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Optimizing User Experience Across Platforms: A Study on Enhancing music-streaming Applications' Cross-device Unification

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Abstract

This thesis examines the crucial role that design consistency plays in shaping user experiences within music streaming applications, focusing specifically on mobile, web, and desktop devices. The research methodology used in this study incorporates both online surveys and usability testing to gather insights. The study revealed that a consistent interface design significantly impacts user satisfaction. When users transition between devices, inconsistencies in design elements and functionality emerge as primary causes of user dissatisfaction. This explains the need for a seamless user experience across all devices.

Further, the research posits that maintaining design consistency considerably enhances the usability of music applications. This consistency, reflected in the layout, typography, and colour scheme, facilitates seamless transitions between various devices, reducing cognitive load and promoting an improved overall user interaction. By highlighting the importance of design consistency across devices, the research provides a clear direction for designers in the industry. A more harmonious and seamless user experience, brought about by design consistency, could increase user engagement, promote user retention rates, and contribute to the overall success of a music streaming application.

In conclusion, this thesis contributes to understanding user experience in music streaming applications, emphasising the pivotal role of design consistency across different platforms in driving user satisfaction and shaping the overall user experience.

Keywords:

User Experience Design, Design Consistency, Music Streaming Applications, User Satisfaction, Cross-device Design, Interface Design, Digital Services, UX Best Practices.

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1 Introduction

In today's digital age, music streaming has become an integral part of our daily lives, with users seamlessly transitioning between various devices, from smartphones to desktops and web interfaces. The increasing adoption of music streaming platforms has revolutionised how users consume music, offering a wide range of personalised experiences across various devices. A survey study conducted by Stat Counter (2019) found that 50.48% of web traffic was generated from mobile devices, while desktop devices accounted for 46.51% of the total web traffic. Particularly in the United States, the use of smartphones and tablets for online access was even more pronounced, accounting for 63% of all online traffic. These statistics underscore the critical importance of optimising user interface design across various platforms to ensure a consistent and satisfying user experience. Consumer satisfaction can be seen as a psychological state when the result of the consumption experience is better than the expectation of the prior consumption experience of consumers (Reynoso, 2010). Therefore, music streaming designers must build platforms that meet users' expectations.

With the evolving digital world, user interaction and user experience (UI/UX) design has become a growing field in informatics, which focuses on improving the experience. In contrast, users interact with the web products. In the music streaming industry, users engage with applications across various devices, desiring a seamless transition and harmonious experience across mobile, web, and desktop platforms. Despite the transformative impact of music streaming platforms, inconsistency in user experience when transitioning between devices can impact overall user satisfaction. For example, while enjoying your favourite music on your mobile app, transitioning to your computer may be disrupted by design elements and typography changes, leading to a disjointed experience. Such inconsistencies can result in user frustration and dissatisfaction, adversely impacting user interaction and user experience while using an application.

The study by Salazar (2023) argues that a consistent user experience, regardless of platform, is one of the five critical components of a successful omnichannel user experience (UX). It highlights how consistency across different channels builds trust with customers. "SoundCloud, a well-known music streaming platform and the subject of our case study, shows inconsistencies in its interface across different devices, as seen in Fig 1.1. Users may notice differences in design elements and functionality when switching from mobile to desktop or web versions. These variations can negatively impact the user experience, potentially leading to dissatisfaction."

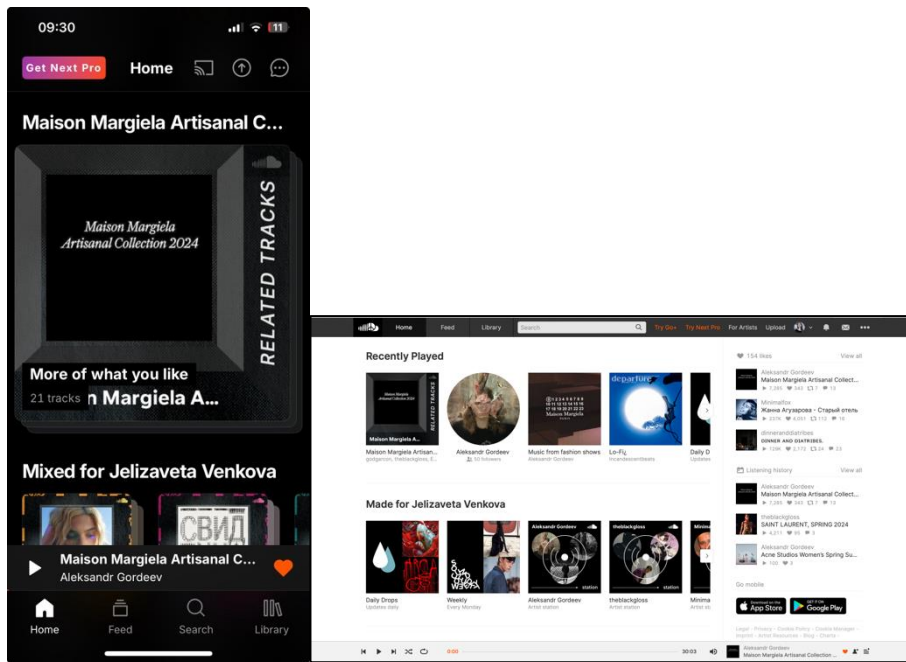


Fig 1.1 – SoundCloud’s original home pages for mobile and desktop versions.

A study done by Shin (2016) on the user experience of cross-platform services identified key elements that affect the user experience of digital products, including design and element consistency, mobility, responsiveness, and accessibility. The research underlines the importance of consistency in the device user experience to enhance satisfaction. Dewra (2023), in his study, emphasises the positive impact of familiar user experience on satisfaction, highlighting the link between design consistency and user experience. Therefore, it is necessary to address the gap regarding application design inconsistencies by discussing the unification of cross-device designs to optimise user experience. As the music-streaming industry evolves, establishing a seamless and consistent user experience across different devices is essential.

