A Project Report on

Heuristic Evaluation of Website using HCI Principles

Submitted by

Arshan Bhanage (Roll no. 10)

Varun Changarankattil (Roll no. 14)

Alaster Cheeramkuzhyil (Roll no. 16)

Reo Correia (Roll no. 18)

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BACHELOR OF ENGINEERING

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Under the Guidance of

Dr. Nazneen Ansari

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University of Mumbai

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CERTIFICATE

This is to certify that Arshan Bhanage, Varun Changarankattil, Alaster Cheeramkuzhyil, Reo Correia are the bonafide students of St. Francis Institute of Technology, Mumbai. They have successfully carried out the project titled "Heuristic Evaluation of Website using HCI Principles" in partial fulfilment of the requirement of B. E. Degree in Computer Engineering of Mumbai University during the academic year 2022-2023. The work has not been presented elsewhere for the award of any other degree or diploma prior to this.

(Dr. Nazneen Ansari)

(Dr. Sincy George)
Principal

(Dr. Kavita Sonawane)
CMPN HOD

Project Report Approval for B.E.

This project entitled **'Heuristic Evaluation of Website using HCI Principles'** by **Arshan Bhanage, Varun Changarankattil, Alaster Cheeramkuzhyil, Reo Correia** is approved for the degree of Bachelor of Engineering in Computer Engineering from University of Mumbai.

Examiners

1. ------------------------

2. ------------------------

Date: 03/05/2023

Place: Borivali, Mumbai

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Signatures of all the students in the group

(Arshan Bhanage)

(Varun Changarankattil)

(Alaster Cheeramkuzhyil)

(Reo Correia)

Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included; we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in this submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Signatures of all the students in the group

(Arshan Bhanage)

(Varun Changarankattil)

(Alaster Cheeramkuzhyil)

(Reo Correia)

Abstract

The report discusses the designing and implementation of a tool for Heuristic Evaluation of Websites Using HCI Principles. The design quality of human machine interface (HCI) is influenced by many factors, such as the percentile of human models, the position and structure of display or control equipments and so on, because the relationship between these factors are very closed, so it is difficult for designers to use enough human factor parameters in design process. Through this report we aim to take the input of multiple users on a well known website and the website on which evaluation is to be performed. This input will be taken through the medium of google form or by answering the questions on the website. The data collected in the evaluations performed were analyzed from the 10 Nielsen usability heuristics, and Shneiderman's 8 Golden Rules which give us the scores of the website. The results showed in this tool will be effective in pointing various usability issues in the targeted website, and provide an overview on the design, functionality, and usefulness of the website.

Keywords: *Heuristic evaluation; usability*

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List of Abbreviations

Sr. No.	Abbreviation	Expanded form
1	HCI	Human Computer Interaction
2	HMI	Human Machine Interaction
3	BTH	Blekinge Tekniska Hogskola
3	UI	User Interface
4	SIDE	Semiotic Interface sign Design and Evaluation
5	DFD	Data Flow Diagram

Chapter 1

Introduction

1.1 Description

Human Computer Interaction, or HCI, is the study, planning, and design of what happens when you and a computer work together. As its name implies, HCI consists of three parts: the user, the computer itself, and the ways they work together.

The importance of HCI in the future of Website development is not to be taken lightly. It has been shown that a large percentage of the design and programming effort of projects go into the actual Website design. The interface is a fundamental part of making the site more successful, safe, useful, functional and, in the long run, more pleasurable for the user.

The tools and techniques that have been developed in this field have contributed immensely towards decreasing costs and increasing productivity. Savings have been created through decreased task time, fewer user errors, greatly reduced user disruption, reduced burden on support staff, the elimination of training, and avoidance of changes in maintenance and redesign costs. Studies have shown that, by estimating all the costs associated with usability engineering, the benefits can amount to 5000 times the project's cost. HCI is a Web imperative now, and it'll continue to be so in future.

1.2 Problem Formulation

We plan to develop a system that is able to evaluate a website using heuristic evaluation methods proposed by Jakob Nielsen's heuristic evaluations and Shneiderman's Golden rules. The results from this evaluation will be used as feedback for making a website more attractive in appearance. We will be taking the survey of a website by a group of students and find the results of the web page as per normal users' perspective.

1.3 Motivation

Developing a unique look and feel for your website is important. A developer works hard to create a website that is the best in his view. But for a user to remember your website, the website should cater to his/her demands to its best ability. If your website looks unconventional and dissimilar, they won't remember it and will never use it ahead in the future. Creating a memorable and distinct look that users will remember is sometimes referred to as branding. This system can bridge the communication gap between the developer and the users to increase the functionality and display of the website.

1.4 Proposed Solution

Using this project we can evaluate various aspects of a website like its functionality, design, performance and more. We use Nielsen's heuristics and Shneiderman's Golden rules to evaluate all the websites. After this evaluation process the website will provide the user with rating as per every aspect. The user can see what improvements he can make to the website for attracting other users.

1.5 Scope of the Project

Using this project we can evaluate various aspects of a website like its functionality, design, performance and more. We use Nielsen's heuristics and Shneiderman's Golden rules to evaluate all the websites. After this evaluation process the website will provide the user with rating as per every aspect. The user can see what improvements he can make to the website for attracting other users.

Chapter 2

Literature Review

Paper [1] focuses on the heuristic evaluation of the Student Portal utilized by BTH University in Sweden using Nielsen's Design Principles. The BTH portal acts as a link between all the entities and personnel within the university for various educational information of students to utilize in the admission process. The authors have tested the portal based on the three components of usability: effectiveness, efficiency and satisfaction. Survey was chosen as the method of data collection for this research; as they found out that, for heuristic assessment, averaging the assessments of certain groups of assessors produced better outcomes than an individual expert.

The author of paper [2] utilized Nielsen's Heuristic principle to evaluate the UI of Uppsala University Student Portal housing a total user base of 50000. They noticed that, as the portal system was old, regardless of the usability improvements brought in, there are still many sections left to be checked out. For the evaluation process, the participants, recruited using social media based on their merits, were instructed to perform certain tasks within the student portal and then provided with a survey individually; A debriefing session was also conducted between the author and the evaluators to discuss the issues. Various tools and methods were used to analyze the data collected from these surveys such as Excel, statistics, content analysis and SPSS. Based on the results obtained from analysis showcase many weaknesses present in the system pointed out by the evaluator and a set of guidelines have been presented by the author. They also mentioned the limitations presented by the paper, particularly in the selection process, as it was conducted mostly online

through social media and offline discussions for much clearer understanding between the peers weren't possible due to covid-19 pandemic at the time.

The role of interface designing has changed and widened to a great extent with the expansion of computing technology. The main aim of paper [3] is to infer design principles, put forth a feasible method for designing an interactive system, and evaluate the changes caused to the system. The author had chosen Agile method as the approach for the designing process as opposed to the Waterfall method. The former was chosen as the studies compared the two approaches and found out Agile was much more flexible than the traditional Waterfall method by splitting the tasks into multiple sprints, aiding in a faster completion of the project within the scheduled time-limit. Evaluation methods were broken down in two main categories: formative (done prior to the implementation) and summative (after the implementation). The reasoning behind choosing a heuristic approach in this study includes provision of quick and cheap feedback to designers from consumers, formulation of best practices, proceeding with usability tests, and evaluation of the system by experts. However, usage of such methods also come with a few shortcomings such as artificiality, lacking quantitativeness, and a sense of bias. While setting up the theoretical framework using Agile, 15 HCI principles are taken into consideration, some of them being accessibility, operability, simplicity, aesthetics, clarity and availability. PACT system is used to refer to the working of a sample interactive system, consisting of people, activity, context and technology after the literature framework is formed. The tools used for designing the interactive system after the completion of design principle review were HTML, CSS, JavaScript, PHP, and MySQL. After the redesigning process using the mentioned tools, the system is then put through usability evaluation, which incorporates heuristic and expert analysis. Utilization of these steps had led to improvements of the target system chosen by the authors and later validated whether the site maintains compliance throughout the design process.

In paper [4], the authors had set their motives to ensure all the users regardless of any real-life shortcomings could access useful information and functionalities of a website effectively. For this and avoiding any dissatisfaction among the users, a

continuous research and tests on the heuristic evaluation of these websites was suggested. As referred to and defined in [9], usability is a 'quality attribute that assesses how easy user interfaces are to use', consisting of learnability, efficiency, memorability, errors and satisfaction. The primary heuristic method used in this study was the one developed by Nielsen [9], often referred to as the traditional heuristic. Other known heuristic approaches such as eight golden rules, Winschenk and Barker classification, etc. were also utilised. As a sample of a public administration unit website for the paper, the Public Information Bulletin (BIP) of Poland was showcased as it provides and ensures free and universal access of all the information to the public. Steps involved in proceeding with research include: selecting BIP sites, researching the websites, identifying basic errors related to the usability of the BIP sites, categorization of those errors, evaluation and ranking the impact of each category on a scale of 1(lowest) to 5(highest), and comparing these categories with the traditional heuristics. Errors were segregated into 14 different categories involving website ergonomics, consistency, content, form, substance, navigation, accessibility, help services and miscellaneous limitations and were assigned rankings of varying severity.

