



A critical evaluation on SRK STORE APP by using the Heuristic Principles of Usability.

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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 aim is to do a critical evaluation on SRK STORE APP (Shopping app for android) by applying the heuristic principles of usability, to obtain the usability issues or problems for the respective mobile application. Another vital element of this thesis is to attain the necessary suggestions for the respective mobile application by accomplishing the principles of the heuristic evaluation required for the mobile application. On the other hand, the outcome should be demonstrated that the mobile application is user flexible by following the principles of heuristic.

Background: To be aesthetic and attractive, the mobile application should be given an ideal user experience with usability. So we decided to focus on this utility field and while looking through the different articles, we came across one that talks about design principles and their concepts. The current thesis idea has been obtained by the literature survey we have done on the design principles of the heuristic evaluation and its concepts. This thesis is to attain the necessary suggestions and as well as the complemented solutions/recommendations for the specific mobile application by accomplishing the principles of the heuristic evaluation required for the mobile application.

Objectives: The main objectives of this project are examining the design principles and identifying the usability issues or problems of the respective mobile application and anthologizing a list of necessary suggestions for enhancing the mobile application and providing absolute recommendations to the existing application.

Methods: To compile a list of necessary suggestions and providing absolute recommendations for the mobile application, we have applied Jakob Neilson's design principles. This specific method aids in determining the utility of design criteria and aids in the transformation of the interactive system by analyzing factors such as usability. Using this method, we will provide a concise detailed overview of the importance of design principles in an interaction. The key aim of employing design principles of usability is to ensure the performance and reliability of the effective interaction design, to provide meaningful user interaction assistance, and as well as to dispense an acceptable and optimal user experience.

Results: The results here obtained are the usability issues of the respective mobile application i.e., SRK STORE APP, and the heuristic principles which are not satisfied by the specific mobile application. The severity level of the heuristic principles will have resulted and the list of necessary suggestions for enhancing the mobile application and providing absolute recommendations to the existing application.

Conclusions: This study was conducted to evaluate the mobile application. Heuristic evaluation methodology was used to evaluate the system. Jakob Neilson's design principles were used to depict the usability issues of the mobile application. The required suggestions and absolute recommendations/solutions are provided to the existing mobile application.

Keywords: evaluation, heuristic principles, application, system, usability.

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Mobile Applications:

- There are two widely used platforms in the fields of mobile application. They are :
 - Android
 - IOS

Mobile application deployment and its use have exploded since Apple deployed the iPhone and the release of Google's Android operating system. Mobile apps are simply software that runs on an independent mobile device[45]. Mobile applications are continuously growing, but in general, they are task-specific, operate on a mobile device, make extensive use of the data network, and have a simple distribution method (Google Play Store or Apple Store). The more intriguing mobile applications leverage your location, rely heavily on the network for information and interactions, and have both a device and a server component[42].

A mobile application, often known as a mobile app or just an app, is a computer program or software application that runs on a mobile device such as a phone, tablet or watch. Apps like email, calendars, and contact databases were designed with efficiency in mind[39]. Apps are often downloaded via application distribution platforms run by the mobile operating system's owner, such as Apple's App Store or Google's Play Store. Mobile apps are frequently distinguished from desktop programs, which are intended to run on desktop computers, and web apps, which are intended to run via mobile web browsers rather than directly on the mobile device[7].

In 2009, David Pogue, a technology pundit, suggested that smartphones be dubbed "app phones" to distinguish them from previous, less-sophisticated smartphones. Formalized paraphrase The term "app," short for "software application," has since gained popularity; in 2010, the American Dialect Society named it "Word of the Year"[7].

According to 2021 statistics, the typical smartphone user uses their device for 3 hours and 10 minutes every day. Apps take up around 2 hours and 51 minutes of this time (apps account for roughly 90 percent of smartphone usage[30]). According to studies, the typical smartphone has more than 80 applications installed. People, on the other hand, aren't utilizing all of those applications[2].

Types of mobile apps:

1. Native applications : These have the finest performance, but they need the development of unique programs for each platform, which is time-consuming and expensive[6].
2. Hybrid applications : These are less expensive to develop since they use a single code base that operates across platforms, but access to native APIs might be limited[6].
3. Web mobile applications : These are simpler to create, but they cannot be deployed through app stores and do not have access to native APIs or device functionality[6].

Benefits of using the mobile apps:

Mobile apps are the future of the education industry, paving the way for its growth. The applications can assist students in receiving the individualized attention they require. It can also provide them with up-to-date information. Students can broaden their knowledge base and boost their reliability[32].

Customers may instantly place orders using a well-designed mobile app from the comfort of their smartphones or tablets. Fast food restaurants are one of the better examples in this area, have greatly benefited from the use of mobile app marketing tools[3].

The most helpful mobile shopping apps gather product information from several sellers. They sort gathered data to allow users to compare prices from different retailers side by side to discover the best offers. Because smartphone alerts immediately send typically best, mobile purchasing using these apps is deemed convenient[3].

It saves a lot of time and effort[41]
The comfort of doing your shopping at home[41]
There is a large selection of items accessible[41]
Savings and reduced rates are available[41]
Find out everything there is to purchase the items[41]
We may examine the different kinds of products and companies[41]

Table 1.1: Benefits of mobile apps

Heuristic Evaluation for evaluating the mobile application:

A heuristic assessment examines your application's user interface and overall user experience in depth. It is evaluated based on established qualitative criteria i.e., heuristics that are drawn from usability principles. The outcome of examining a report on usability concerns will identify places where your respective application's UI or UX would be improved[20]. A practical advantage of heuristic assessment is that once a user interface problem is detected, it is generally short and simple to provide a solution for the problem in the application[34].

Heuristics evaluation is a time-saving way of testing usability since it may be done with few resources and in a short time (1992). Another advantage is that, while usability specialists get the greatest results using heuristic evaluation[26], non-professionals may utilize the approach to evaluate product usability with moderate success[17]. Heuristic evaluation is a method that uses certain concepts to measure how well a system works in opposition to a series of clearly specified parameters.

Heuristic evaluation is a very effective usability engineering tool by independent research. Heuristic evaluation is a usability engineering technique for identifying the usability issues in a user interface design (interactive system) and addressing them as part of an iterative design process[23]. The key advantage of heuristic evaluation is the identification of usability issues, but certain advantages can be realized if evaluators improve their knowledge of usability by comparing their evaluation results to those of other evaluators [21].

Heuristic evaluation is using efficiently as it can be relatively inexpensive as it doesn't require much time and it will utilize in-house resources. The primary aim of heuristic evaluation[28] is to find the usability problems or issues in an interactive system. After knowing the importance of heuristic, we have determined to work on the area of heuristic evaluation and we have concentrated on the heuristic principles of usability.

Selecting the specific mobile application for the evaluation:

Being a fan of Mr. Shah Rukh Khan, previously we came to know the world's first online merchandise store of Mr. Shah Rukh Khan i.e., SRK STORE APP. When we decided to work on the heuristic evaluation, we have chosen this application because, we have noticed that there are some problems while we are using the application before and even though it has good reviews, we have collected some information about the functioning of the application from the users and noticed some problems from them and hence we are opted to do a critical evaluation on it by using the heuristic principles of usability to find out the usability issues and to provide the required suggestions and recommendations for the mobile application.

Our main goal refers to do a critical usability evaluation for an existing mobile application by applying the "Heuristic Principles of Usability" (Jakob Neilson's design principles of Usability) for the identification of respective Mobile Application's usability issues to compile a list of necessary suggestions for enhancing the mobile application and to provide solutions to the current application[15].

1.1 Aim and Objectives

Aim of the project :

1. To evaluate an existing mobile application i.e., SRK STORE APP (Shopping App for Android) by applying the design principles of Jakob Neilson for usability i.e., Heuristic Principles of Usability.
2. To compile a list of necessary suggestions for enhancing the mobile application and to provide the solutions to the respective mobile application.

Objectives of this project are:

Objective 1: Examining the design principles and identifying the usability issues/problems of the selected mobile application.

Objective 2: Anthologizing a list of necessary suggestions for enhancing the interactive system and providing absolute solutions to the existing application.