1.1 Problem statement

Building on the introduction above, this thesis, focused on enhancing the user experience in music streaming applications, necessitates a comprehensive understanding of users' complexities and inconsistencies when transitioning between devices. These challenges arise in a highly digital world that is continually evolving, creating a demand for ongoing evaluation and revision of design strategies (Sánchez-Adame et al., 2019). Designers are responsible for applying and continuously adapting fundamental design principles. These principles include design consistency, accessibility, responsiveness, and design familiarity. Adaptations are necessary to cater to the evolving needs and preferences of the users. The ultimate objective is to enhance the overall user experience, a goal that aligns with the overarching aim of our thesis.

One potential strategy relevant to our thesis is cross-device unification in music streaming applications. This concept suggests that a unified device experience can significantly amplify user satisfaction and encourage more robust interaction between the user and the application. According to a study conducted by Sánchez-Adame, Mendoza, Meneses Viveros, and Rodriguez (2019), enhancing consistency in the design of multi-device environments can boost usability and lessen the chances of a negative user experience. This research, which used Spotify as a case study, identified that despite the platform's broad user base, there were several consistency issues. This research highlights the importance of consistency in multi-device environments, especially as users frequently switch between devices.

Dong, Churchill, and Nichols (2016) identified three obstacles in interactive environments. The challenges include difficulties designing consistent interactions between devices, adapting graphical user interfaces to different platform standards, and a lack of tools and methods for testing multi-device user experiences. Formulating and executing efficient strategies to rectify these discrepancies in user experience is imperative.

As such, the current research gap exists in understanding how design inconsistencies across different devices impact the user experience in music streaming applications. This gap presents a significant issue as it undermines the ability to provide a seamless and satisfying user experience., which is crucial in today's digital age, where users frequently transition between devices.

1.2 Purpose and research questions

As the problem statement highlights, a research gap exists regarding design inconsistencies in music-streaming applications. With the continuous improvement in overall network speed and the increasing refinement of music applications, it is crucial to enhance user interaction into micro-interaction (Ahram & Falcão, 2020). This relates to the concept of essential focal points, which are interaction points and call for impactful design.

Denzin and Lincoln (2018) state that clearly focusing on the research question is vital when constructing a research design. This design serves as a comprehensive guideline linking theoretical paradigms with strategies of inquiry and subsequent methods for collecting empirical data.

This research explores the role of cross-device unification in enhancing user experience, specifically focusing on music-streaming applications. To adequately address this subject, we use SoundCloud as a primary case study because of its current inconsistencies in certain elements, such as playlists, album icons and display designs. This study aims to identify design

consistency's potential impact on user satisfaction across different platforms. The study intends to provide practical suggestions based on feedback from the final usability testing participants that can be applied to improve the user experience in real-world scenarios.

The following research questions will guide our study:

1. *How does user satisfaction depend on consistent interface design across mobile, web, and desktop platforms?*
2. *How can we improve the usability of music app products to ensure user experience tends to be consistent across digital devices?*

By answering these questions, this study aims to bridge the gap between the current state of user experience in music-streaming applications and the ideal state of seamless, consistent, and satisfying user experience across different devices. This research aims to contribute to the broader field of user experience design by shedding light on the critical aspect of cross-platform unification. This study hopes to offer a comprehensive understanding of the role of consistent design in shaping users' interaction with music-streaming applications across various platforms, such as web, mobile, and desktop.

1.3 Scope and limitations

The scope of this study is comprehensive, focusing on optimising user experience across platforms within the context of music streaming applications. The approach is rooted in the principles of user experience design, interaction design, and cross-device unification, which serve as the foundation of our research. The study explores various aspects of user experience, such as consistency and responsive design, and aims to understand how these factors can enhance overall user satisfaction in music streaming applications.

This research encompasses an in-depth examination of the design of music streaming applications with SoundCloud as a case study. While the principles and findings may have broader implications, our primary focus is on creating a unified, seamless experience across different devices for music streaming applications. It is important to note that the specific strategies and recommendations may not directly apply to platforms outside of music streaming.

About limitations, this study, while thorough and detail-oriented, has constraints. A primary limitation is the size of our sample. This study utilised a sample size of 57 participants, considered adequate for Structural Equation Modelling (SEM) based on general guidelines. However, a larger sample size might have provided more robust and generalisable data. This limitation is mitigated by the relative simplicity of this research design and the specificity of

our research questions, which have been crafted to yield meaningful insights even with a smaller sample.

Another area for improvement is our reliance on user surveys and usability testing. While valuable for gaining insights into user preferences and behaviours, these methods are subject to self-reporting bias and the potential for misinterpretation of questions by participants. Although we have employed strategies to minimise these biases in our study design, they remain an inherent limitation of these research methods.

Furthermore, while our research provides valuable insights into the design of music streaming applications, it is essential to acknowledge that the findings may not directly apply to other digital products or services. The specificity of our research context should be considered when interpreting and applying the results of our study. Our research delves into the unique and complex nature of music streaming applications, and the findings are most applicable within this context.

In conclusion, as with any research, this study has its scope and limitations. This study will review existing literature on user experience design and cross-device unification to answer our research questions. However, these limitations mentioned above uphold the value of the study. Instead, they highlight areas for further research and provide a clearer understanding of the context in which the findings are most applicable.

1.4 Disposition

The study is structured into crucial sections. The **Introduction** introduces the research topic, outlines the research problem and questions, and emphasises the study's significance. The **Literature Review** backs up with relevant literature forming the theoretical framework and evaluates previous studies, identifying strengths, weaknesses, and gaps. The **Research Methodology** details the research methods, including the design, data collection, and analysis techniques, and discusses the study's validity and reliability. The Results and Discussion section presents and interprets the findings about the research questions and the theoretical framework. It also compares the results with those of previous studies. The **Conclusion and Future Directions** summarise the essential findings and their implications, acknowledge the study's limitations, and suggest future research directions. Lastly, the **References** section lists all the sources cited in the study.

2 Method and Implementation

To gain insights into behaviours, experiences, and perceptions, research done by Flick (2018) adopts a qualitative approach characterised as “exploratory.” A qualitative study allows for a deeper understanding of the subject matter, as it seeks to explore the 'why' and 'how' of a phenomenon rather than just what. This is particularly relevant for our study, as we aim to delve into the complexities of interface consistency in music streaming applications across different devices. Consequently, the study employs qualitative research, which adopts a naturalistic approach, focusing on understanding the meanings people attribute to their experiences and constructing interpretations based on them. Flick (2018) asserts that this approach is beneficial in gathering knowledge pertinent to devising solutions for practical problems and fine-tuning them during the testing phase.