The role of semiotics being used in website design evaluation is the main focus for paper [6]. Semiotics is the science of signs that serve as a foundation of interface sign designs, focusing on interpretation and sense production. Interface signs facilitate interaction between UI and the end users. The objective of this study is to analyse the Semiotic Interface sign Design and Evaluation (SIDE) Framework and its impact in interface designing. The SIDE framework was developed, on the basis of the research and data of 3 years, to design and evaluate the usage of interface signs. It includes five semiotic layers: syntactic, pragmatic, social, environmental and semantic. Various factors were considered to evaluate the quality of the framework itself. The research was derived from two studies: One involving the users, while the latter involves the evaluators. The outcome of these studies were discussed simultaneously regarding the results based on the quality metrics, before comparing them to the SIDE framework.

Design of an e-Commerce website is extremely crucial with the rise of transactions and usage within the sphere. Paper [8] deals with the development of an

evaluation system for e-Commerce websites exclusively done from the view of a first-time buyer. E-commerce websites were selected as these sites require an objective, business policies and criteria in contrast to the subjective form of evaluation or individual preferences. Important factors include the target users(suppliers, buyers, shareholders, or stakeholders), user satisfaction, the reasoning behind their satisfaction and the goal of a first-time consumer (successful e-commerce transactions). The paper states that user satisfaction is derived from attractiveness and informativeness. Attractiveness is defined as the quality of a website's physical settings increasing the involvement of customers on the website, divided into three sections: customization, interactivity, and vividness; Whereas informativeness can be defined as logical settings of a website, providing constructive and clear information to its consumers, comprising of understandability, reliability, and relevance. After processing all these factors, the development process began. The proposed model consisted of three key steps: finding the function on the web, conducting transactions, and producing customer satisfactions. However, this model alone cannot measure satisfaction of the consumers. Therefore, in conjecture to this model, three failure points have been set up at the tail end of each step to evaluate not only the successful, but also the failed attempts. All three failure points can be applied to the first-time buyers on an e-commerce website. Based on the model, evaluation criteria chosen were ease-of-identification (failure point 1), ease-of-use (failure point 2), usefulness and interactivity (failure point 3). Since a multiple-scale scoring system was required to evaluate the satisfaction in contrast to a two-scale system, modified five-point Likert scales were used.

Chapter 3

System Analysis

System analysis is conducted for the purpose of studying a system or its parts in order to identify its objectives. It is a problem solving technique that improves the system and ensures that all the components of the system work efficiently to accomplish their purpose.

3.1 Functional Requirements

Functional requirements describe all the required functionality or system services. Functionality is described as a set of inputs, the behaviour, and outputs expected from the system. They are functions or features that must be included in a system in order to satisfy the business needs and must be acceptable to the system users.

- The system must allow a user to login in order to use the tool.

- The user must be able to view the questionnaire and submit their responses.

- The user must be able to save the responses and view the score.

- The software must show the results in the form of a pie chart and give proper feedback about the website.

3.2   Non-Functional Requirements

Non-Functional requirements define the properties and constraints of the system. These impose constraints on the design or implementation. It is used to judge the operation of a system.

- Questionnaire must be easy to understand by every user.

- Response to each statement in the checklist should be assigned points by the tool automatically.

- Detailed results with proper feedback should be shown to the user.

- The result table should display total points for each category and its usability score with relevant feedback.

- The user should be able to find out the usability issues of the website they wish to evaluate.

3.3 Specific Requirements

Hardware:

- 32 or 64 bit Windows OS

- 8 GB RAM at least

- 40 GB of free hard disk space

- CPU, 1.0 GHz or better

Software:

- Node.js

- Express.js

- React

- MongoDb

3.4 Use Case Diagrams

Use case diagrams are usually referred to as behavior diagrams used to describe a set of actions (use cases) that some system or systems (subject) should or can perform in collaboration with one or more external users of the system (actors).
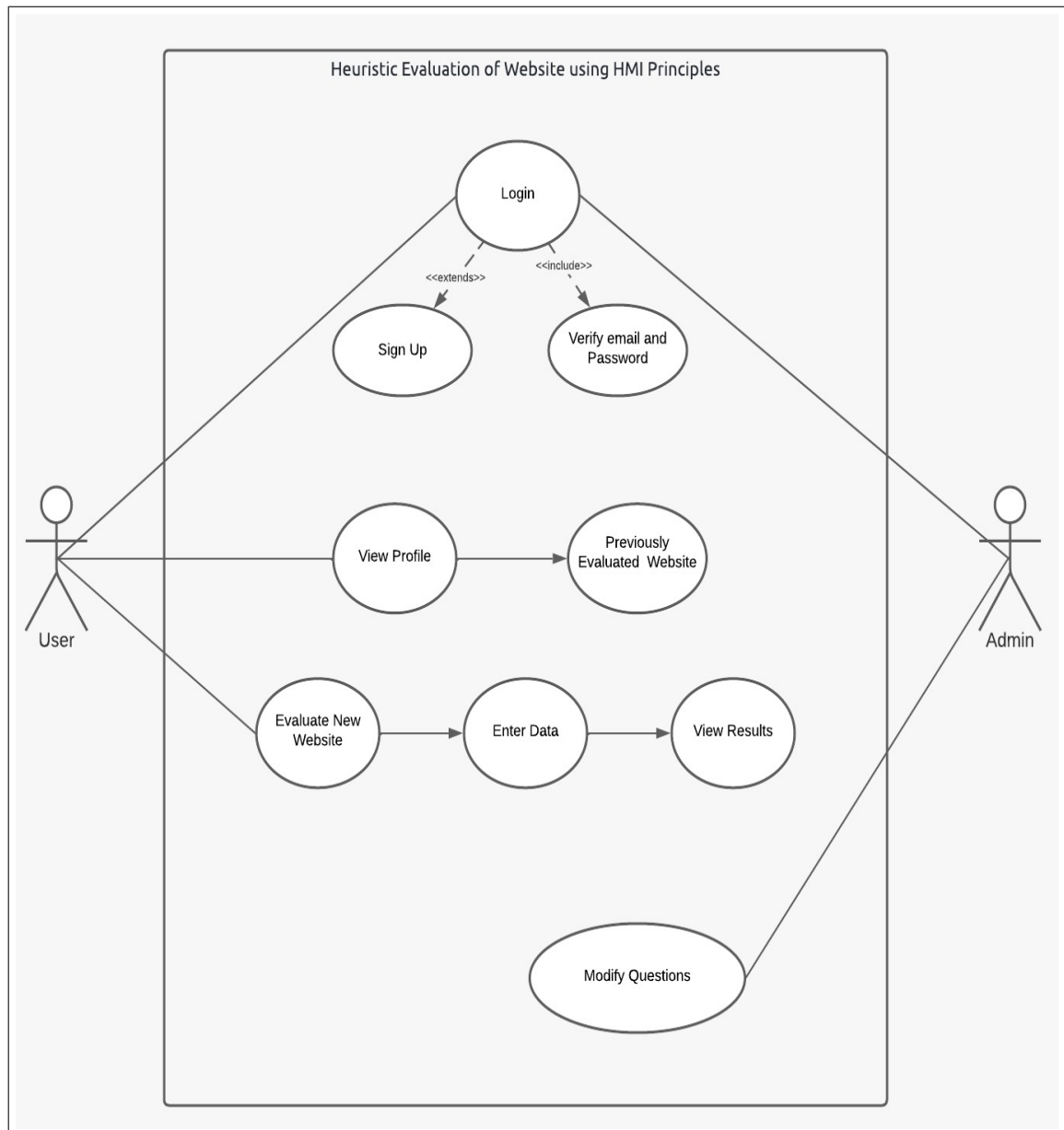
Fig 3.4.1 Use-Case Diagram

Chapter 4

Analysis Modeling

Analysis Model is a technical representation of the system. It acts as a link between system description and design model. In Analysis Modelling, information, behavior, and functions of the system are defined and translated into the architecture, component, and interface level design in the design modeling.

4.1   Activity Diagrams
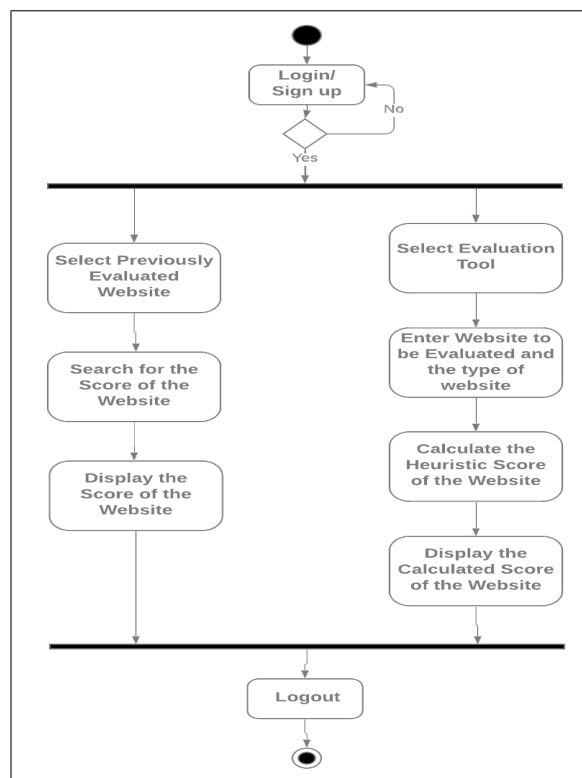
Fig 4.1.1 Activity Diagram for User

Fig 4.1.1 is the activity diagram is for the User. The system first checks if the user is logged in or not. When the user successfully logs in, it is directed to the homepage.From here the user can view their previously evaluated websites or use the evaluator tool to evaluate new website. User can answer the questions asked and click on the submit button to view the calculated heuristic score.