1.2 Research Questions

In order to achieve the aim and objectives, this project will make a concentrate on the following research questions.

1. **(RQ1)**- Does SRK STORE APP satisfies every principle of heuristic evaluation?
 - Null Hypothesis(H0): SRK STORE APP satisfy every principle of ‘Heuristic Evaluation’. .
 - Alternative Hypothesis(H1): SRK STORE APP does not satisfy every principle of ‘Heuristic Evaluation’.
2. **(RQ2)**- How far the ‘Heuristic Evaluation method’ is suitable to list out the suggestions and solutions to the SRK STORE APP?
 - Null Hypothesis(H0): The ‘Heuristic Evaluation method’ is not suitable to list out the suggestions and solutions to the SRK STORE APP.
 - Alternative Hypothesis(H1): The ‘Heuristic Evaluation method’ is suitable to list out the suggestions and solutions to SRK STORE APP.

2.1 Nielson's principles of usability

A heuristic evaluation is a usability inspection technique for computer devices that helps identify usability flaws in the UI framework. It includes assessors inspecting the interface and determining how well it complies to established usability standards[21].

Nielsen's heuristics for user interface architecture are perhaps the most often used usability heuristics. Nielsen created the heuristics in collaboration with Rolf Molich in 1990. Nielsen published the last collection of heuristics that are still used today in 1994[23].

The following table 2.1 list out the ten heuristic principles of usability[18] :

1	Visibility of system status
2	Match between system and the real world
3	User control and freedom
4	Consistency and standards
5	Error prevention
6	Recognition rather than recall
7	Flexibility and efficiency of use
8	Aesthetic and minimalist design
9	Help users recognize, diagnose, and recover from errors
10	Help and documentation

Table 2.1: Heuristic principles of usability

The heuristic evaluation will be performed with the help of a predetermined set of heuristic principles of usability and these principles are simply known as heuristics[24] and these ten principles are have their own characteristics as shown in table 2.1.

The description of ten heuristic principles proposed by Nielsen :

1. **Visibility of system status:**
The architecture should still keep consumers up to date with what's going on by providing accurate input on time[12].
2. **Match between system and the real world:**
Instead of using machine-oriented jargon, the system can speak the users' language using vocabulary, sentences, and ideas that are common to them. referred to as "heuristics" because they are general guidelines rather than precise usability guidelines[12].
3. **User control and freedom:**
Users frequently make mistakes when doing acts. They need a marked "emergency exit" that allows them to exit the unwelcome activity without going through a lengthy procedure[12].
4. **Consistency and standards:**
Users do not have to guess whether various sentences, scenarios, or acts mean the same thing[12].
5. **Error prevention:**
A thoughtful implementation that avoids a mistake from happening in the first place is much better than successful error messages. Either remove error-prone situations or scan for them and provide users with a validation choice before proceeding with the action[12].
6. **Recognition rather than recall:**
Make elements, behaviors, and options available to reduce the user's memory load. The user does not have to recall data from one aspect of the interface to the next. Where needed, the information needed to use the template should be visible or readily accessible[12].
7. **Flexibility and efficiency of use:**
Unseen by the novice user, accelerators will also speed up the interface with the skilled user, allowing the device to appeal to both new and advanced users. Allow users to customize their routine actions[12].
8. **Aesthetic and minimalist design:**
Data that is obsolete or just used frequently can not be used in user interfaces. Any additional unit of data in an interface competes with the relevant units of data, lowering their relative visibility[12].
9. **Help users recognize, diagnose, and recover from errors:**
Error messages should be written with no error codes (clear and understandable language), describe the problem precisely, and constructively propose a solution[12].
10. **Help and documentation:**
Even though it is good if the system can be used without documentation, it may need to provide help and documentation. Any such material should be easy to find, based on the user's mission, have a list of specific measures to be taken, and not be too big[12].

2.2 Agile method

The definition of agile is marked by rapidity, quickness, lightness, and ease of movement. The phrase lightweight is frequently used for agile. It has gained widespread prominence since the late 1990s[36].

Agile approaches were created to construct systems with less amount of time for analysis. Agile[11] approaches are iterative, with a focus on cooperation, communication between customer and developer, and their feedback throughout the software project's lifespan and support. Helps to complete the tasks on time or estimated time[36].

In Scrum, requirements are usually defined as user stories in a product backlog. An item in the Product Backlog that is useful to the project team, such as a feature, problem, or technical work[27].

Usability is a good fit for agile software development. Usability could well be designed for the agile environment. For example, by employing a more iterative approach and doing testing throughout the project. Usability and agile are well compatible and they work together[36].

2.2.1 Sprint time plan

- The goal of sprint planning is to describe what work can be completed in a project and how that work will be completed. Sprint planning is done with the help of the entire scrum team. In scrum, a sprint is a predetermined amount of time during which all work is completed[46].
- Sprint planning is a timed work session that lasts around one hour for each week of a sprint. The entire team agrees to fulfill a set of product backlog items during sprint preparation[13].

Sprint planning :

- Iteration opening starts.
- The team starts a sprint by planning the work to be done.
- The team sets a goal.
- It defines the plan to achieve the setup goal.

2.3 Evaluation method

It is important to test an integrated environment because assessment aids in the comprehension of an interface's usability. An immersive system's possible usefulness can be determined by evaluation. It aids in the identification of compatibility issues in the system. Evaluation aids in recommending changes and resolving issues that arise during the process[29].

The two Evaluation methods are :

Formative evaluation:

- This method occurs before implementation in order to have an effect on the final product.
- Design reviews, heuristic approaches, and other UX assessment approaches are all instances of purely formative assessment approaches[12].

Summative evaluation:

- This method occurs after the final framework has been implemented, to ensure that it is working properly.
- Summative testing is used to identify the vulnerabilities, complexities, and drawbacks of a current or existing application[10].

2.3.1 Heuristic Evaluation

A heuristic assessment is a computer device usability inspection tool that aids in the identification of usability issues in the user interface architecture. It entails evaluators looking over the interface and assessing how well it adheres to defined usability guidelines. Nielsen's heuristics for user interface architecture are perhaps the most often used usability heuristics[15].

Heuristic principles are necessary to evaluate any existing application while performing the heuristic evaluation so that we can list out the usability issues and problems of the respected application. And also we can provide the required suggestions and necessary recommendations to the specific interactive system by applying the ten Jakob Nielson's design principles of usability and shortly we called them 'Heuristic principles of usability'[29].

The study's major purpose is to look at usability design concepts (principles) and why they are important for an interactive environment to be well-organized and consistent. In this study, we selected the heuristic evaluation method to highlight the importance of design criteria in enhancing the efficiency and user experience of a mobile application[15].

The paramount outcome of this project is obtaining the usability issues/problems for a specific interactive system by applying the respective heuristic design principles. Another vital outcome of this project is to attain the necessary suggestions and as well as the complemented solutions for the specific interactive system by accomplishing the heuristic design principles[4] required for the system (mobile application). And the outcome should be demonstrated that the respective and specific interactive system is user flexible by following the heuristic design principles[15].

Despite the usability assessment, evaluation methods have advantages and disadvantages and are listed below.

PROS:

- The interactive system is being improved.
- Identifying the issues is the first step.
- Setting objectives to meet the needs of the end-users.
- The evaluation aims to hold people accountable.
- To assess the interactive system's utility[29].

CONS:

- It's possible that evaluating an immersive environment would result in unreality.
- It takes a long time which can be costly in some situations.
- When it comes to understanding the needs of consumers, there are no numerical metrics.
- When examining an immersive device, there is a risk of inefficiency being seen[29].

2.3.2 Survey Evaluation

- Survey evaluation involves gathering the relevant information from a subset of people and is generalized to the target population[19].
- Survey evaluation aims to elicit user's subjective opinions of the system.

Characteristics of the survey:

- Intent: Collect people's reasons for using an application[19].
- Task success: Quantify levels of success[19].
- User experience feedback: Collect open-ended feedback about a user's experience[19].
- User characteristics: Figure out user characteristics[19].
- Interactions with technology: Understand how they interact with technologies[19].
- Awareness: Understand awareness of features[19].