The methodology for data collection is divided into two distinct segments, with each segment deploying an appropriate qualitative method to address the individual research inquiries.

2.1.1 Online Survey

For the first segment, we employed online surveys to explore our first research question due to its multiple advantages. As Ruppert et al. (2011) contend, surveys serve as a mechanism for "governing" populations and enacting specific categories that can be targeted for interventions. It provides a valuable tool for data collection, capable of enacting populations and categories and providing insights into the subject of study (Denzin & Lincoln, 2018). Furthermore, administering an online survey in the initial stages of the research process provides more authentic data on participants' habitual interactions and preferences in their natural environments. We opted for close-ended questions in our online surveys, as they allow for efficient data collection and analysis in restricted timelines and increase respondents' enthusiasm for returning a completed questionnaire (Hyman & Sierra, 2016). Furthermore, Sowitz (2019) posits that incorporating closing questions in research adding a “new breath” to the interview, a concept that can be adapted to survey methodologies.

Table 1 below shows all the survey questions for this study.

Question Number	Question
1	What’s keeping you busy these days?

(See Fig 9.1.1 in Appendix 1)	
2 (See Fig 9.1.2 in Appendix 1)	May I know your gender?
3 (See Fig 9.1.3 in Appendix 1)	How old are you right now, if you don't mind me asking?
4 (See Fig 9.1.4 in Appendix 1)	What are the main devices you use to access music applications?
5 (See Fig 9.1.5 in Appendix 1)	What are the primary music applications you're utilising at the moment?
6 (See Fig 9.1.6 in Appendix 1)	How frequently do you switch between different devices (e.g., mobile, web, desktop) of the same music streaming applications?
7 (See Fig 9.1.7 in Appendix 1)	What factors affect your usability/satisfaction of a platform the most?
8 (See Fig 9.1.8 in Appendix 1)	Here's an example of a music app on mobile and desktop devices. You should compare the mobile screen to desktop screen in each choice and select the most visually consistent one.
9 (See Fig 9.1.10 in Appendix 1)	Here's an example of a music app on mobile and desktop devices. You should compare the mobile screen to desktop screen in each choice and select the most visually consistent one.
10 (See Fig 9.1.12 in Appendix 1)	Which one of the images is more visually consistent compared to each other?
11 (See Fig 9.1.14 in Appendix 1)	Which one of the shapes gives a user-friendly feeling?
12 (See Fig 9.1.15 in Appendix 1)	Colour contrast checker. Which image has the most contrast between the colours?
13 (See Fig 9.1.16 in Appendix 1)	Do you spot any visual differences in the example below?

14	How frequently do you encounter differences in visual elements when transitioning between different devices (e.g., mobile, web, desktop) of the same music streaming applications?
15	How frequently do you encounter differences in app functionalities when transitioning between different devices (e.g., mobile, web, desktop) of the same music streaming applications?

Table 1 – Survey Questions

This study employed surveys to build a user-centric prototype before conducting usability testing. This approach aimed to comprehensively understand user preferences and expectations during interactions with a music streaming application. After analysing the data collected, we merged survey insights with peer-reviewed literature studies to design a semi-functional high-fidelity prototype for our modified version of the music app.

2.1.2 Prototype Implementation

After a comprehensive review of relevant literature and getting survey feedback, we started creating a prototype. This stage marked a crucial transition in this research process, moving us from theoretical understanding to practical application. Our primary goal was to put all the feedback and insights we gathered from the survey into a prototype of a music streaming app. We used a design tool called Figma for this.

Our design process was heavily centred on the user. All our decisions were grounded in real user data obtained from our surveys. This user-centric approach enabled us to create a design that was not only aesthetically pleasing but also semi-functional and tailored to meet the needs of our proposed users.

Throughout this process, we placed a high value on user feedback. We considered all the feedback we received from the survey, allowing it to guide aspects such as the prototype's layout, colours, fonts, and navigation system. These decisions were made with the user in mind, addressing the issues identified in our case study.

The result was a detailed, interactive, and semi-functional prototype as shown in **Fig 2.1**. It was designed with a strong emphasis on the user, addressing the issues we identified in the current music streaming app from our case study. Moreover, it adequately met the needs of our target users.

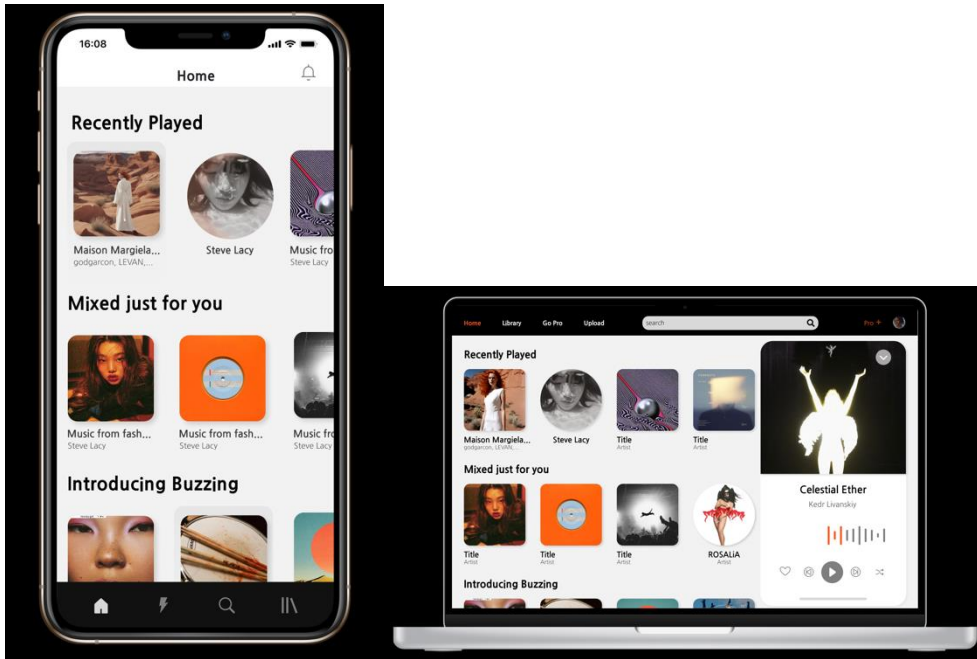


Fig 2.1 – Modified homepage on desktop and mobile devices.