4.2 Functional Modeling

The data flow diagram is a way of representing a flow of data through a process or system. It shows how data enters and leaves the system, what changes the information, and where data is stored.
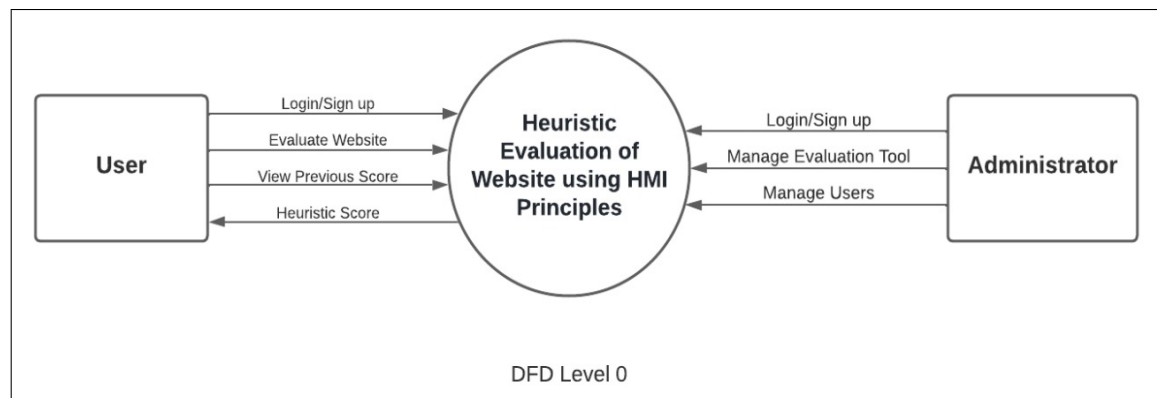
Fig 4.2.1 DFD Level 0

1. Data Flow Diagram Level 0 - The DFD level 0 represents the basic level. The Fig 4.2.1 shows the data flow diagram level 0 of the system. There are two external entities user and admin. the user can login/sign up, Evaluate website, and View previously evaluated website score. The Admin manages the users and the evaluation tool.
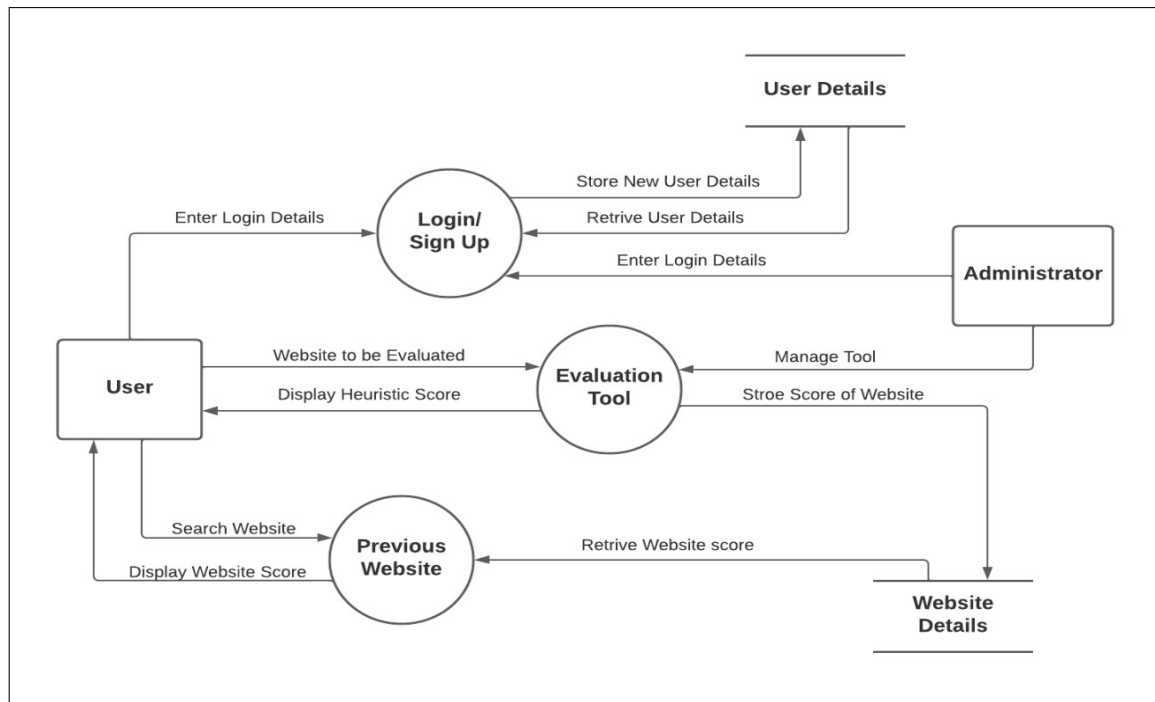
Fig 4.2.2 DFD Level 1

2. Data Flow Diagram Level 1 - The DFD level 1 represents a more detailed view of the system. Fig 4.3.2 shows the data flow diagram level 1 of the system. The System has two external entities (user and administrator), two data stores (user details and website scores), and three processes (login/sign up, evaluation tool, and previous website score).

4.3   Timeline Chart

TimeLine Chart depicts the different tasks that were performed and the resources used over time, which helps to plan in an efficient way, coordinate, and track some particular tasks in the project. We have used the Gantt chart to illustrate project tasks and events in chronological order, it shows which tasks were performed by whom and when they were performed. The series of horizontal lines present show the amount of work done or production completed in a given period of time in relation to the amount planned for those projects.

Name	Duration	Start	Finish	Predecessors
☐ PROJECT SELECTION AND RESEARCH	11 days	12/7/22 8:00 AM	26/7/22 5:00 PM	
Requirements for the project	4 days	12/7/22 8:00 AM	15/7/22 5:00 PM	
Preparing Abstract, Problem Statement	3 days	18/7/22 8:00 AM	20/7/22 5:00 PM	2
Making Presentation	3 days	21/7/22 8:00 AM	25/7/22 5:00 PM	3
Project Prososal	1 day	26/7/22 8:00 AM	26/7/22 5:00 PM	4
☐ REVIEW OF LITERATURE	15 days	27/7/22 8:00 AM	16/8/22 5:00 PM	5
Search relevant research papers	15 days	27/7/22 8:00 AM	16/8/22 5:00 PM	
☐ SYSTEM ANALYSIS	15 days	17/8/22 8:00 AM	6/9/22 5:00 PM	7
Discuss Functional Requirements	3 days	17/8/22 8:00 AM	19/8/22 5:00 PM	
Discuss Non-Functional Requirements	12 days	22/8/22 8:00 AM	6/9/22 5:00 PM	9
☐ PROJECT FLOW	4 days	7/9/22 8:00 AM	12/9/22 5:00 PM	10
Working on Use Case Diagram	2 days	7/9/22 8:00 AM	8/9/22 5:00 PM	
Creating Block Diagram	2 days	9/9/22 8:00 AM	12/9/22 5:00 PM	12
☐ ANALYSIS MODELLING	6 days	13/9/22 8:00 AM	20/9/22 5:00 PM	13
Creating DFD	2 days	13/9/22 8:00 AM	14/9/22 5:00 PM	
Creating Activity Diagram	2 days	15/9/22 8:00 AM	16/9/22 5:00 PM	15
Creating TimeLine Chart	2 days	19/9/22 8:00 AM	20/9/22 5:00 PM	16
☐ DESIGN	6 days	21/9/22 8:00 AM	28/9/22 5:00 PM	17
Architectural Design	6 days	21/9/22 8:00 AM	28/9/22 5:00 PM	
☐ IMPLEMENTATION	137 days?	29/9/22 8:00 AM	7/4/23 5:00 PM	19
Preparing Questionnaire based on Jakob Nielsen and Shneiderman's Rules	65 days	29/9/22 8:00 AM	28/12/22 5:00 PM	
UI Design	25 days	29/12/22 8:00 AM	1/2/23 5:00 PM	21
Database	25 days	2/2/23 8:00 AM	8/3/23 5:00 PM	22
Backend	22 days?	9/3/23 8:00 AM	7/4/23 5:00 PM	23
☐ DOCUMENTATION	15 days	10/4/23 8:00 AM	28/4/23 5:00 PM	
Blackbook	10 days	10/4/23 8:00 AM	21/4/23 5:00 PM	24
Final Presentation	5 days	24/4/23 8:00 AM	28/4/23 5:00 PM	26