Choosing survey among other methods:

- Follow previous qualitative studies to help quantify specific observations[19].

- Initially identify high-level insights that can be followed by in-depth research through more qualitative methods[19].
- Access to persons in remote regions, the capacity to reach difficult-to-contact participants, and the simplicity of automated data collection, which saves researchers time and effort are all advantages[47].
- Among various methods, surveying has gained popularity in recent years as a data-collection approach that is both efficient and cost-effective in human dimensions research[44].
- The below table 2.1 shows the absolute benefits of the survey method which makes people use the survey method to evaluate the interactive systems more quickly, effectively, cheaply, and easily than other methods conducted via traditional methods[8].

Relatively easy to administer[5]
Can be developed in less time[5]
Cost-effective [5]
Can be administered remotely via online, mobile devices, mail, email, kiosk, or telephone[5]
Conducted remotely can reduce or prevent geographical dependence[5]
Capable of collecting data from a large number of respondents[5]
A broad range of data can be collected (e.g: attitudes, opinions, beliefs, values, behavior, factual)[5]
Standardized surveys are relatively free from several types of errors[5]

Table 2.2: Benefits of survey

2.4 Scope

The nature of user interaction with technology has shifted as computing technology and the function of interface design has expanded accordingly. Since the range of accessibility and user interface for an interactive environment is so wide. In this thesis, we will be focusing on design concepts/principles of usability. The study's main goal is to look at design concepts(principles) of usability and why they are essential for an interactive environment to be well-organized and consistent. In this thesis, we chose to demonstrate the significance of design criteria in improving the mobile application's accessibility and user interface. Following the implementation of the design criteria, we would decide what suggestions, recommendations that the mobile application acquires[29].

2.5 Outline

The main purpose of our study is to anthologize a list of necessary suggestions for enhancing the interactive system and providing the required solutions for the future improvement of an acceptable and existing application based on Jakob Neilson's design principles. The key aim of employing Jakob Neilson's design principles of Usability[22] is to ensure the performance and reliability of the effective interaction design[1], to provide meaningful user interaction assistance and as well as to dispense an acceptable and optimal user experience.

Chapter 3

Related Work

This chapter incorporates the concepts of the study that was conducted to complete the project. We learned a lot about user engagement, user interface, user interaction design, user style, usability, usability evaluation, and user-oriented architecture when looking at the usability of an interface.

Lauralee Alben[1] has analyzed defining the criteria for effective interaction design in terms of explaining the understanding of users as understanding the needs, tasks, and environments of the users. His main task about the effective design process is the identification of major design issues that occurs during the process and selecting a sufficient method to solve the issues. The necessity for the users has mainly dealt with the satisfaction of the product. His intention is by maintaining the features of self-evident and self-healing, we can measure the learnable and usable terms.

Cathleen Wharton[31] has analyzed heuristic evaluation and he specifies that heuristic evaluation by several UI experts identifies the various usability issues and problems with a low effort of time. He also specifies that at present, most of the interfaces are evaluated through various techniques which need expertise in usability.

Christin Lindholm and Martin Host[4] have done a study and the overall objective of their research is to specify that how usability can help with the product risk assessment process and the experience that comes from both the risk assessment and usability evaluation. Their research specifies that usability checks can be argued and can provide useful insight into the risk assessment process.

Vincci Kwong[18] have done the analysis on web usability and their study states about the components of web usability and types of usability testing where the heuristic evaluation is one of the derived types of usability testing. Also specifies that perquisites for all the usability testing will be stated by information gathering and by understanding the design principles and rules.

Slack[35] have done the analysis on pros and cons of heuristic evaluation and his study specifies that the heuristic assessments are helpful in certain cases, and they may offer valuable insights into how the selected web application is achieving its goals without the time, cost, or possible issues that come with actual user evaluation. However, depending on it individually to test the idea and product is likely to be a risk.

Zackarias Madsen and Aleh Talstøi[40] have done their study on the user interface and user experience of web design and they have compared two websites focused on usability, clarified the value of design principles, and announced their plans to implement all of the design principles in the future. They have specified how the important usability concepts for a user interface impacts the user experience. The main task of them this analysis is to show the significance of design principles of usability and how they will impact a web application.

In this thesis, we are using only public information to evaluate the mobile application. We are performing the heuristic evaluation and analyzing the usability issues and problems on the existing mobile application and providing the required recommendations to the respected application[43].

This chapter includes the overview of the heuristic evaluation of usability which describes Jakob Neilson's design principles of usability that need to be performed along with research methods i.e., Case Study and the formal experiment to answer the research questions we have chosen these processes and methods used for implementing the thesis[29].

Overview :

The following chapter briefly outlines the methods used in the thesis which are used to speculate on the heuristic evaluation method for the 'SRK STORE APP'. The mobile application's accessibility and user engagement do not meet the end-user's expectations. We need to use heuristic principles to identify the usability issues. In this immersive framework [9] , the application of design criteria is inappropriate.

The issues that arose during the creation of an interactive system(mobile application) are identified using this method, and the necessary suggestions and required recommendations are provided. Most of the time, the user interface aids in gaining a thorough understanding of the end-users requirements, as well as their prerequisites[29].

- Initially, this study was conducted by examining various articles based on the usability evaluation methods and Jakob Neilson's principles of usability[29].
- We learned the design principles from various literature reviews. From the user's perspective, high quality ensures that the interface is reliable, easy to understand and has enough functionality to efficiently execute all of the specified goals and tasks[29].
- Heuristic design principles of usability explore the critical convergence of heuristic design by identifying the specifications required for the users to construct application(s) as well as the requirements for users/developers to make an interactive framework that is in a way of consistent[29].
- We have opted for the agile method to complete the thesis with a low effort of time[29].

4.1 Case Study

A case study is used to collect information from a variety of sources. We learned the design principles from various literature reviews and they are all mentioned in the (Related Work)"Chapter 3". From the user's perspective, high quality ensures that the interface is reliable, easy to understand, and has enough functionality to efficiently execute all of the specified goals and tasks. To attain all the goals and tasks, we must have to use the heuristic design principles of usability. The immersive mobile application(s) is currently used by several (millions)people. As a result, the user interface's consistency is crucial[29]. While there are many approaches to user interface design, some of them describe consistency in a manner that defines software development outcomes. Heuristic evaluation[28] explores the critical convergence of heuristic design by identifying the specifications required for the users to construct application(s) as well as the requirements for users/developers to make an interactive framework that is in a way of consistent. It has been shown that heuristic is fragmented by the review of the principles of heuristic. As a result, following a clear and compatible set of values by which to assess an interface performance of usability[29]. Many experts in this area have proposed various sets of standards to this end. Although, there are no unified set of universally agreed values that exist. This research on heuristic design principles aims to standardize the wide variety of principles that have been suggested and to identify the most important collection[29].

Thus, this approach aids in determining the utility of heuristic design concepts that aid in the evaluation of the mobile application to identify the usability issues and providing suitable suggestions and necessary recommendations for the respective mobile application[29].

4.2 Agile Method for the Thesis Draft (Formal-experiment)

Product Backlog list for the accomplishment[29] :

1. Worked on a literature review about HCI, User Interaction Design, evaluation methods, heuristic evaluation of usability.
2. Have a good understanding of evaluation processes and HCI principles of usability.
3. Choosing an existing mobile application for the evaluation.
4. Deciding on which method is suitable to choose for evaluating the existing mobile application.
5. HCI principles are keenly observed and made utilization according to the requirement.
6. An in-depth examination of the respective mobile application and the contents in the mobile application.
7. Performing the critical heuristic evaluation on the respective mobile application.

8. Identifying the usability issues and problems in the mobile application by applying the heuristic principles of usability.
9. Based on Neilson's heuristic principles of usability, making a list of necessary suggestions and providing the required solutions for the future improvement of an acceptable and existing application.
10. Draft a report that explains the entire processes and procedures that were followed[29].

4.2.1 Sprint Time Plan

The task was completed in a sprint, which enabled us to complete the project in a less amount of time and within the estimated time. The sprint is a time slot set aside to complete the assigned tasks and work[29].