After completing the prototype, we conducted usability testing to evaluate its effectiveness. The feedback and suggestions gathered from this testing phase were invaluable. We considered all the feedback and made modifications to our prototype accordingly. These adjustments were made further to align the design with user needs and expectations, enhancing the overall user experience and satisfaction which can be seen in **Fig. 2.2**.

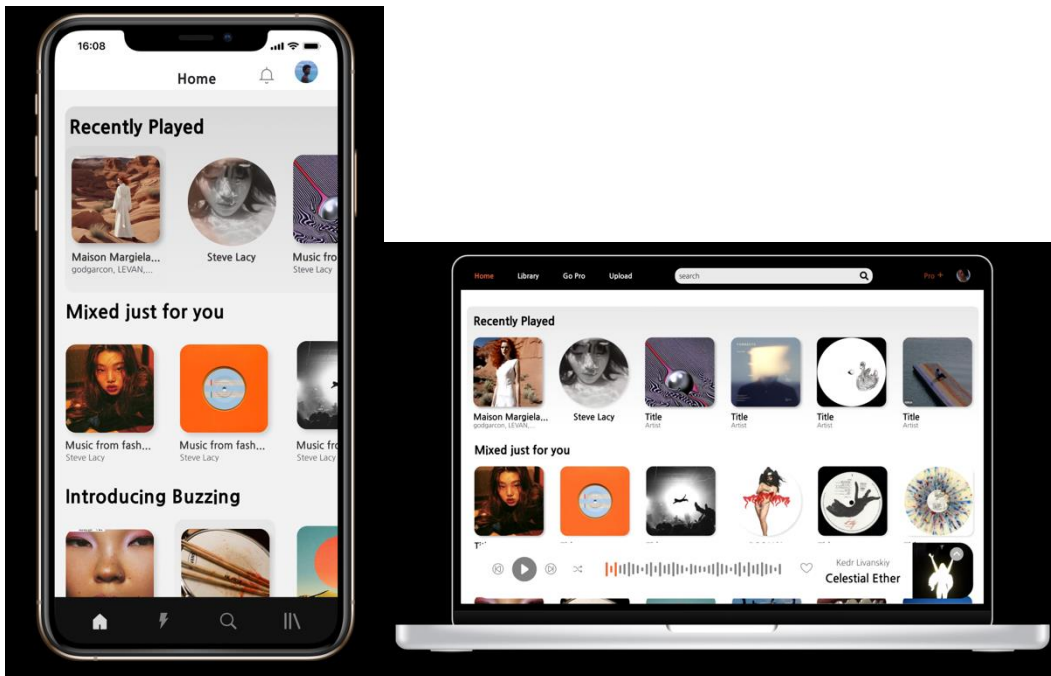


Fig 2.2 – Following the usability testing: Modified homepage on desktop and mobile devices in light mode.

2.2 Usability Testing

Our second approach involves usability testing on the prototype of the modified version of the music application. This approach is intended to provide an answer to our second research question, which is centred on enhancing the adaptability of music apps to ensure design consistency across digital platforms: *RQ2* “*How can we improve the usability of music app products to ensure user experience tends to be consistent across digital devices?*”. The project's testing phase was conducted face-to-face, involving students as participants. As the usability test occurred within a university environment, the primary age groups consisted of participants aged 18 to 23 and 24 to 29. This study tested five students to verify the high-fidelity wireframes' usability for our proposed optimal music application.

In usability testing, we presented participants with specific tasks designed to evaluate the current state of the application's unification across desktop and mobile platforms, specifically the “SoundCloud” music streaming application. The primary objective was to encourage participants to articulate their thoughts and reactions in real time as they interacted with the application. In the interest of comprehensive data collection, we sought consent from each participant to audibly record their thoughts throughout the usability test.

The tasks focused on three main pages of the application: the home page, my library, and the search page. Participants were asked to navigate between these pages on both mobile and desktop versions of the application, paying close attention to the main composition of the pages. The goal was to gather valuable user feedback on the existing design and possible improvements. Subsequently, participants were presented with four inquiries to enhance their initial impressions. For more detailed observations corresponding to the questions, refer to **Appendix 3**.

In addition to primary research methods, this study employs document analysis and an extensive literature review to enrich our understanding of the subject matter, ascertain the current knowledge and identify areas necessitating further research. The literature review focuses on academic and industry publications on user experience, interface design, and responsive design in music streaming platforms. Lastly, we utilised exploratory statistical analysis within the framework of cross-tabulation to identify patterns within our data. This approach significantly aided in effectively addressing our research inquiries.

2.3 Data collection

To create meaningful design elements for the prototype, we focused on providing only the most essential questions and options. Hick's Law, a fundamental principle of User Experience (UX) design, suggests that digital products perceived as subpar are often those that overwhelm users with an excessive assortment of choices and options (Yablonski, 2018). UX designers are responsible for organising content so users are presented only with significant options. This method simplifies the decision-making process, improves user experience by minimising cognitive load and decision fatigue, and facilitates smoother user interaction with the interface. In scenarios where participants needed to select a preferred design, we provided them with two images for comparison to gather insights into people's preferences based on age, gender, and occupation.

Such structured responses facilitate the quantification and subsequent statistical analysis of the data collected, enabling a more objective examination of results. Furthermore, using close-ended, multiple-choice survey questions aids in generating quantifiable data (Pereyra, 2023). This methodology allowed us to collect data relating to age, occupation, music app preferences, and factors influencing the usability of a preferred music application through responses to approximately five options.