Fig 4.3.1 Gantt Chart Tasks

Fig 4.3.1 shows the tasks or activities that are required to complete the project. Each task is assigned a start date, an end date, and a duration, and are linked to other tasks to create dependencies between them.
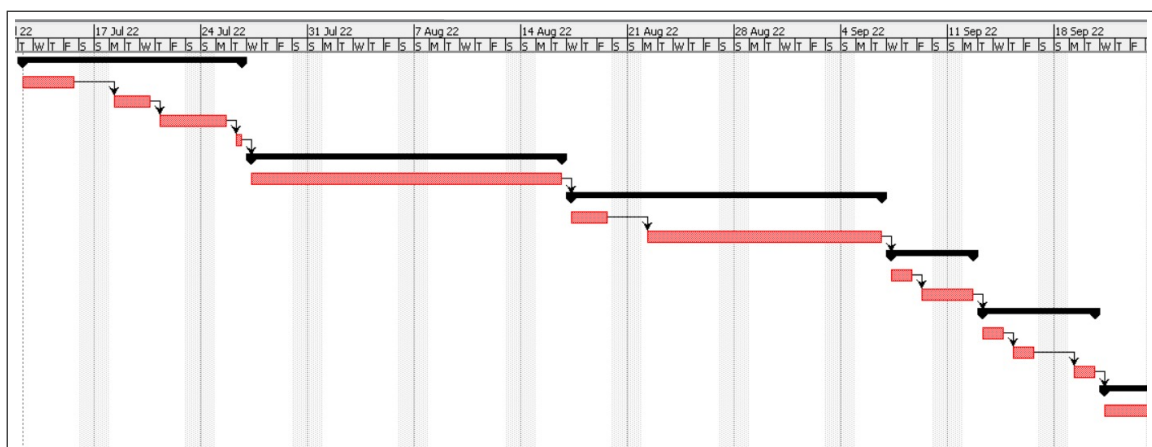
Fig 4.3.2 Gantt Chart Timeline
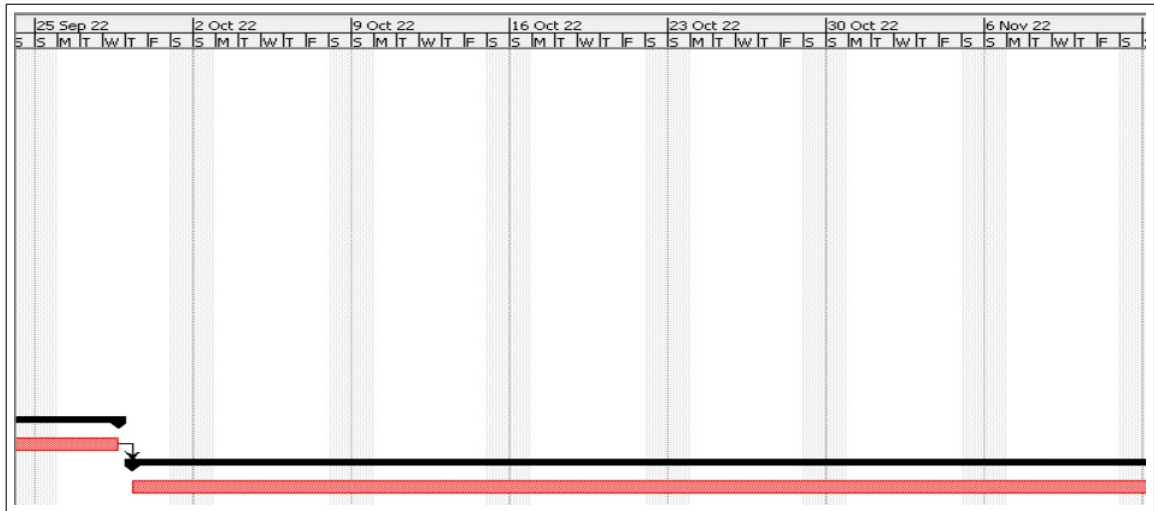
Fig 4.3.3 Gantt Chart Timeline
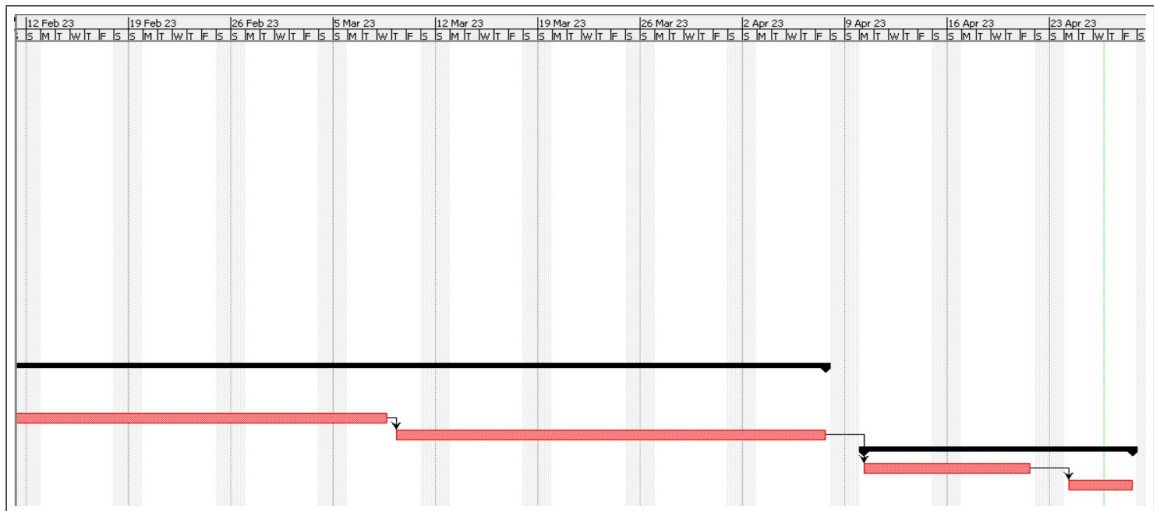
Fig 4.3.4 Gantt Chart Timeline

Fig 4.3.2, Fig 4.3.3 and Fig 4.3.4 shows the start and end dates of each task or activity within the project. It is a visual representation of the project schedule.

Chapter 5

Design

Software design is a mechanism to transform user requirements into some suitable form, which helps the programmer in software coding and implementation. It deals with representing the client's requirement, as described in SRS (Software Requirement Specification) document

5.1 Architectural Design
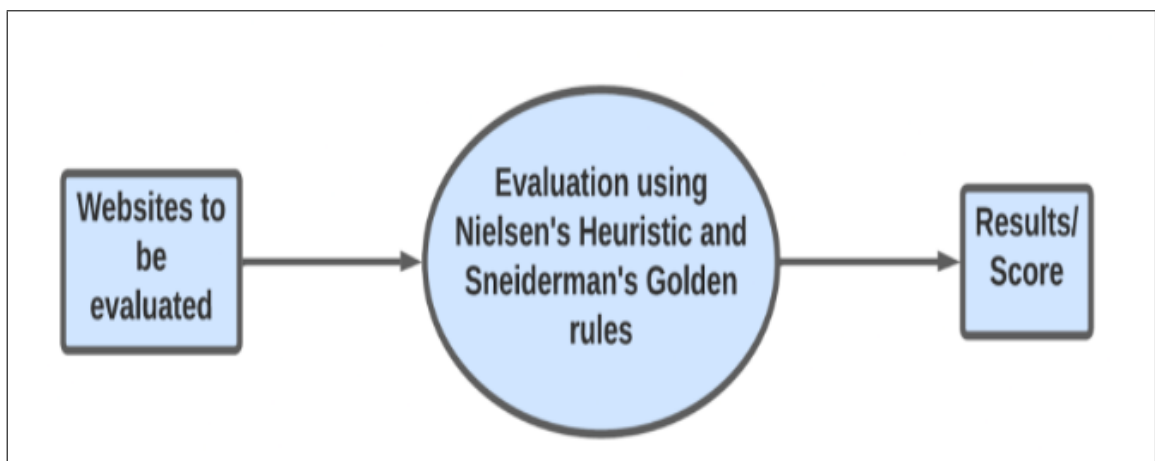
Fig 5.1.1 Architectural Design

Fig 5.1.1 portrays the block diagram of the evaluation tool. The tool takes the website and answers given by the user as input. The input is then used for evaluation in accordance with Nielsen's Heuristics and Shneiderman's Golden rules. After Processing the tool returns the Heuristic Score of the website.