Each sprint's work is listed below.

Sprint-1 (Time span of 3 weeks) :

- A literature survey has been done on 'Heuristic evaluation of usability and its concepts.
- Heuristic evaluation to be done on the existing application has opted and we studied the features of the existing application related to the heuristic principles of usability.
- The existing application that has to be evaluated is the 'SRK STORE APP'(Shopping App for Android). This is the mobile application that is selected to evaluate by applying the heuristic principles of usability.
- We have begun examining the papers, articles related to the heuristic evaluation of usability for mobile applications.
- After studying various articles, we make the first move to evaluate the respective mobile application.

Sprint-2 (Time span of 2 weeks) :

- We have collected the information about the respective mobile application.
- After the heuristic evaluation, we have identified the usability issues and problems in the mobile application.
- After the heuristic evaluation, we have chosen the case study of mobile applications using the agile method.
- The agile method(formal experiment) has been studied.
- We have taken the heuristic principles of usability for the accomplishment.

Sprint-3 (Time span of 3 weeks) :

- The heuristic principles have been selected to make the evaluation efficient and to provide absolute recommendations for the mobile application.
- At this moment, we have made a move to start the thesis draft with the 'Introduction' chapter.
- The agile method is executed for the entire project so that every sprint will run as planned every week.

Sprint-4 (Time span of 2 weeks) :

- Based on heuristic design principles, written down every usability issue to list out the suggestions and recommendations to the specific mobile application.
- By doing the heuristic evaluation on the respective mobile application, we find out the usability problems.
- By applying the heuristic principles of usability we have list out the absolute solutions and necessary recommendations to the specific SRK STORE APP.
- We have evaluated the results of our evaluation done on the mobile application by using the survey evaluation in which we get the responses from the audience.
- The primary task of employing this survey evaluation is to determine audience response to determine how well we have provided essential suggestions and necessary recommendations to the particular mobile application.

4.3 Heuristic Evaluation

The most important result of this research is the identification of usability issues/problems for a specific interactive system using heuristic design concepts. Another important accomplishment of this project is the achievement of the required ideas and supplemented solutions for the unique interactive system by completing the heuristic design principles required for the app[4]. By applying the heuristic design principles, it will be easy to find out whether that the corresponding and unique interactive system is user flexible or not[15].

While performing the heuristic assessment, heuristic principles are required to analyze the interactive system, so that we would list down the usability difficulties and flaws of the selected mobile application. We may also give the essential suggestions and comments to the application by utilising the 10 usability design principles of Jakob Neilson[29].

The outcome is supposed to be imperative for the people who buy the clothing products online and the dealers who sell their products online and finally, the interactive system that we have selected must be artistic, productive, truly efficient,

beautiful, acceptable, conscious, style[38]. The aim of using 'Heuristic Evaluation' is to find flaws in the architecture of a user-interactive framework. It aids in the evaluation of user interfaces and the detection of usability issues that can arise as end users communicate with them[29].

4.4 Survey Evaluation

The main aim of using Survey Evaluation for our project is to find out the responses of the audience to know how far better we have given the absolute suggestions and required recommendations to the specific mobile application (SRK STORE APP). This segment examines a variety of measurement techniques used in the context of an online survey. Based on the category of audience, survey results are gathered and analyzed. The survey has been conducted with an audience who are familiar with the usability evaluation and heuristic principles of usability. The answers to the survey are limited to the most relevant and prominent opinions[29].

This survey will make a clear knowledge about the evaluation we have done on the respective mobile application to find out the issues and problems in the mobile application and the suggestions, recommendations we have given for the mobile application[14]. To obtain the desired results from a wide range of users, the results are reviewed and the problems are compared to the specifications. It provides the details about the criteria needed to decide the portability and consumer with the newly developed portal source of data[29].

Survey objectives and questionnaire :

The primary goal of employing this survey evaluation for our project is to determine audience response to determine how well we have provided essential suggestions and necessary recommendations to the particular mobile application. The analysis is important further, to get a better understanding of the heuristic evaluation process and focusing on the issues and problems of various existing applications[29].

Objectives:

1. To know the viewer's perspective on SRK STORE APP in terms of heuristic principles of usability.
2. To know the viewer's opinion of our absolute recommendations and necessary suggestions given to the SRK STORE APP.

Questionnaire :

The survey questionnaire will be planned to provide a comprehensive overview of the SRK STORE APP. The survey is performed using usability heuristics for the appropriate mobile application. As part of the survey assessment, the questionnaire is crucial in knowing the performance of our heuristic evaluation result for the SRK STORE APP. The survey collects all the responses given for our results which are

reported by the audience regarding the SRK STORE APP, as well as their perspectives on how well we meet the satisfaction of the audience with our absolute solutions given by heuristic principles of usability. However, visual material such as pie charts represents the details of the survey's audience responses[29].

Survey conducted :

The survey has been conducted through an online process. 83 responses come for the survey. The survey has conducted in google forms. A link for google form, our results of mobile application, and apk of respective mobile application have been shared with the audience for the survey. The survey was conducted with a group of people who have an awareness of usability evaluation and heuristic principles of usability.

5.1 Critical evaluation on SRK STORE APP by using the heuristic principles.

In this chapter, the results are obtained when we have done a critical evaluation on SRK STORE APP (Shopping App for Android) by using the heuristic principles of usability.

We have done a critical evaluation of the SRK STORE APP by using the heuristic principles of usability and we have identified the usability issues in the respective mobile application. Some principles are obeyed by the mobile application and there are some usability issues in the mobile application and those are stated below.

1. Visibility of system status/informative feedback :

Informing the users about what is going on in the respective application within a little amount of time[16].

Thus, the 'SRK STORE APP' satisfied the first heuristic principle of usability i.e., 'Visibility of system status/informative feedback'.

2. Match between system and the real world :

The application only appears in one language for the users. There is no clear information provided for the users to change the language[14] as shown in figure 5.1.

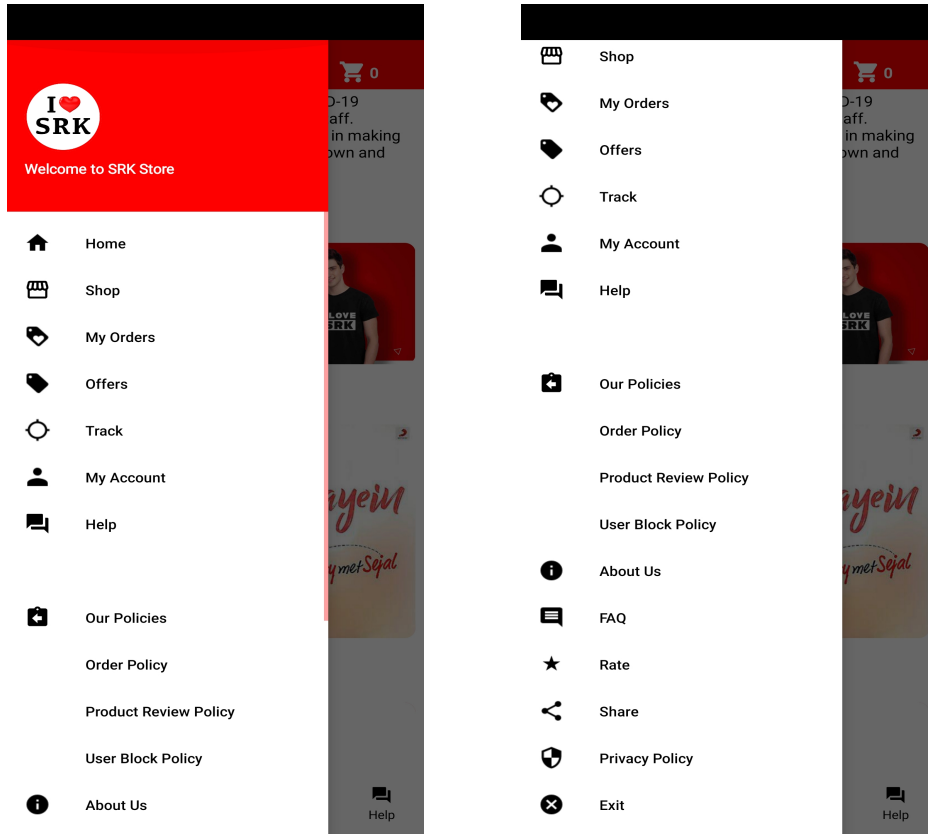


Figure 5.1: There is no language option to change

Thus, the 'SRK STORE APP' does not completely satisfied the second heuristic principle of usability i.e., 'Match between system and the real world'.