To evaluate the satisfaction aspect of usability in a system, we chose the System Usability Scale (SUS) (Brooke, 1996). The SUS is designed to evaluate the satisfaction aspect of usability in a system and comprises Likert scale questions ranging from "strongly disagree" to "strongly agree". The effectiveness of the SUS lies in its simplicity and efficiency: it is quick to complete and easy to comprehend.

Questions like "How frequently do you switch between different devices (e.g. mobile, web, desktop) of the same music streaming applications?" can be responded to with a measurement scale from 0, which states "rare/never" to 10 "frequently"(see **Appendix 1**).

As a result, we gathered data from 58 participants. Within Appendix 1 – Online Survey Results, it is noteworthy to mention that the total number of responses amounted to 60. However, due to the timing and their receipt, two responses were deemed invalid, as the analysis had already been conducted based on 58 responses. In the context of our study, this number of responses is acceptable and considered sufficient. This judgement is based on guidance from the Journal of Applied Structural Equation Modelling (2020). Their review and recommendations on sample size for survey research explain that the appropriate sample size can fluctuate depending on the study's design and complexity. Specifically, they mention that a sample size of 50 for many

research scenarios is deemed adequate as it permits substantial data analysis and the recognition of significant trend patterns.

Furthermore, Kline's guidelines for Structural Equation Modelling (SEM), mentioned in the same article, suggest that a sample of 100 is considered small, a sample of 100 to 200 is medium, and a sample over 200 is considered significant. However, any sample below 100 cases may not be recommended for any SEM technique unless it analyses a simple model. The sample size 58 falls into this category, as our research design is not overly complex. Therefore, our sample size is sufficient for meaningful analysis.

In the usability testing planning phase, we identify suitable participants for the meeting. The selection of participants is based on the most significant demographic group identified from an online survey conducted previously.

Consequently, the focus was on testing a subgroup of five students, as this demographic represents the most prominent group identified in the study's online survey (see **Appendix 1**). The next step is to get an agenda to prepare the appropriate information to make the meeting productive (Barnum, 2020). According to Barnum (2020), establishing the goals for the test is paramount when planning the test.

“An early step in getting ready for usability testing – often an activity that is done on its own – involves creating personas of your user” (Cooper, 1999).

Adopting a formative evaluation approach, this usability testing aims to test our music application in its early development phase. Formative evaluation is known for its effectiveness in testing prototypes or partially developed products, as well as specific features or the product's overall information architecture (Barnum, 2020). Unlike summative evaluation, which focuses on the finished product, formative evaluation provides ongoing feedback that can guide the development process, leading to a more user-friendly final product.

Once the participants complete the survey, the responses can be tailed up, and their statistics can be used to verify the original hypothesis or compare with insights gathered from user interviews. This way, it is possible to determine if the data aligns with initial expectations or reveals a different story, contributing significantly to the robustness and reliability of the research findings.

2.4 Data analysis

The data analysis for this study primarily utilises Exploratory and Descriptive Statistics, as these methods align with the nature of our data and research objectives.

Descriptive Statistics was employed to summarise and describe the key features of our collected data. This approach allows us to summarise and synthesise the significant responses we have gathered.

Each question from our survey as shown in **Table 1** was analysed separately, with the calculated statistics providing a clear and concise pattern in the data, such as the most common responses or any outliers.

Exploratory Statistics is used to identify patterns, trends, and relationships in our dataset (Scott Jones & Goldring, 2024). This method helps “to see and make collective or shared meanings and experiences” (Braun & Clarke, 2012).

“When we are interested in determining how two or more categorical variables are linked in a study, cross-tabulation is one of the initial approaches to consider. In a cross-tabulation, we create a table like that of a FREQUENCY DISTRIBUTION to learn more about frequency distribution, but here, we merge the counts of different values of two or more variables.” (Dass, 2010)

Cross-tabulations have been created to examine the relationship between several variables and look for any significant associations. To identify common patterns, group similar responses into categories and then analyse the frequency and distribution of these categories, which involves data analysis. We also use graphical methods like bar charts to represent these relationships and make patterns more evident visually (Scott Jones & Goldring, 2024).

2.5 Validity and reliability

Validity and reliability are critical factors that ensure the credibility of a research study. They measure the sound of the research design and methodology and how confident we can be in the research findings.

Validity refers to the accuracy of the research findings and whether the research truly measures what it set out to measure. In this study, validity was ensured through the careful construction of the research design and the meticulous development of the research instruments. Online surveys were designed to be clear and precise, reducing the potential for misinterpretation. Usability testing scenarios were constructed to mimic real-world usage as closely as possible, ensuring the findings were relevant and applicable. Furthermore, data collected from various sources were cross-verified, improving the study's validity.

Reliability, conversely, pertains to the consistency and repeatability of the research findings. If the study was to be conducted again under the same conditions, the results should be similar.

This research ensured reliability by consistently applying research methods and reliable statistical techniques. The online surveys were administered uniformly to all participants, and the usability tests were conducted under controlled conditions. Moreover, Exploratory and Descriptive Statistics methods were used for data analysis, enhancing the reliability of the findings.

In conclusion, this study has made significant efforts to ensure its validity and reliability. The rigorous research design, the careful construction of research instruments, and the use of reliable statistical methods all contribute to the overall credibility of the study's findings.

3 Theoretical framework

In this section, we will delve into the theoretical framework that serves as the basis for this study. First, we will explore the concept of Human/User-Centered Design and its role in our research. Then, we will discuss the concept of User Experience (UX) and its relevance to our study, with a particular focus on the aspect of consistency in UX design. Understanding these theories is crucial for comprehending our research approach and interpreting our findings.

3.1 Human/User-centered Design

Human-centred design (HCD) is an approach to problem-solving that involves the human perspective in all steps of the problem-solving process. This design and management framework involves developing a deep understanding of the people for whom we are designing products or services (IDEO, 2015). This approach aims to make systems usable and useful by focusing on the users, their needs, and requirements and applying cognitive, physical, and organisational ergonomics to design solutions. This design approach involves integrating the user's perspective in all stages of problem-solving, from understanding the user's needs to designing an intuitive interface that enhances user experience across platforms. By empathising with users and understanding their interaction with music streaming applications across various devices such as smartphones, desktops, or web interfaces, we can create a unified user experience design.