5.2   User Interface Design
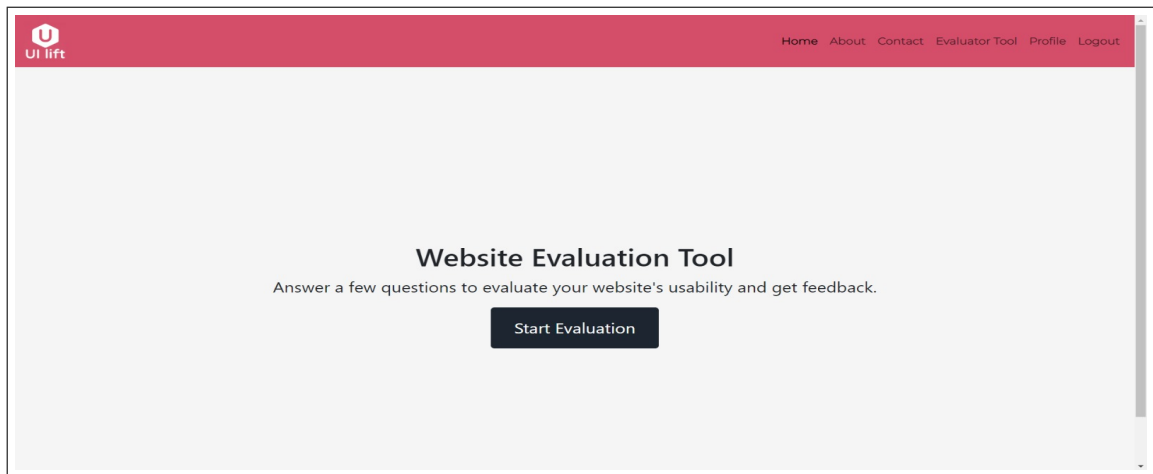
Fig 5.2.1 Evaluation Tool - Website homepage

The fig 5.2.1 is the homepage of the website which provides a user-friendly interface and includes navigation options, allowing the user to easily access different parts of the website.
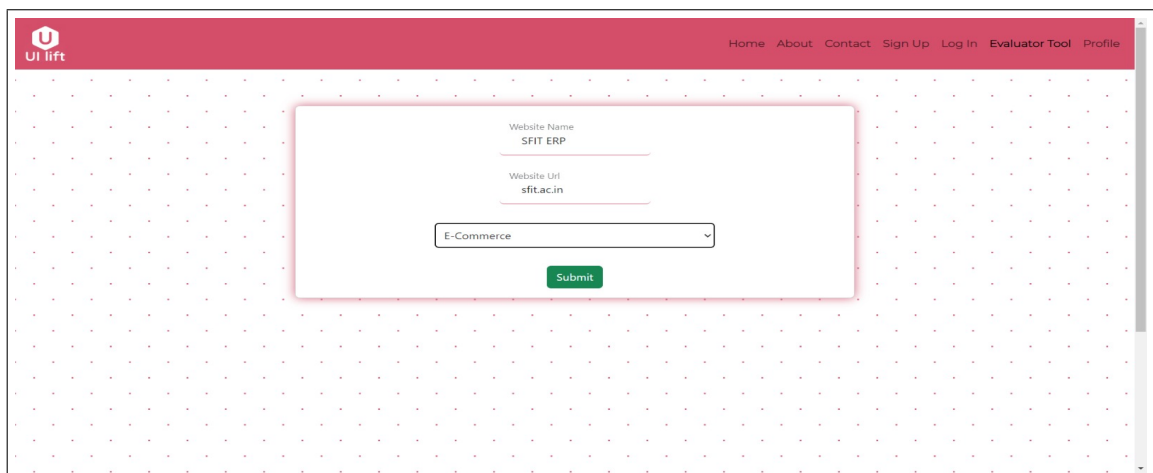
Fig 5.2.2 Evaluation Tool - Website details

The fig 5.2.2 is a screenshot of the evaluation tool interface, which consists of three input fields and a dropdown menu. The input fields require the user to enter the website name and URL, while the dropdown menu allows the user to choose between e-commerce or e-learning websites which then navigates to the tool which analyzes the website and provides an evaluation or feedback based on criteria such as usability, design, navigation, content, search functionality, and security features.

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Fig 5.2.3 Evaluation Tool - Questionnaire

Fig 5.2.4 Evaluation Tool - Questionnaire

Fig 5.2.3 and 5.2.4 are evaluation tool questionnaire designed to assess the usability of a website. The questionnaire is based on the usability rules developed by Ben Shneiderman and Jakob Nielsen, which provide a set of guidelines for creating user-friendly interfaces. The questionnaire is organized into different categories, each of which corresponds to a different aspect of the website.
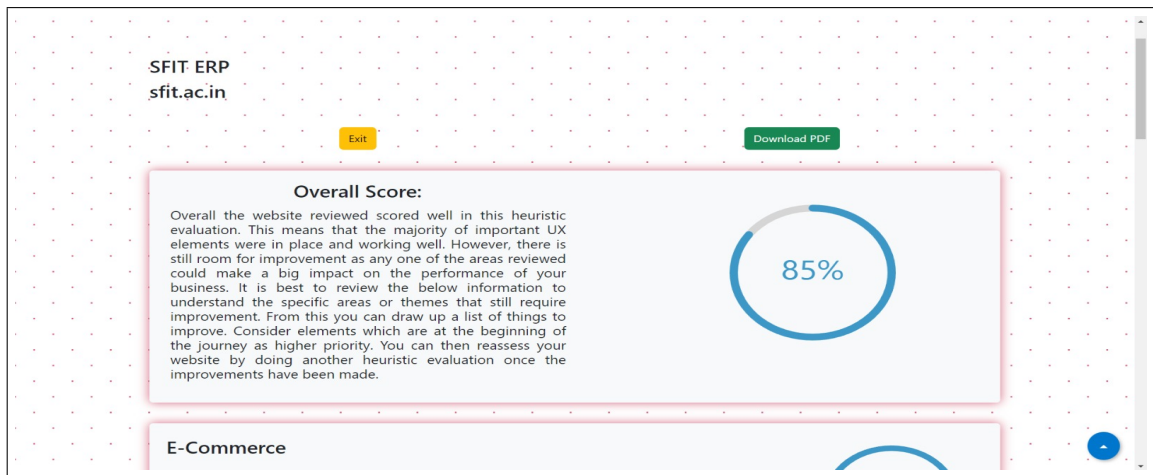
Fig 5.2.5 Result - Overall score

Fig 5.2.5 displays the result of the website evaluation, which includes overall score. The scores are based on the user's responses to the questionnaire, which targets various aspects of the website's design and functionality.
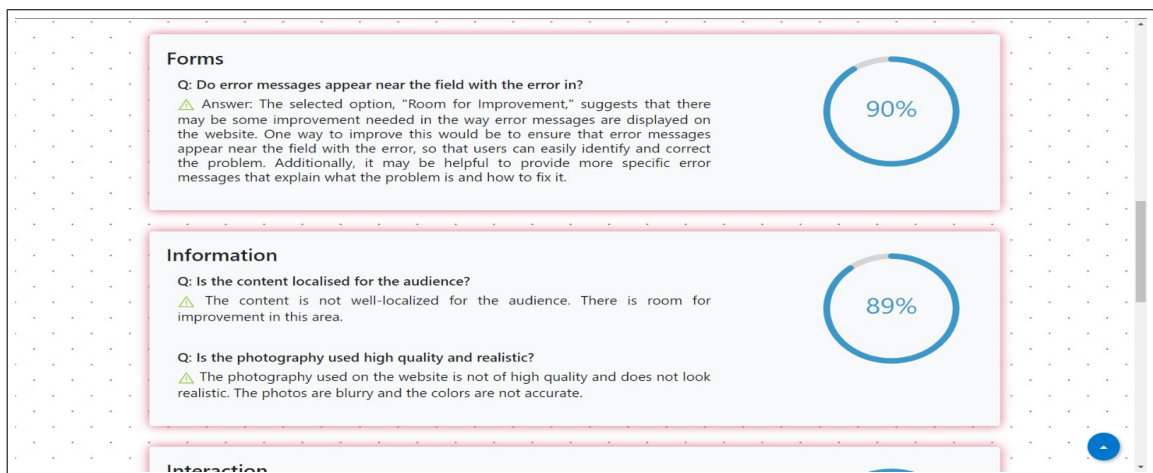
Fig 5.2.6 Result - Feedback

In fig 5.2.6, displays the result of the website evaluation, which includes individual scores and feedback for each category evaluated. The scores are based on the user's responses to the questionnaire, which targets various aspects of the website's design and functionality, as well as the usability rules developed by Ben Shneiderman and Jakob Nielsen.

Chapter 6

Implementation

Implementation is the execution or practice of a plan, a method or any design, idea, model, specification, standard or policy for doing something. As such, implementation is the action that must follow any preliminary thinking for something to actually happen.

6.1 Algorithms / Methods Used

The methods used for building this project are as follows:

6.1.1 Shneiderman's Eight Golden rules

Ben Shneiderman, in 1986, published the first edition of his book, "Designing the User Interface: Strategies for Effective Human-Computer Interaction"(currently in its sixth edition) in which a list of eight golden rules of interactive design was proposed within section 3.3.5 that are as follows[5]:

1. **Strive for consistency:**

   Consistent sequences of actions should be required in similar situations; identical terminology should be used in prompts, menus, and help screens; and consistent color, layout, capitalization, fonts, and so on, should be employed throughout. Exceptions, such as required confirmation of the delete command or no echoing of passwords, should be comprehensible and limited in number

2. **Seek universal usability:**

   Recognize the needs of diverse users and design for plasticity, facilitating transformation of content. Novice to expert differences, age ranges, disabilities, international variations, and technological diversity each enrich the spectrum of requirements that guides design. Adding features for novices, such as explanations, and features for experts, such as shortcuts and faster pacing, enriches the interface design and improves perceived quality.

3. **Offer informative feedback:**

   For every user action, there should be an interface feedback. For frequent and minor actions, the response can be modest, whereas for infrequent and major actions, the response should be more substantial. Visual presentation of the objects of interest provides a convenient environment for showing changes explicitly (see the discussion of direct manipulation in Chapter 7).