3. User control and freedom :

Users cannot exit from the application easily and few things in the application are unable to make undo that makes the users difficult to go to the previous action and it's unable for redo also, these make the users difficult to change the state of the system[14] as shown in figure 5.2.

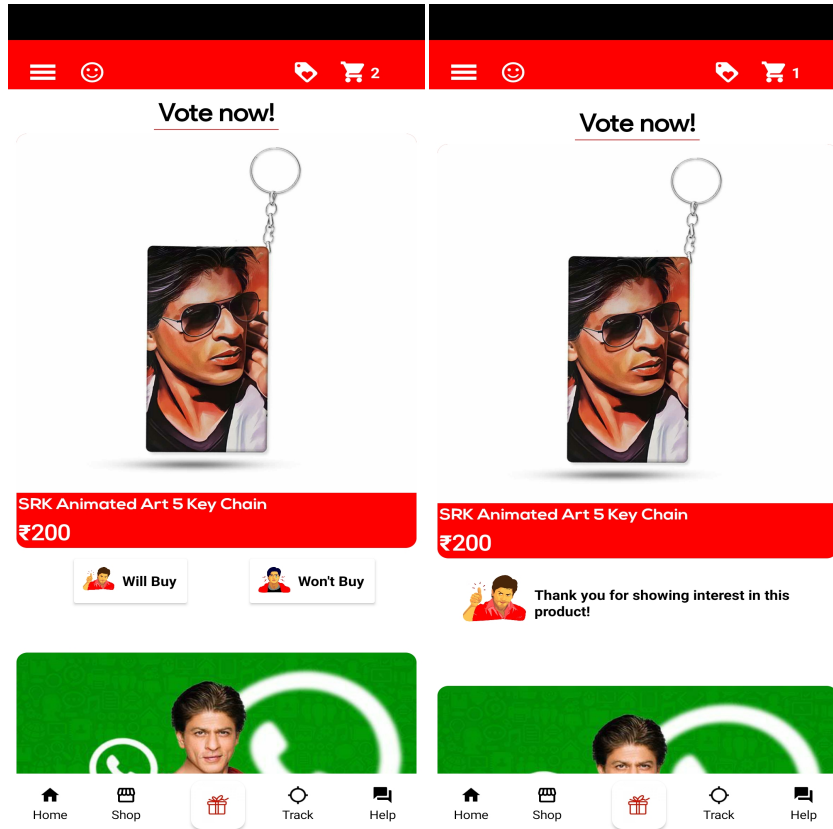


Figure 5.2: No undo and redo options are given to the users

Thus, the 'SRK STORE APP' does not completely satisfied the third heuristic principle of usability i.e., 'User control and freedom'.

4. Consistency and standards :

'Cart' button is not responding, when we click on the 'cart' button, it is exiting out of the application and some links of the application are in an inactive state[14] as shown in figure 5.3.

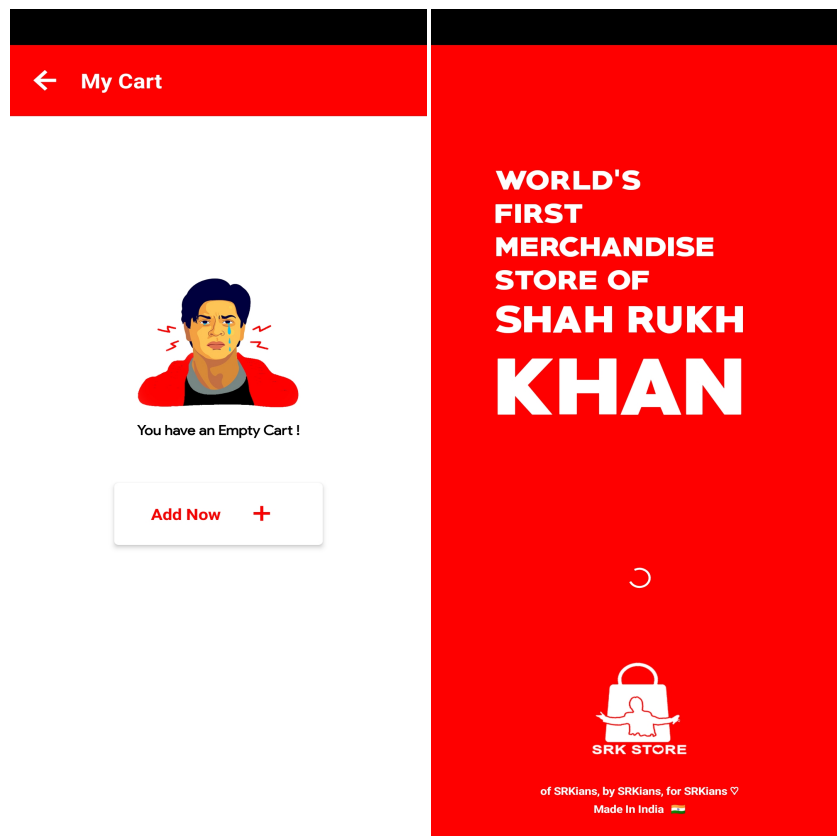


Figure 5.3: Clicking on cart button results to home page

Thus, the 'SRK STORE APP' does not completely satisfied the fourth heuristic principle of usability i.e., 'Consistency and standards'.

5. Error prevention :

No confirmation for the error-prone conditions and error actions done by the users and fails to provide the users with validation choice before proceeding with the action[14] as shown in figure 5.4.

Checkout

☒ Cash On Delivery ☐ Pay Now

Subtotal ₹ 0
 Shipping Charges + ₹ 70
 Total ₹ 70
 Service Charge (5% of Total) + ₹ 0
Order Total ₹ 70

[Have a promocode?](#)

Full Name* !
 Mobile Number* !
*Order details will be sent on entered mobile number
 Alternate Mobile Number

Flat/ House No. / Floor / Building
 Colony/ Street/ Locality/ Village Name* !
 Landmark E.g. Near ABC Bank (optional)
 City* ! Pincode* !
 State* !

[Save Address](#)

PLACE ORDER

Home Shop Track Help

Figure 5.4: There is no validation choice given to the users

Thus, the 'SRK STORE APP' does not completely satisfied the fifth heuristic principle of usability i.e., 'Error prevention'.

6. Recognition rather than recall :

The application makes objects, actions, and options visible to the users to reduce the user's memory load. The user should not have to remember the information and the template is readily accessible[16].

Thus, the 'SRK STORE APP' satisfied the sixth heuristic principle of usability i.e., 'Recognition rather than recall'.

7. Flexibility and efficiency of use :

Payment options are not functioning properly and showing the payment failed status even before doing the payment and before selecting the payment option[14] as shown in figure 5.5.