According to Lowdermilk (2013), user-centric design (UCD), a similar approach to HCD, is essential for maintaining optimal user experience. The author presents some key design principles such as the Principle of Proximity, which suggests that objects grouped closely together are perceived as related, and Hick's Law, indicating that decision-making time increases with more available choices, which are vital to consider in the design of a seamless, consistent user experience across different devices.

The stages of HCD, according to Brown (2008), which include empathising, defining, ideating, prototyping, and testing, are not always sequential but can be concurrent and iterative, mirroring our research process. As HCD is deeply collaborative and cross-functional, bringing together multiple stakeholders and disciplines (Brown, 2008), this thesis combines user experience, design consistency, and device unification.

According to Norman (2013), HCD is about solving the right problem as it focuses on defining the correct problem to solve before jumping into generating solutions. By focusing on solving the right problem, which in our case is the lack of design consistency across platforms, we apply the principles of HCD to enhance user interaction and satisfaction with music streaming

applications. This approach guides our exploration of the role of cross-device unification in enhancing the user experience, forming the backbone of our research.

User-Centred Design (UCD) and Human-Centred Design (HCD) aim to provide beneficial designs to the end-user, though they differ in approach. HCD is often viewed as a more emotionally and psychologically oriented design method. At the same time, UCD is seen as a more technical approach, focusing on how users interact with an application.

3.2 User Experience (UX)

The International Organization for Standardization [ISO] (2019) provided a comprehensive definition of user experience, describing it as the overall perceptions and responses resulting from using or anticipating a product, system, or service. Other scholars, such as Law et al. (2009) and Hassenzahl et al. (2010), have contributed significantly to understanding UX. They highlight the subjective, individualised nature of UX and argue that it can vary based on several factors. These factors include physical, social, and cultural contexts and the design and usability of the product in question.

With the evolving use of digital platforms, a positive user experience (UX) is paramount and can significantly influence the success of a platform. This involves not only the functionality of the service but also the ability to evoke positive emotions in users while using a product, which depends upon a variety of factors, including a user's physical, social, and cultural context and the product's design and usability (Hassenzahl et al., 2010). It underlines the importance of seamless transition and consistent design across different devices, such as mobile, web, and desktop platforms, which is the primary focus of this research.

According to Rajeshkumar et al. (2013), UX considerations should be integral to the earliest stages of product development. This approach ensures that the final product meets users' needs and expectations, resulting in a satisfactory user experience. In music streaming applications, this is particularly critical, where user satisfaction and ease of use can significantly impact the platform's success.

3.2.1 Consistency of User Experience

User experience (UX) consistency is a fundamental design principle that aims to provide a consistent, predictable, cohesive user interaction throughout the user interface (UI) and uniformity across various aspects of a system, which plays a pivotal role in making the user interface more predictable, learnable, and reliable (Nielsen, 1995). Consistency in UX can be categorised into four main types: visual, functional, internal, and external consistency (Van Welie et al., 1999). Their article further explains that visual consistency relates to the

uniformity of graphical elements while functional consistency pertains to the behaviour of elements across the interface. Internal consistency emphasises coherence within the product, whereas external consistency extends to other products in the same family. A previous study by Tognazzini (1993) also explains that visual consistency pertains to the uniformity of visual elements, such as typography, colour schemes, and layout, across different screens and components of an interface. Tognazzini (1993) further highlights the “principle of least astonishment”, which suggests that users should not be confused by unexpected changes in interface elements, reinforcing the importance of maintaining visual consistency across devices of the same product. Similarly, in his book, Garrett (2010) coined that maintaining consistency across different devices and platforms is paramount for providing a seamless user experience. Going further, Garrett’s book highlights the “principle of platform consistency”, which posits that users should encounter similar interface elements and interaction patterns regardless of the device they are using, ensuring continuity and coherence in their journey on the platform.

In digital music consumption, providing a uniform and seamless user experience (UX) is pivotal for user satisfaction. A key ingredient in creating this seamless experience is the principle of consistency in UX design. This fundamental design principle aims to provide predictable, harmonious user interaction throughout the user interface (UI). It ensures uniformity across various aspects of a system, playing a pivotal role in making the user interface more predictable, learnable, and reliable (Nielsen, 1995).

Consistency in UX design can be categorised into four main types: visual, functional, internal, and external (Van Welie et al., 1999), as explained below. Each category plays a distinct role in shaping the overall user experience and contributes to the effectiveness and functionality of music streaming applications.

Visual consistency pertains to the uniformity of graphical elements, such as typography, colour schemes, and layout, across different screens and components of an interface (Tognazzini, 1993). This uniformity can provide users with familiarity and comfort, allowing them to navigate and interact with the application more intuitively. It also helps maintain a brand's identity across various parts of the application, reinforcing the brand's image in the user's mind.

Functional consistency, on the other hand, relates to the behaviour of the elements across the interface. It ensures that similar actions produce outcomes across the application, leading to a stable and predictable user experience. This consistency is essential in music streaming applications where users often switch between different features such as playlists, radio stations, and artist profiles.

Internal consistency emphasises coherence within the product. It ensures that the design and operation of features within the application are consistent and harmonious, contributing to a cohesive user experience. For example, the search function should operate similarly whether a user is searching for an artist, album, or song, and the playback controls should function consistently regardless of the user's location within the application.

External consistency extends the concept of consistency to other products in the same family. This is particularly relevant for music streaming companies that offer multiple products or services. Maintaining consistency across these different offerings allows users to easily transition between them without learning new interaction patterns.

In the context of music streaming applications, these principles of consistency are especially crucial. Tognazzini's (1993) highlights that the "principle of least astonishment" suggests that users should not be startled by unexpected changes in interface elements. This principle emphasises the importance of maintaining visual consistency across devices for the same product, ensuring users a smooth transition when switching between devices.

Moreover, in his book, Garrett (2010) talked about the "principle of platform consistency." According to this principle, users should encounter similar interface elements and interaction patterns, regardless of their device. This ensures continuity and coherence in their journey on the platform, further enhancing the overall user experience. This principle is particularly relevant in today's multi-device environment, where users often switch between desktops, laptops, tablets, and smartphones.