4. **Design dialogs to yield closure:**

   Sequences of actions should be organized into groups with a beginning, middle, and end. Informative feedback at the completion of a group of actions gives users the satisfaction of accomplishment, a sense of relief, a signal to drop contingency plans from their minds, and an indicator to prepare for the next group of actions. For example, e-commerce websites move users from selecting products to the checkout, ending with a clear confirmation page that completes the transaction.

5. **Prevent errors:**

   As much as possible, design the interface so that users cannot make serious errors; for example, gray out menu items that are not appropriate and do not allow alphabetic characters in numeric entry fields. If users make an error, the interface should offer simple, constructive, and specific instructions for recovery. For example, users should not have to retype an entire name-address form if they enter an invalid zip code but rather should be guided to repair only

the faulty part. Erroneous actions should leave the interface state unchanged, or the interface should give instructions about restoring the state.

6. **Permit easy reversal of actions:**

   As much as possible, actions should be reversible. This feature relieves anxiety, since users know that errors can be undone, and encourages exploration of unfamiliar options. The units of reversibility may be a single action, a data-entry task, or a complete group of actions, such as entry of a name-address block.

7. **Keep users in control:**

   Experienced users strongly desire the sense that they are in charge of the interface and that the interface responds to their actions. They don't want surprises or changes in familiar behavior, and they are annoyed by tedious data-entry sequences, difficulty in obtaining necessary information, and inability to produce their desired result.

8. **Reduce short-term memory load:**

   Humans' limited capacity for information processing in short-term memory (the rule of thumb is that people can remember "seven plus or minus two chunks" of information) requires that designers avoid interfaces in which users must remember information from one display and then use that information on another display. It means that cellphones should not require reentry of phone numbers, website locations should remain visible, and lengthy forms should be compacted to fit a single display.

6.1.2 Nielsen's Usability Heuristics

Nielsen's heuristics are one of the most widely used usability heuristics for user interface designing. An early version of the heuristics was displayed in the papers written by Nielsen and Molich [9] which had been updated since up to the final set published in 2005 [7]:

1. **Visibility of system status:**

   The system should always keep users informed about what is going on, through appropriate feedback within a reasonable time.

2. **Match between system and the real world:**

   The system should speak the user's language, with words, phrases, and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

3. **User control and freedom:**

   Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

4. **Consistency and standards:**

   Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

5. **Error prevention:**

   Even better than good error messages is a careful design that prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

6. **Recognition rather than recall:**

   Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

7. **Flexibility and efficiency of use:**

   Accelerators-unseen by the novice user-may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

8. **Aesthetic and minimalist design:**

   Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

9. **Help users recognize, diagnose, and recover from errors:**

   Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

10. **Help and documentation:**

    Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

6.2 Working of the project

6.2.1 Code:

Evaluator.jsx:

```
import React, {
useState ,
useEffect
} from "react";
import {
useNavigate
} from "react-router-dom";
const Form1 = (props) => {
        const navigate = useNavigate();
        const [userData, setUserData] =
        useState({
            website: props.websiteName,
            websiteUrl: props.websiteUrl,
            quesCat: "E-Commerce",
        });
        const userEvaluator = async() => {
            try {
                const res = await fetch(
                    "/getData", {
                    method: "GET",
                    });
                const data = await res
                    .json();
                console.log(data);
                if(res.status !==
                    200) {
                    const error =
```

```javascript
                    new Error(
                        res.error
                    );
                throw error;
            }
        } catch(err) {
            console.log(err);
        }
    };
    useEffect(() => {
        console.log(
            "Updated userData:",
            userData);
        if(userData.rquestionScores) {
            (async() => {
                const {
                    website,
                    websiteUrl,
                    quesCat,
                    rquestionScores,
                    rresult,
                    rvalid,
                    categoryRValid,
                } =
                userData;
                try {
                    const
                        res =
                        await fetch(
                            "/tool", {
                                method: "POST",
                                body: JSON
```

```
                    .stringify({
                        website,
                        websiteUrl,
                        quesCat,
                        rquestionScores,
                        rresult,
                        rvalid,
                        categoryRValid,
                    }),
                }
            );
const
    data =
    await res
    .json();
if (!
    data
) {
    console
        .log(
            "data not updated"
        );
} else {
    alert
        (
            "evaluated website successfully
        and stored data to db"
        );
    navigate
        (
            "/results", {
                replace: true
```

```jsx
                    }
                );
            }
        } catch (
            error
        )
    })();
    }
}, [userData]);
const [questions] = useState([
    {
        question: "On the homepage, is it clear what the
        business does and what the key benefits are
        for customers ?
        ",
        options : [
            "Yes",
        "Room for improvement",
        "No",
        "Not Applicable"
    ],
        scores: [2, 1,
        0, -1
    ],
        qCat: "First Impression",
}, {
        question: "Does the initial impression
                (imagery/design/information) support
                the proposition?",
        options: ["Yes",
        "Room for improvement",
        "No",
```

```
                            "Not Applicable"
                        ],
                            scores: [2, 1,
                            0, −1
                        ],
                            qCat: "First Impression",
                    },
                    {
                        question: "Is the website representative
                        of the brand you know offline?",
                            options: ["Yes",
                            "Room for improvement",
                            "No",
                            "Not Applicable"
                        ],
                            scores: [2, 1,
                            0, −1
                        ],
                            qCat: "First Impression",
                    },
                    {
                        question: "Does the website feel
                        current and up to date?",
                            options: ["Yes",
                            "Room for improvement",
                            "No",
                            "Not Applicable"
                        ],
                            scores: [2, 1,
                            0, −1
                        ],
                            qCat: "First Impression",
```

```
            },
        {
         question: "Does the website have plenty of
           white space and feel uncluttered?",
             options: ["Yes",
             "Room for improvement",
             "No",
             "Not Applicable"
         ],
             scores: [2, 1,
             0, -1
         ],
             qCat: "First Impression",
        },
        {
           question: "Is it clear where to go or what
           to do next from the homepage?",
             options: ["Yes",
             "Room for improvement",
             "No",
             "Not Applicable"
         ],
             scores: [2, 1,
             0, -1
         ],
             qCat: "First Impression",
        },
        {
             question: "Do you always know where
           you are on the site?",
             options: ["Yes",
             "Room for improvement",
```

```
            "No",
            "Not Applicable"
        ],
            scores: [2, 1,
            0, -1
        ],
            qCat: "Navigation",
    },
    {
        question: "Can you easily get back to
        the homepage and the previous page?",
            options: ["Yes",
            "Room for improvement",
            "No",
            "Not Applicable"
        ],
            scores: [2, 1,
            0, -1
        ],
            qCat: "Navigation",
    },
    {
            question: "Does the information
        requested feel necessary for the task
        you are trying to complete?",
            options: ["Yes",
            "Room for improvement",
            "No",
            "Not Applicable"
        ],
            scores: [2, 1,
            0, -1
```

```
                ],
                qCat: "Forms",
    }, {
                question: "Are you notified of errors
    in form fields in real time?",
                options: ["Yes",
                "Room for improvement",
                "No",
                "Not Applicable"
            ],
                scores: [2, 1,
                0, -1
            ],
                qCat: "Forms",
    }, {
        question: "Does the form validate
        information to help prevent errors?",
                options: ["Yes",
                "Room for improvement",
                "No",
                "Not Applicable"
            ],
                scores: [2, 1,
                0, -1
            ],
                qCat: "Forms",
    },
        {
                question: "Does the form provide
            shortcuts for inputting information?",
                options: ["Yes",
                "Room for improvement",
```

```
            "No",
            "Not Applicable"
        ],
            scores: [2, 1,
            0, -1
        ],
            qCat: "Forms",
    },
        {
            question: "Is the search box visible
        wherever you are on the site?",
            options: ["Yes",
            "Room for improvement",
            "No",
            "Not Applicable"
        ],
            scores: [2, 1,
            0, -1
        ],
            qCat: "Search",
    },
        {
            question: "If you enter a misspelled word into
        the search box, or there are no results to show
        , does it provide suggestions?",
            options: ["Yes",
            "Room for improvement",
            "No",
            "Not Applicable"
        ],
            scores: [2, 1,
            0, -1
```

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```
        ],
            qCat: "Search",
    },
        {
            question: "Are advanced search features available?",
            options: ["Yes",
            "Room for improvement",
            "No",
            "Not Applicable"
        ],
            scores: [2, 1,
            0, -1
        ],
            qCat: "Search",
    },
        {
          question: "Are advanced search features
          such as filtering easy to undo or remove?",
            options: ["Yes",
            "Room for improvement",
            "No",
            "Not Applicable"
        ],
            scores: [2, 1,
            0, -1
        ],
            qCat: "Search",
    },
        {
            question: "Is the content presented
            in a logical order?",
            options: ["Yes",
```

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```
                    "Room for improvement",
                    "No",
                    "Not Applicable"
            ],
                    scores: [2, 1,
                    0, -1
            ],
                    qCat: "Information",
        },
            {
                    question: "Are fonts, colours, icons, layout
                    and links, consistent across the website?",
                    options: ["Yes",
                    "Room for improvement",
                    "No",
                    "Not Applicable"
            ],
                    scores: [2, 1,
                    0, -1
            ],
                    qCat: "Information",
        },
            {
                    question: "Is the content as concise
                    as it can be?",
                    options: ["Yes",
                    "Room for improvement",
                    "No",
                    "Not Applicable"
            ],
                    scores: [2, 1,
                    0, -1
```

```
                ] ,
                  qCat : " Information " ,
        } ,
            {
              question : "Does the font and it 's size
              make information easy to read?" ,
                  options : [" Yes " ,
                  "Room for improvement " ,
                  "No" ,
                  "Not Applicable "
              ] ,
                  scores : [ 2 , 1 ,
                  0 , −1
              ] ,
                  qCat : " Information " ,
        } ,
            {
              question : " Is the content free from jargon and
        terms your users are unlikely to be familiar with?" ,
                  options : [" Yes " ,
                  "Room for improvement " ,
                  "No" ,
                  "Not Applicable "
              ] ,
                  scores : [ 2 , 1 ,
                  0 , −1
              ] ,
                  qCat : " Information " ,
        } ,
            {
              question : " Is the content localised
              for the audience?" ,
```