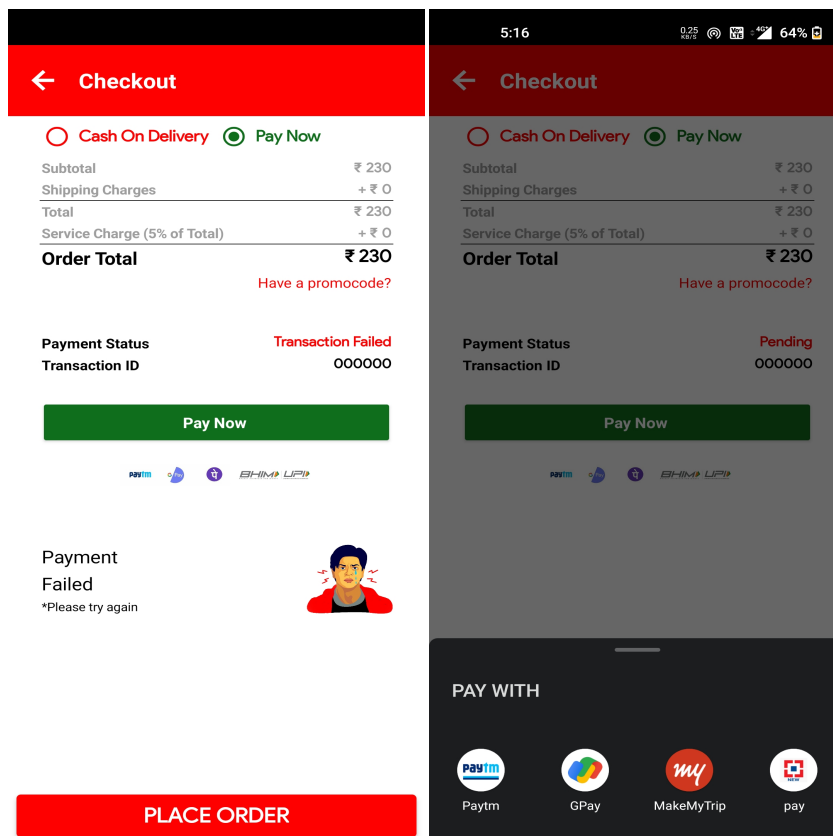


Figure 5.5: Payment failed before doing the payment

Thus, the 'SRK STORE APP' does not completely satisfied the seventh heuristic principle of usability i.e., 'Flexibility and efficiency of use'.

8. Aesthetic and minimalist design :

A clean and aesthetic look with professional design can be seen in the application but some minor elements of the application do not meet the same standards[14] as the other and one among them is that the user might have to be a wait while using the application because home page and contest page are not done loading in enough amount time. There is no irrelevant information appears to the users, while using the application as shown in figure 5.6.

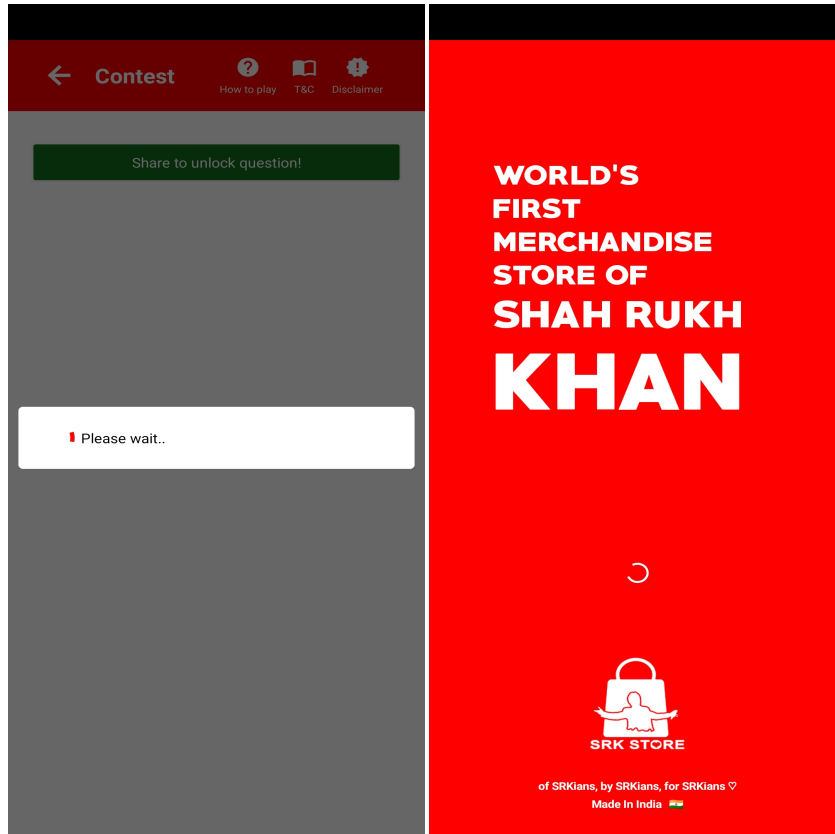


Figure 5.6: Pages are consuming more time for loading

Thus, the 'SRK STORE APP' partly satisfied the eighth heuristic principle of usability i.e., 'Aesthetic and minimalist design'.

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

There are no error messages that are informed to the users whenever the user done a technical mistake or an error action while using the application[14] as shown in figure 5.7.

My Cart

Cart Total ₹ 0

Checkout

☒ Cash On Delivery ☐ Pay Now

Subtotal	₹ 0
Shipping Charges	+ ₹ 70
Total	₹ 70
Service Charge (5% of Total)	+ ₹ 0
Order Total	₹ 70

Have a promocode?

Full Name* !

Mobile Number* !

*Order details will be sent on entered mobile number

Alternate Mobile Number

Flat/ House No. / Floor / Building

Colony/ Street/ Locality/ Village Name* !

Landmark E.g. Near ABC Bank (optional)

City* ! Pincode* !

State* !

Save Address

PLACE ORDER

Figure 5.7: Order is proceeding without adding item to cart

Thus, the 'SRK STORE APP' does not completely satisfied the ninth heuristic principle of usability i.e., 'Help users recognize, diagnose and recover from errors'.

10. Help and documentation :

It is easy to search for helpful information in the application and there is documentation available that describes the framework, technological aspects, and even its general function. But this documentation cannot be retrieved from the application to the users[16].

Thus, the 'SRK STORE APP' partly satisfied the tenth heuristic principle of usability i.e., ' Help and documentation'.

The following table 5.1 represents the suggestions and recommendations to the mobile application.

No.	Usability issues	Heuristics	Severity	Suggestions and Recommendations
1	The application only appears in one language for the users	Match between the system and the real world	Major	Instead of just English, the system should give various languages to users in their area to avoid user misconception and to improve communication.
2	Users cannot exit from the application easily and few things in the application are unable to make undo that makes the users difficult to go to the previous action and it's unable for redo also, these make the users difficult to change the state of system	User control and freedom	Major	The application should provide exit link or construct a button to exit from the application.
3	'Cart' button is not responding, when we click on cart button, it is exiting out of the application and some links of the application are in inactive state	Consistency and standards	Major	The system should check for broken links on other things, rather than simply hiding the link on the cart button if it is not appropriate.
4	No conformation for the error-prone conditions and error actions done by the users and fails to provide the users with validation choice before proceeding with the action	Error prevention	Minor	The architecture should assist consumers in making the best decision from the start. The error warnings should then assist users if they do chance to make errors. The system does not display the desired entry format of information until the user has made a mistake.

5	Payment options are not functioning properly and showing the payment failed status even before doing the payment and before selecting the payment option	Flexibility and efficiency of use	Major	The payment method listed, such as debit or credit should be function good. And the payment status should appear only if the user has done a payment.
6	Some minor elements of the application that do not meet the standards as the one among them is that user might have to be a wait while using the application because home page and contest page are not done loading in enough amount time	Aesthetic and minimalist design	Minor	To improve the user experience, the program's interface should be attractive, and it should convey the impression of being competent, efficient, and protected.
7	There are no error messages that are informed to the users whenever the user has done a technical mistake or an error action while using the application	Help users recognize, diagnose and recover from errors	Minor	Provide the appreciate message to inform the user when there is wrong input.

Table 5.1: Suggestions and recommendations to the mobile application

5.2 Survey responses :

The survey has been conducted among the students who are familiar with the usability evaluation and heuristic principles of usability. The below pie-charts will represents the details of the audience responses for the survey[29].

After conducting the heuristic evaluation on SRK STORE APP, we have conducted an online survey to know the user satisfaction and feedback from the audience for the necessary suggestions and recommendations we have given to the SRK STORE APP for each heuristic, where ever the usability issues occur in the application.

The below pie-charts shows the results of the survey of each heuristic principle from the students.

