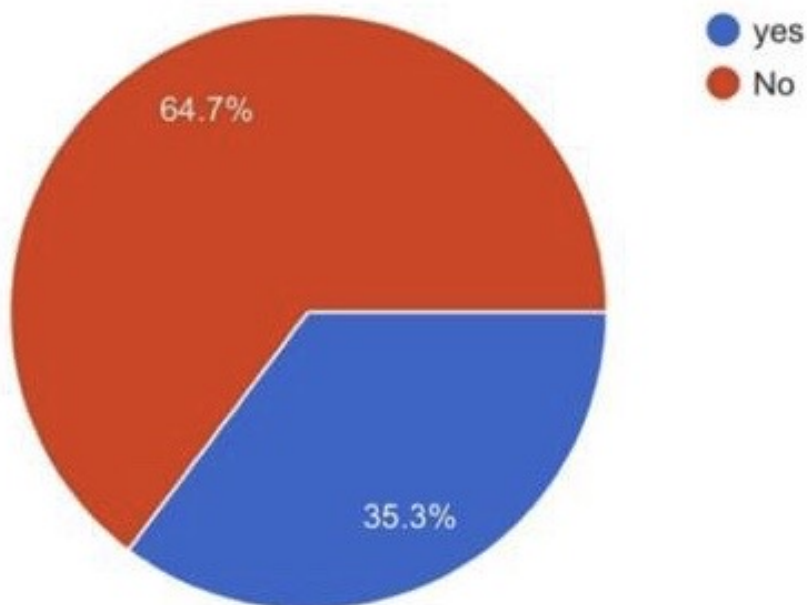


Figure 7.6: Products finding

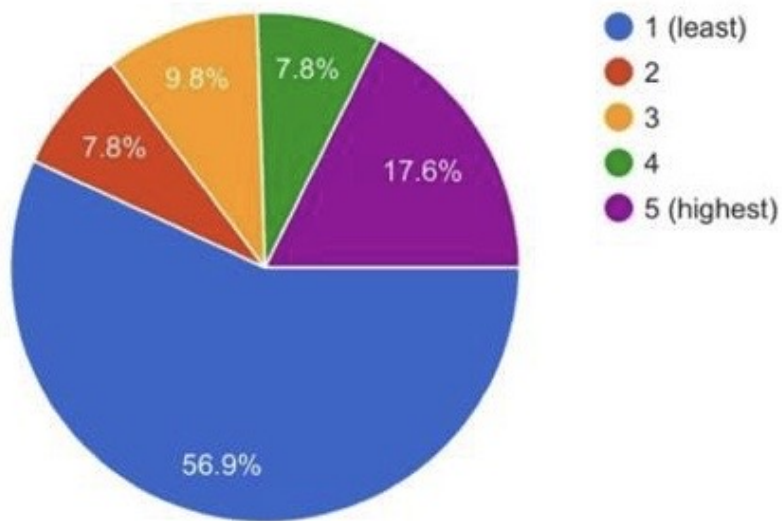
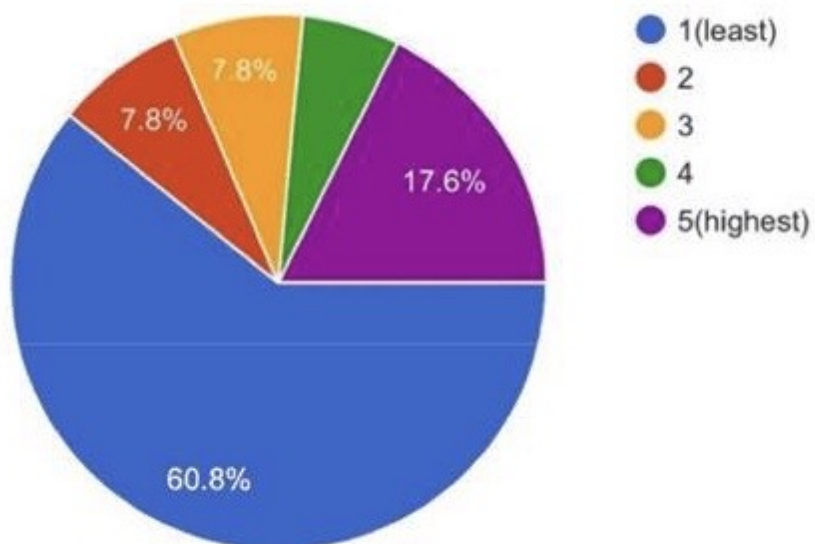


Figure 7.7: shopping experience



8.1 Conclusions

In this research we have studied the usefulness of design principles in developing an interface. The research questions behind this project are:

1. RQ1: What is the necessity of design principles for an interactive system to be well organized?

Design principles are an important aspect in web designing, they increases the usability and make the website look and feel professional. However, if design principles are not taken into consideration, the outcome would be negative[29].In our perspective design principles are the backbone of any interactive system. The website feels unprofessional without the design principles and it breaks the visitors trust. So, to make the interactive system look professional, design principles play a major role. Thus, without the design principles the interactive system may lose the visitors expectations.

2. RQ2: What changes does an interactive system possess after implementing the design principles and will it be more consistent compared to the previous one?

By using the Design principles the interactive system becomes more feasible and consistent. We have validated this by using HCI design principles. We have concluded this by taking a survey from two groups of people- students and online shoppers. The responses have been noted and most of the responses were decisive for the redesigned website. Thus, the Website is more coherent by using the design principles.

8.1.1 Author Perspective

Design should structure the user interface in a deliberate and useful manner, based on simple, reliable models that are accessible, noticeable and recognizable to users. So design principles were very useful for an acceptable interactive system. We almost tried to follow the design principles but some of them doesn't fit for the website. We have finally redesigned the website by adopting the standards of design principles and get to know the importance of design principles. We had come across a question which is quite interesting for interface developers - "Is it difficult to follow all the design principles for an interactive system?"

8.2 Future work

The intriguing future work of this thesis is to achieve all the design principles for an interactive system. Though we tried to obey all the design principles it was not possible so the future work for this is:

- Is it possible to follow all the design principles for an acceptable interactive system?
- Can any special features such as speech recognition and voice search be implemented for disabled people by following all the HCI design principles?

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