The principle of consistency in UX design is a vital aspect of music streaming applications. It enhances the overall user experience and significantly affects user satisfaction and engagement. By ensuring a consistent, predictable, and seamless user journey across different platforms, music streaming applications can provide a superior user experience, retain existing users, and attract new ones.

3.3 Interface Consistency

This research, which seeks to optimise user experience in music streaming applications across different devices, plays a crucial role in Interface Consistency. The increase in smart device usage has transformed how users interact with products and services across various digital platforms, from mobile and desktop to smart televisions. As a result, cross-device services are expanding rapidly (Majrashi, 2015). As the rapid increase in smart device usage continues to reshape the digital world, consistent cross-device services are progressively becoming a necessity rather than a luxury.

In the digital age, users frequently switch between devices to access various products and services, including music streaming applications. This transition between devices necessitates a seamless and consistent user experience. With its dynamic and ever-changing nature, the music streaming industry is a prime example of this. The industry is driven by continuous technological advancements, changing user preferences, and the expansion of digital platforms. Music streaming platforms have not only revolutionised the way we consume music, but they have also brought forth fresh challenges related to maintaining user experiences across different devices. To tackle these challenges, user experience designers must adopt a user-first approach. A sustainable user experience in interface design involves a logical continuation of user behaviour with the existing design, consistent design elements, a clear and intuitive information architecture, and a user-friendly interface across various platforms (Kramer, 2012). These factors are not only vital for providing users with a consistent experience, but they also contribute to optimal interface design. Recent studies have demonstrated that web applications which offer a familiar user experience can significantly enhance user satisfaction and loyalty (Kaya et al., 2019). This reflects the importance of consistency in interface design. In addition, Brown and Smith's (2019) research further emphasised the transformative impact of multiple platforms on user behaviour, highlighting the need for user-centric approaches to optimise satisfaction.

In the current era, where music consumption via streaming applications is becoming increasingly popular, providing a unified user experience across devices has become critical to enhancing user satisfaction.

3.4 Responsive Design

Responsive Web Design (RWD) is an essential aspect of web design that ensures websites render well on various devices and screen sizes. A concept first proposed by Marcotte (2010), RWD has gained significant importance in the digital world, especially given that mobile traffic accounts for more than half of total internet traffic (Statista, 2020), as shown in **Fig. 3.1**. This prevalence of mobile usage underscores the relevance of RWD in this thesis, which focuses on music-streaming applications.

RWD involves designing websites to provide an optimal viewing experience across the spectrum of devices today, from desktop computer monitors to mobile phones. This optimisation is centred around minimising the need for users to resize, pan, and scroll while navigating the website. Marcotte (2010) explained that the fundamental principles of RWD include using flexible grid layouts, flexible images, and media queries.

Flexible grid layouts are designs that employ relative units like percentages instead of absolute units like pixels for the width of an element. This flexibility allows the design to adapt and respond effectively to different screen sizes. Similarly, using flexible images, which can scale with the layout, is another essential component of RWD.

The third component, CSS3 media queries, allows the page to use different CSS style rules based on the characteristics of the device the site is being displayed on, most commonly the width of the browser. With media queries, the layout of a website or application can change based on the device's screen size (Media Queries, 2012).

However, it is crucial to understand that RWD is not simply about resizing and scrolling; it is about creating a seamless integration between the user and the website, regardless of their device. This seamless integration is particularly relevant to our current thesis, as we aim to create a unified, seamless experience across different platforms for music streaming applications.

Mobile devices' advent and subsequent rise have made responsive web design an essential skill for web developers and designers. By adhering to the principles of RWD and using available tools, developers and designers can ensure that their websites provide a consistent and enjoyable user experience across all devices.

In the context of our thesis, this implies that applying RWD principles in the design of music streaming applications can significantly enhance user experience. RWD can facilitate a more consistent and unified user experience by ensuring seamless navigation and interaction across various devices. As we delve deeper into the landscape of music streaming applications, the insights gained from understanding and applying RWD will prove invaluable in achieving our research objectives.

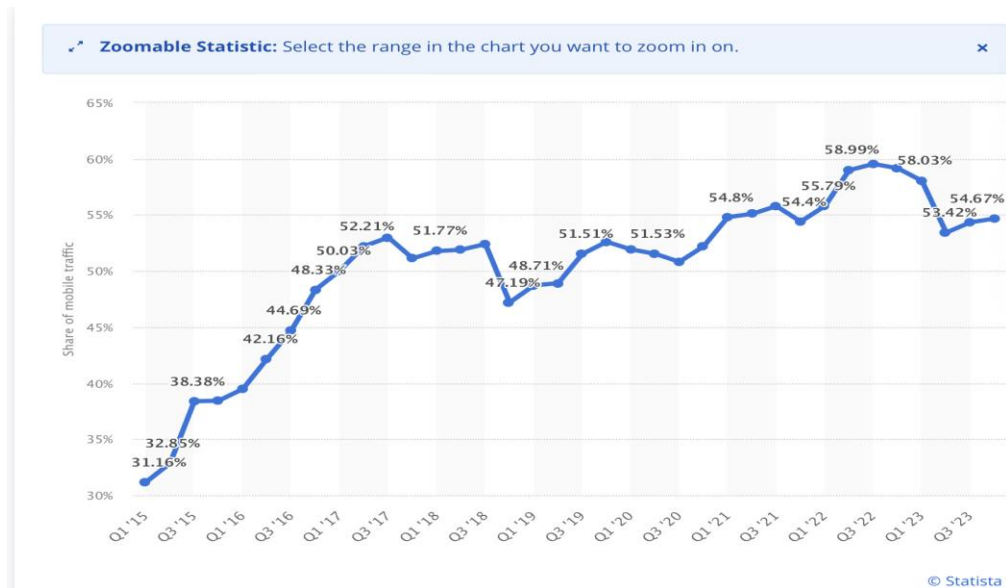


Fig 3.1 – Percentage of mobile device website traffic worldwide from 1st quarter 2015 to 3rd quarter 2020 (Statista, 2020).