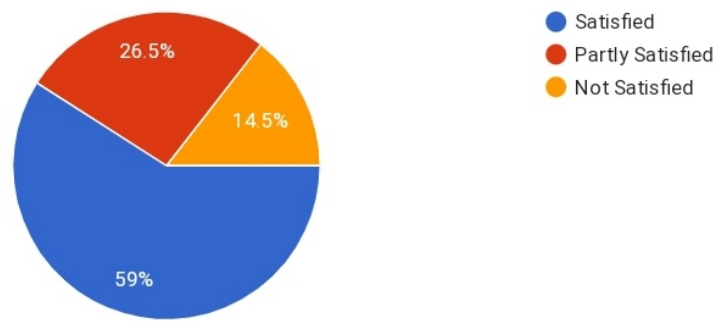


Figure 5.8: Match between system and the real world

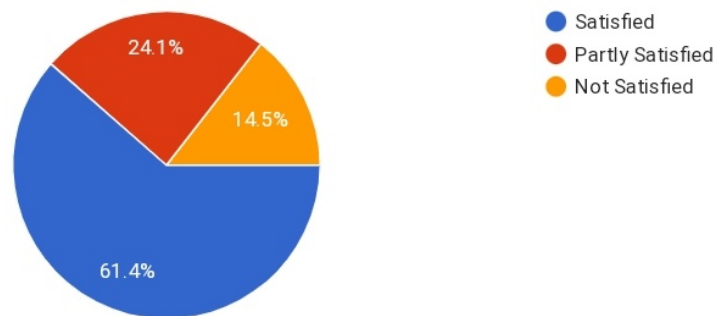


Figure 5.9: User control and freedom

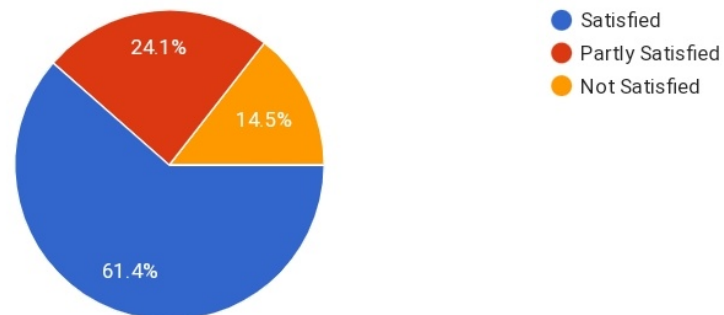


Figure 5.10: Consistency and standards

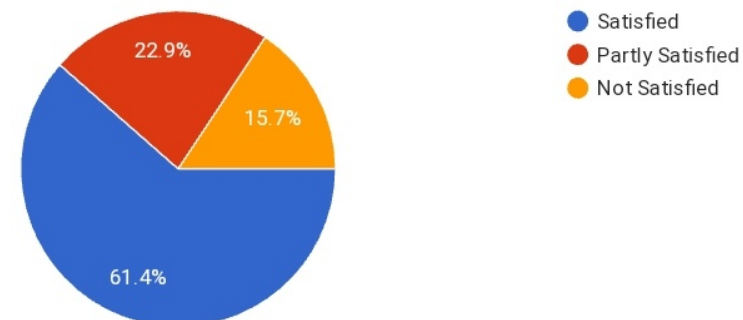


Figure 5.11: Error prevention

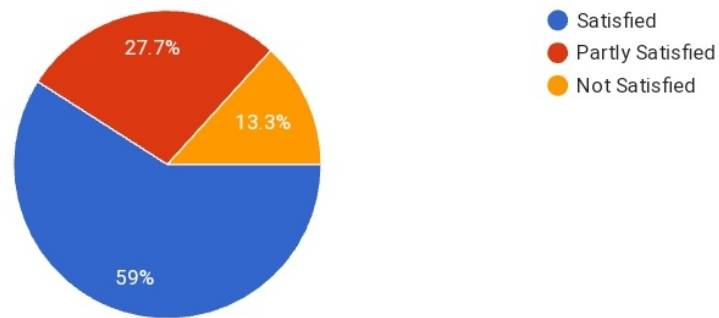


Figure 5.12: Flexibility and efficiency of use

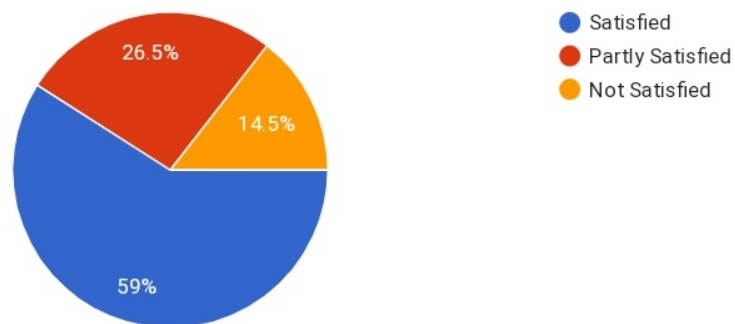


Figure 5.13: Aesthetic and minimalist design

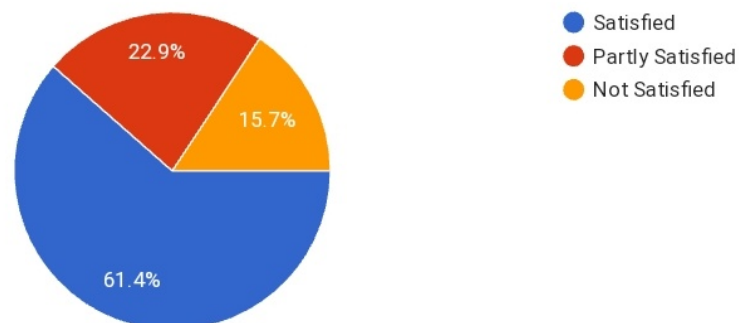


Figure 5.14: Help users recognize, diagnose and recover from errors

In this research, we have studied the importance of the design principles and by examining the heuristic principles of usability. we are supposed to identify the usability issues or problems of mobile application for each heuristic principle of usability.

The research questions of this respective thesis are:

- **(RQ1)**- Does SRK STORE APP satisfy every principle of heuristic evaluation?

In our research, we have studied the importance of heuristic principles and we have used them to identify the usability issues and problems in the mobile application in terms of heuristic evaluation of usability. Examining the heuristic design principles of usability results in the finding of usability issues in the application for each heuristic. While evaluating the respective mobile application(SRK STORE APP), we have found out the principles of heuristic evaluation that are satisfied by the specific mobile application. But some principles of heuristic design are not satisfied by the SRK STORE APP. The usability issues that are involved in the mobile application refer to those principles that are not satisfied by the SRK STORE APP. Hence, we conclude that the SRK STORE APP does not satisfy every principle of heuristic evaluation.

- **(RQ2)**- How far the heuristic evaluation method is suitable to list out the suggestions and recommendations to the SRK STORE APP?

Heuristic principles of usability have been used in the evaluation of mobile applications since it is one of the better usability evaluation methods available. Using this method, we have provided a concise detailed overview of the importance of heuristic principles in an evaluation. We have found the issues and problems in the application with a low effort of time and we have evaluated within the estimated time by using the heuristic evaluation. The usability problems in the respective mobile application are easily identified in a limited time with the heuristic evaluation method. And from the survey responses, we got the majority satisfaction of audience for our evaluation result. This is happened because of using the heuristic evaluation method for evaluating the SRK STORE APP to find out the issues in the mobile application and to list out the necessary suggestions and required recommendations for the SRK STORE APP. The survey analysis shows the majority satisfaction with the suggestions and recommendations we have given for the SRK STORE APP. This was also

happened because of choosing the heuristic evaluation method to evaluate the mobile application. Hence, we conclude that the heuristic evaluation method is suitable to list out the suggestions and recommendations to the SRK STORE APP.

6.1 Analysis procedure

The crucial part of our study about ethics is how we can quantify goodness in our interactive framework and maintaining fairness and inclusion by empowering all regardless of ability. Another important ethical thing we maintained here is the prevention of undesirable biases. We are not going to use any personal/private data for the evaluation. By protecting the data from misuse, we are going to maintain privacy. We are using only the accessible information i.e., public information to evaluate the mobile application.

This study followed the analysis procedure as below:

1. A literature review based on the heuristic evaluation, evaluation methods, and Jakob Neilson's principles of usability.
2. Evaluation.
3. Evaluation result(Suggestions and recommendations).
4. Survey evaluation results for our heuristic evaluation.