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```
                    options: ["Yes",
                    "Room for improvement",
                    "No",
                    "Not Applicable"
              ],
                    scores: [2, 1,
                    0, -1
              ],
                    qCat: "Information",
        },
{
                question: "Does it give you
                confidence that you won't be spammed?",
                    options: ["Yes",
                    "Room for improvement",
                    "No",
                    "Not Applicable"
              ],
                    scores: [2, 1,
                    0, -1
              ],
                    qCat: "Trust and Persuasion",
        },
          {
            question: "Is there a privacy policy
            that's short, and easy to read?",
                options: ["Yes",
                "Room for improvement",
                "No",
                "Not Applicable"
          ],
                scores: [2, 1,
```

```
                0, -1
              ],
                qCat: "Trust and Persuasion",
          },
          {
          question: "Can you easily find the
          contact information and address of company?",
                options: ["Yes",
                "Room for improvement",
                "No",
                "Not Applicable"
              ],
                scores: [2, 1,
                0, -1
              ],
                qCat: "Trust and Persuasion",
          },
          {
            question: "Does the website has
            a SSL certificate?",
                options: ["Yes",
                "Room for improvement",
                "No",
                "Not Applicable"
              ],
                scores: [2, 1,
                0, -1
              ],
                qCat: "Trust and Persuasion",
          },
          {
          question: "Are there real people
```
```
          question: "Are there real people
```

```
        behind the company referenced in some way?",
            options: ["Yes",
            "Room for improvement",
            "No",
            "Not Applicable"
        ],
            scores: [2, 1,
            0, -1
        ],
            qCat: "Trust and Persuasion",
    },
    {
            question: "When you take an action that is
        not immediate, are there any visual cues to
        show the website is responding?",
            options: ["Yes",
            "Room for improvement",
            "No",
            "Not Applicable"
        ],
            scores: [2, 1,
            0, -1
        ],
            qCat: "Interaction",
    }, {
        question: "Does the design and functionality
    work across different screen sizes?",
            options: ["Yes",
            "Room for improvement",
            "No",
            "Not Applicable"
        ],
```

```
        scores: [2, 1,
        0, -1
    ],
        qCat: "Interaction",
}, {
        question: "Are you warned before taking an
    irreversible action such as permanently deleting
    something?",
        options: ["Yes",
        "Room for improvement",
        "No",
        "Not Applicable"
    ],
        scores: [2, 1,
        0, -1
    ],
        qCat: "Interaction",
}, {
        question: "Does the website feel fast, and
    quickly reacts to actions you take?",
        options: ["Yes",
        "Room for improvement",
        "No",
        "Not Applicable"
    ],
        scores: [2, 1,
        0, -1
    ],
        qCat: "Interaction",
}, {
        question: "Can you personalise information
    which is unique to you?",
```

```
        options: ["Yes",
        "Room for improvement",
        "No",
        "Not Applicable"
    ],
        scores: [2, 1,
        0, −1
    ],
        qCat: "Interaction",
},
    {
        question: "Are product descriptions clear
      and detailed with high−quality images?",
        options: ["Yes",
        "Room for improvement",
        "No",
        "Not Applicable"
    ],
        scores: [2, 1,
        0, −1
    ],
        qCat: "amainquestions",
}, {
        question: "Does the website provide clear
    and concise information about its products and
    services? ",
        options: ["Yes",
        "Room for improvement",
        "No",
        "Not Applicable"
    ],
        scores: [2, 1,
```

```
                0, -1
          ],
                qCat: "amainquestions",
    }, {
                question: "Are the website's forms and
       checkout processes easy to use and understand?",
                options: ["Yes",
                "Room for improvement",
                "No",
                "Not Applicable"
          ],
                scores: [2, 1,
                0, -1
          ],
                qCat: "amainquestions",
    }, {
                question: "Are customer reviews
        and ratings visible and accessible?",
                options: ["Yes",
                "Room for improvement",
                "No",
                "Not Applicable"
          ],
                scores: [2, 1,
                0, -1
          ],
                qCat: "amainquestions",
    }, {
                question: "Is the shopping cart easily
        accessible and clearly shows items added?",
                options: ["Yes",
                "Room for improvement",
```

```
            "No",
            "Not Applicable"
        ],
            scores: [2, 1,
            0, -1
        ],
            qCat: "amainquestions",
    }, {
            question: "Does the website provide ways
    for users to contact customer support if they
    have questions or issues?",
            options: ["Yes",
            "Room for improvement",
            "No",
            "Not Applicable"
        ],
            scores: [2, 1,
            0, -1
        ],
            qCat: "amainquestions",
    },
]);
    const [currentQuestion,
    setCurrentQuestion
] = useState(0);
    const [scores, setScores] =
    useState(Array(questions.length)
        .fill(0));
    const [selectedOption,
    setSelectedOption
] = useState(null);
    const qCatValues = [... new Set(
```

```javascript
        questions.map((q) =>
            q.qCat))];
    const handleNext = async(e) => {
        e.preventDefault();
        const score = questions[
            currentQuestion
            ].scores[
            selectedOption];
        const newScores = [...scores];
        let applicable = 0;
        newScores[
            currentQuestion
            ] = score;
        if(currentQuestion <
            questions.length −
            1) {
            setCurrentQuestion(
                currentQuestion +
                1);
            setSelectedOption(
                null);
        } else {
            const categoryScores = {};
            const
                categoryQuestionScores = {};
            let questionScores = [];
            const
                categoryApplicableCounts = {};
            questions.forEach(({
                    qCat,
                    scores
                },
```

```
index) => {
if (!
    categoryScores [
        qCat
        ]
) {
    categoryScores
        [
            qCat
            ] =
        0;
    categoryQuestionScores
        [
            qCat
            ] =
        Array (
            scores
            .length
        )
        .fill (
            0
        );
    categoryApplicableCounts
        [
            qCat
            ] =
        0;
}
const
    score =
    newScores [index ];
if (
```

```
            score >=0) {
            categoryScores
                [qCat] += score;
            categoryQuestionScores
                [
                    qCat
                ]
            [index] = score;
            categoryApplicableCounts
                [qCat]++;
            applicable++;
} else {
            categoryQuestionScores
                [
                    qCat
                ]
            [
                index
            ] = -1;
}
questionScores
    [
        index
        ] =
    questions[
        index
        ]
    .qCat +
    " " +
    questions[
        index
        ]
```

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```
                    . question +
                    "  " +
                    score ;
            });
            setUserData ({... userData ,
                rresult : categoryScores ,
                rvalid : applicable ,
                categoryRValid : categoryApplicableCounts ,
                rquestionScores : questionScores ,
            });
        }
        setScores ( newScores );
    };
    const handlePrevious = (e) => {
        e.preventDefault ();
        if ( currentQuestion > 0) {
            setCurrentQuestion (
                currentQuestion −
                1);
            setSelectedOption (
                null );
        } else {
            // Handle beginning of quiz
        }
    };
    const handleTabClick = (qCat) => {
        const index = questions
            .findIndex ((q) => q
                .qCat === qCat );
        setCurrentQuestion (
            index );
        setSelectedOption ( null );
```

```
    };
    const handleOptionClick = (
        index) => {
        setSelectedOption(index);
    };
    export default Form1;
```