6.1.1 Literature review

- This study was conducted by examining various articles based on the usability evaluation methods and Jakob Neilson's principles of usability. We learned the design principles from various literature reviews[25].
- From the user's perspective, high quality ensures that the interface is reliable, easy to understand, and has enough functionality to efficiently execute all of the specified goals and tasks[25].
- The critical convergence heuristic principles of usability have been explored by identifying the specifications required for the users to construct the applications as well as the requirements for users/developers to make an interactive framework that is in a way of consistent[25].
- We need to use heuristic principles to identify the usability issues. In this immersive framework, the application of design criteria is inappropriate[25].
- The issues that arose during the creation of an interactive system(mobile application) are identified using this method, and the necessary suggestions and required recommendations are provided[25].

6.1.2 Evaluation

We have selected the heuristic evaluation method because our study's main goal is to work on the area of heuristic, so we decided to look at heuristic principles of usability and implementing their principles of usability in order to provide the necessary suggestions and recommendations for an interactive environment with well-organized and consistent. We have chosen the heuristic evaluation method to emphasise the relevance of system design in improving the performance, user experience and usability of the specific mobile application i.e., SRK STORE APP[15].

6.1.3 Evaluation result

1. The application only appears in one language for the users. This belongs to the second heuristic principle i.e., Match between system and the real world as shown in figure 5.1. The suggestion and recommendation we have given are instead of just English, the system should give various languages to users in their area to avoid user misconception and to improve communication[14].
2. Users cannot exit from the application easily and few things in the application are unable to make undo that makes the users difficult to go to the previous action and it's unable to redo also, these make the users difficult to change the state of the system. This belongs to the heuristic principle i.e., User control and freedom as shown in figure 5.2. The suggestion and recommendation we have given are The application should provide an exit link or construct a button to exit from the application[14].
3. 'Cart' button is not responding, when we click on the cart button, it is exiting out of the application and some links of the application are in an inactive state. This belongs to the heuristic principle i.e., Consistency and standards as shown in figure 5.3. The suggestion and recommendation we have given are the systems should check for broken links on other things, rather than simply hiding the link on the cart button if it is not appropriate[14].
4. No confirmation for the error-prone conditions and error actions done by the users and fails to provide the users with validation choices before proceeding with the action. This belongs to the heuristic principle i.e., Error prevention as shown in figure 5.4. The suggestion and recommendation we have given is the architecture should assist consumers in making the best decision from the start. The error warnings should then assist users if they do chance to make errors. The system does not display the desired entry format of information until the user has made a mistake[14].
5. Payment options are not functioning properly and showing the payment failed status even before doing the payment and before selecting the payment option is belongs to the heuristic principle i.e., Flexibility and efficiency of use as shown in figure 5.5. The suggestion and recommendation we have given is the payment method what have been listed like debit or credit methods are must

be function good. And the payment status should appear only if the user has done a payment[14].

6. Some minor elements of the application that do not meet the standards as the one among them are that user might have to be a wait while using the application because the home page and contest page are not done loading in enough amount time. This belongs to the heuristic principle i.e., Aesthetic and minimalist design as shown in figure 5.6. The suggestion and recommendation we have given are to improve the user experience and it should be attractive, and it should convey the impression of being efficient and protected[14].
7. There are no error messages that are informed to the users whenever the user done a technical mistake or an error action while using the application. This belongs to the heuristic principle i.e., Help users recognize, diagnose and recover from errors as shown in figure 5.7. The suggestion and recommendation we have given are to provide the correct message to inform the user when there is an error or given a wrong input[14].

6.1.4 Survey evaluation results

The main intention and aim of employing this survey evaluation for our project are to determine the audience[33] response to determine how well we have provided essential suggestions and necessary recommendations to the particular mobile application. The analysis is important further, to get a better understanding of the heuristic evaluation process and focusing on the issues and problems of various existing applications[29].

The main objectives of this survey evaluation are to know the viewer's perspective on the SRK STORE APP in terms of heuristic principles of usability and to know the viewer's opinion of our absolute recommendations and necessary suggestions given to the SRK STORE APP. The survey has been conducted with an audience who are aware of usability evaluation and heuristic principles of usability.

We have conducted an online survey to know the user satisfaction and feedback from the audience for the necessary suggestions and recommendations we have given to the SRK STORE APP. The survey have been conducted with the audience who are aware of usability evaluation and heuristic principles of usability.

We have conducted an online survey to know the user satisfaction and feedback from the audience for the necessary suggestions and recommendations we have given to the SRK STORE APP [37]. 83 responses came from the students for the survey we have conducted on SRK STORE APP.

Analysis on survey responses

- 59 percent of the audience are satisfied, 26.5 percent of the audience are partly satisfied and 14.5 percent of the audience are not satisfied with 'Match between system and the real world' as shown in figure 5.8.
- 61.4 percent of the audience are satisfied, 24.1 percent of the audience are partly satisfied and 14.5 percent of the audience are not satisfied with 'User control and freedom' as shown in figure 5.9.
- 61.4 percent of the audience are satisfied, 24.1 percent of the audience are partly satisfied and 14.5 percent of the audience are not satisfied with 'Consistency and standards' as shown in figure 5.10.
- 61.4 percent of the audience are satisfied, 22.9 percent of the audience are partly satisfied and 15.7 percent of the audience are not satisfied with 'Error prevention' as shown in figure 5.11.
- 59 percent of the audience are satisfied, 27.7 percent of the audience are partly satisfied and 13.3 percent of the audience are not satisfied with 'Flexibility and efficiency of use' as shown in figure 5.12.
- 59 percent of the audience are satisfied, 26.5 percent of the audience are partly satisfied and 14.5 percent of the audience are not satisfied with 'Aesthetic and minimalist design' as shown in figure 5.13.
- 61.4 percent of the audience are satisfied, 22.9 percent of the audience are partly satisfied and 15.7 percent of the audience are not satisfied with 'Help users recognize, diagnose and recover from errors' as shown in figure 5.14.

Analysis on survey results

Overall satisfaction of audience for our evaluation result is given below.

- The analysis of survey results are as follows :
 1. Satisfied - 60.37 percent.
 2. Partly satisfied - 24.95 percent.
 3. Not satisfied or dissatisfied - 14.67 percent.
- 60.37 percent of audience are satisfied, 24.95 percent of audience are partly satisfied and 14.67 percent of audience are not satisfied for our heuristic evaluation result of SRK STORE APP.

7.1 Author's Perspective

The user interface of a mobile application should be structured in a planned and practical way, based on basic, dependable models that are accessible, visible, and familiar to users. As a result, heuristic principles of usability proved to be quite beneficial in evaluating a usable, acceptable, and optimal interactive system i.e., mobile application[29]. We have analyzed the specific mobile application and we have provided the necessary suggestions and recommendations to the SRK STORE APP based on heuristic principles of usability. So the respective heuristic principles of usability were very useful for an acceptable mobile application to maintain the standards of heuristics and for providing the necessary suggestions and recommendations to the existing applications.

Finally, we have evaluated the mobile application by applying the heuristic principles of usability and have given satisfactory suggestions and recommendations by using the design principles and was proven by the survey results obtained from the survey responses given by the students for the heuristic evaluation result which contains the suitable suggestions and necessary recommendations for the usability issues identified in the SRK STORE APP.

The survey results we have obtained given a clear knowledge about user satisfaction and feedback from the audience for the necessary suggestions and recommendations we have given to the SRK STORE APP. The satisfactory results we have gained from the survey have made us analyze what we have performed in future work. In this analysis, we have got an idea about re-designing the mobile application with all the acceptance of heuristic principles of usability.

7.2 Future work

As the respective mobile application does not satisfy every principle of heuristic because it contains some usability issues, so in the future, we have decided to resolve the issues by considering all the suggestions and recommendations given for the application and to design the app so that it should satisfy the every heuristic principle. Hence, the future work of this thesis is to re-design the respective mobile application i.e., SRK STORE APP with the acceptance of all the heuristic principles of usability.

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