Results.jsx:

```
    import React, { useState, useEffect,
    useRef } from 'react'
import html2pdf from 'html2pdf.js';
import { useNavigate, useLocation } from "react-router-dom"
import 'react-circular-progressbar/dist/styles.css';
const { Configuration, OpenAIApi } =
require("openai");
const config = new Configuration({
    apiKey: skey.substring(0,
        skey.length - 1)});
const openai = new OpenAIApi(config);
const Results = () => {
    const [resultData,
        setResultData] = useState({ websites: [] });
    const componentRef = useRef();
    const navigate = useNavigate();
    const location = useLocation();
    const props = location.state;
    const [feedbacks, setFeedbacks] =
    useState([]);
    function handleExit() {
        navigate('/');
    }
    const handleDownloadPdf = () => {
```

```javascript
            const input =
                componentRef.current;
            html2pdf(input, {
                margin: 0.5,
                filename: 'mypage.pdf',
                image: { type: 'jpeg',
                    quality: 1 },
                html2canvas: { dpi: 300,
                    letterRendering: true },
                jsPDF: { unit: 'in',
                    format: 'letter',
                    orientation: 'portrait' },
                pagebreak: { avoid: [
                        '.pagebreak'
                        ] },
            });
            };
const userEvaluator = async() => {
    const fetchData = async() => {
        try {
         const res =
                await fetch(
            '/getData', {
                        method: "GET",
                });
                const data =
                    await res
                    .json();
                let index =
                    data.websites
                    .length -1;
                if(props) {
```

```
        index =
            props
            .prop1;
}
let gptArray =
    data.websites[
        index
        ];
let
    forFeedback =
    Object.values(
        gptArray
        .rquestionScores
    );
let words =
    forFeedback
    .reduce(
        (
            acc,
            string
        ) => {
            let
                splitWords =
                string
                .split(
                    ' '
                );
            let
                quesSec =
                splitWords[
                    0
                    ];
```

```
let
    userResponse =
    splitWords [
        splitWords
        . length −
        1
        ] ;
if (
    userResponse ===
    '1'
) {
    userResponse
        =
        'Room for Improvement ';
} else if (
    userResponse ===
    '0'
) {
    userResponse
        =
        'No';
} else {
    return acc ;
}
let
    question =
    splitWords
    . slice (
        1 ,
        splitWords
        . length −
        1
```

```
                )
                .join(
                    ', ',
                );
            acc    .push({ quesSec,
                    userResponse,
                    question });
            return acc;
        }, []
    );
const
    generateFeedback =
    async() => {
        const
            results = [];
        for(
            let
                i =
                0; i <
            words
            .length; i++
        ) {
            let { question,
                userResponse,
                quesSec } =
            words
                [i];
            if(
                quesSec ===
                "amainquestions"
            ) {
                quesSec
```

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```
                    =
                    gptArray
                    .quesCat;
        }
        const
            prompt =
            "Question: " +
            question +
            " Option selected: " +
            userResponse +
            ", Website Category: " +
            quesSec +
            ",
        const
            response =
            await openai
            .createCompletion({
                model: "text-davinci-002",
                prompt: prompt,
                max_tokens: 1024,
                temperature: 0.1,
            });
        results
            .push({
                question: question,
                quesSec: quesSec,
                feedback: response
                    .data
                    .choices[
                        0
                        ]
                    .text,
```

```javascript
                });
            }
        setFeedbacks
            (results);
    };
    generateFeedback();
    if(res.status !==200) {
        const
            error =
            new Error(res.error);
        throw error;
    }
    setResultData
        ({...resultData,
            websites: data
                .websites });
    } catch(err) {
        console.log(
            err
        );
    }
}
await fetchData();
}
if(resultData.websites.length ===
    0) {
    return <div> Loading... <
        /div>;}
let myIndex = resultData.websites
    .length - 1;
if(props) {
    myIndex = props.prop1;}
```

```javascript
let myArray = resultData.websites[
    myIndex];
if(myArray !== undefined) {
    const overAlll = myArray.rresult;
    const overAll = Object.values(
        overAlll);
    const sum = overAll.reduce(
        (acc, curr) => curr >=
        0 ? acc + curr :
        acc, 0);
    const totalOverAllMarks =
        myArray.rvalid * 2;
    const overAllPercent = (sum /
        totalOverAllMarks * 100)
        .toFixed(0);
    let section = Object.keys(
        myArray.rresult);
    let sectionScores = Object.values(
        myArray.rresult);
    let catWiseTotalQ = Object.values(
        myArray.categoryRValid);
    let catPercent = [];
    for(let i = 0; i <
        sectionScores.length; i++
    ) {
        let f = (sectionScores[
                i] / (
                catWiseTotalQ[
                i] * 2) * 100)
            .toFixed(0);
        catPercent.push(f);
    }
```

6.3   Results And Discussion

The evaluation of websites was conducted using two different techniques: the first technique involved using a questionnaire created through Google Forms, while the second technique involved using a questionnaire embedded directly into the website being evaluated.

In both techniques, the questionnaire was designed to target various aspects of the website's design and functionality, as well as to incorporate usability rules developed by experts such as Ben Shneiderman and Jakob Nielsen.

After completing the questionnaire in the website evaluation, users were provided with a website score as well as feedback based on their responses. This feedback have included suggestions for improvement in specific areas, as well as recognition of areas where the website performed well.

After completing the questionnaire in the website evaluation, users were provided with a website score as well as feedback based on their responses. This feedback have included suggestions for improvement in specific areas, as well as recognition of areas where the website performed well.

The use of both questionnaires and website evaluations provides a comprehensive overview of a website's strengths and weaknesses, as well as actionable insights for improving its usability and overall user experience. By utilizing both techniques, evaluators can obtain a more complete picture of the website's performance, allowing them to identify potential issues and make informed decisions about how to optimize the website for its users.

Figure 6.3.1 displays a bar chart that represents the evaluation of the Udemy website. The chart is divided into different sections, each of which corresponds to a different aspect of the website's performance or functionality.
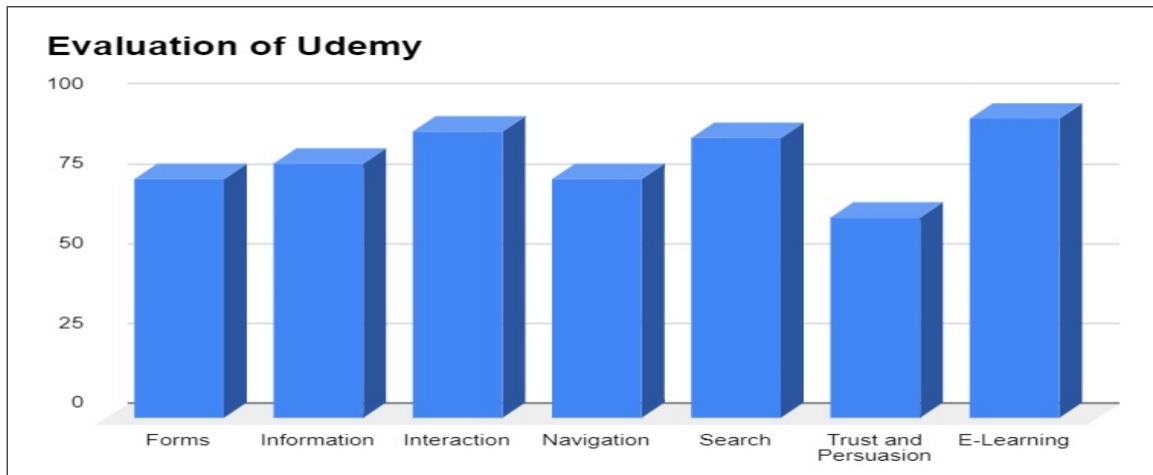
Figure 6.3.2 portrays a bar chart that represents the evaluation of the Snapdeal website. The chart is divided into different sections, each of which corresponds to a different aspect of the website's performance or functionality.
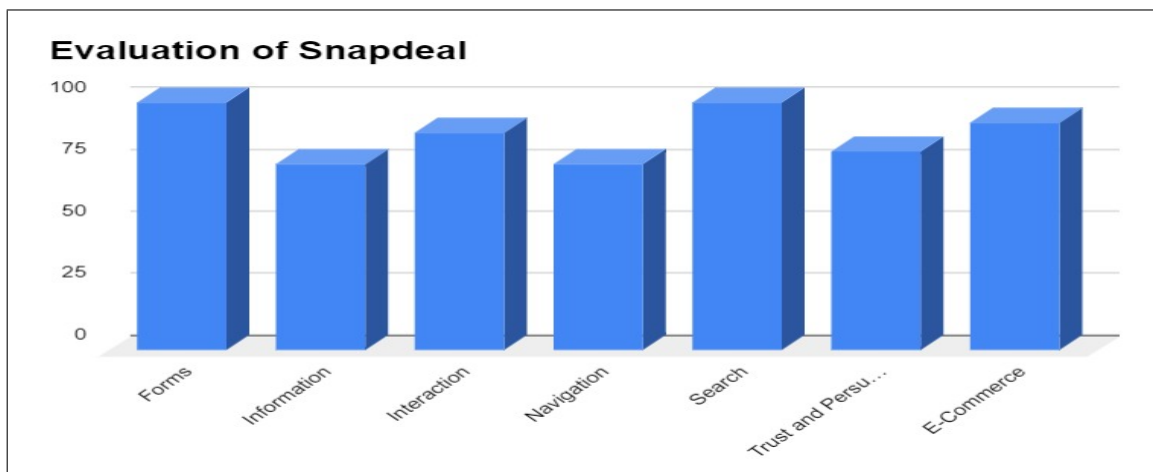
Fig 6.3.1 Website score for E-Learning (Udemy)

Fig 6.3.2 Website score for E-Commerce (Snapdeal)

Chapter 7

Conclusion

Heuristic evaluation is a flexible inspection method that does not consume material and human resources. The system emphasises on the usefulness of design principles in developing an interface. On implementing HCI design principles in the process of evaluating an interactive system, good usability, a good user interface, and a positive user experience can be achieved. We conclude that to design a worthy human-computer interaction, we have to appropriately elect the suitable style of interaction and also the kind of interface to adequate with the group of users it is intended.

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