3.5 Interaction Design

Interaction design plays a pivotal role in shaping user experiences across digital platforms. Moggridge (2007) discusses the evolution, theoretical overview, and practical application of digital interaction design in his publication. From its inception, the field has seen widespread adoption by designers globally. Moggridge (2007) further defines interaction design as creating digital and interactive designs that focus on subjective and qualitative aspects, striving for utility, desirability, and accessibility. Interaction design is a discipline that focuses on defining the behaviours and interactions of products and systems, often digital. It involves creating meaningful relationships between people and the products and services they use, from computers to mobile applications to complex systems (Preece et al., 2015). This is achieved by designing the interface and the entire interaction experience.

Going further, Norman’s User Centred Design principles emphasise the importance of designing products based on the needs and wants of the users. Norman’s book “The Design of Everyday Things” also emphasises the importance of affordances, signifiers, and mapping in designing interfaces that align with user expectations and mental models. These principles, among others, form the theoretical basis for ensuring that products are easy to use and meet users' needs.

Furthermore, interaction design entails a multidisciplinary approach integrating concepts from psychology, sociology, and anthropology to understand user behaviour better and inform design decisions (Dourish, 2001). This further emphasises the human-centred focus of interaction design.

Interaction design is vital in enhancing user experiences across various digital platforms, particularly in our research on music streaming applications. As defined by Moggridge (2007), interaction design involves the creation of interactive and digital designs focused on subjective and qualitative aspects, such as usability, desirability, and accessibility. This definition emphasises the importance of designing interactive digital products that foster meaningful relationships between people and the products and services they use. In the context of our research, this involves understanding how to create a seamless and unified user experience across various devices for music streaming applications.

Going further, interaction design is not just about designing an interface but also the whole interaction experience. This includes every element the user interacts with, from the interface layout to the navigation menu, from the search function to the playlist creation feature. The goal is to create a coherent, consistent, and intuitive user experience that meets the users' needs and enhances their engagement with the application.

Adding to this, Norman's User-Centred Design principles underline the significance of designing products based on the needs and desires of the users. This is particularly relevant in music streaming applications where meeting user expectations is vital to creating a satisfying and engaging user experience. Norman's principles, such as the importance of affordances, signifiers, and mapping, guide the design of interfaces that align with user expectations and mental models. Implementing these principles in the design of music streaming applications can help ensure that the products are easy to use and effectively meet users' needs.

Moreover, interaction design involves a multidisciplinary approach, integrating psychology, sociology, and anthropology concepts. These disciplines provide invaluable insights into user behaviour, motivations, and preferences. Utilising these insights can help us make informed design decisions that resonate with users on a deeper level. This becomes especially important when designing for a diverse user base with varying preferences and habits, such as users of music streaming applications.

In the context of our research, this multidisciplinary approach helps us understand how users interact with music streaming applications across different devices. Understanding the nuances of these interactions can inform our design strategies and help us create a unified, seamless user experience across different devices.

4 Results

4.1 Survey

In this section, we will present the results of our survey. The survey was live for ten days, during which we obtained responses from approximately 90% of the people we contacted. We will present our findings in the following categories: demographics, user behaviour, and user experience. Detailed analysis of the survey findings will be discussed, providing insights into user preferences regarding music streaming applications.

4.1.1 Survey Findings

Our survey was live for ten days. We sent the survey to approximately 65 people and received 58 responses, giving us an impressive response rate of roughly 90%. The respondents' comprehensive feedback has provided valuable insights into various aspects of user experience in music streaming applications. For ease of understanding, we have organised our findings into demographics, user behaviour, and user experience.

4.1.1.1 Demographics

The survey respondents were primarily residents of Sweden. Regarding gender distribution, as shown in **Fig. 4.1**, more than half of the respondents, 53.3%, were female, while the remaining 46.7% were male. Considering the respondents' occupation status, we found that students accounted for 45% of the respondents, with the remaining 55% being non-students. As for the age distribution, as shown in **Fig. 4.2**, the respondents were evenly spread across different age groups. The youngest age group, 18 - 23, comprised 21.7% of the respondents. The 24 - 29 age group was the most represented, with 41.7% of respondents. The rest, 36.7%, were 30 years or older. Understanding our respondents' demographic characteristics helps us contextualise our findings better and consider the varied experiences or perceptions among different demographic groups.

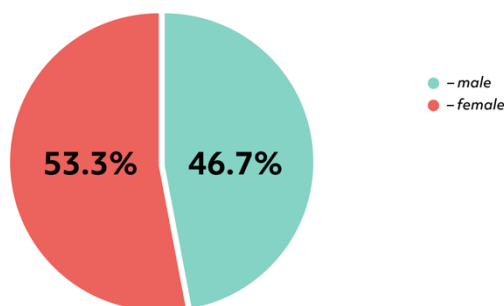


Fig 4.1 – Results of the questionnaire: May I know your gender

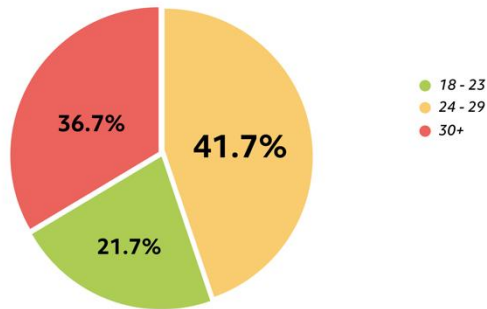


Fig 4.2 – Results of the questionnaire: How old are you right now, if you do not mind me asking?

4.1.1.2 User Behavior

We found that 93.3% of the respondents predominantly use smartphones to access their preferred music-streaming applications. Desktop computers are also a popular choice, with 48.3% of the respondents using them too, but only a tiny fraction, 1.7%, prefer tablets. Regarding specific music applications, as shown in **Fig 4.3**, Spotify is the go-to option for most users who responded, accounting for 63.3% of our respondents. YouTube Music is the second most popular choice, used by 50% of respondents, while SoundCloud is less commonly used, with only 8.3% of respondents choosing it as their primary music application. An interesting trend we noticed is that 35.2% of respondents frequently switch between different devices when using the same music application, while the remaining 64.8% do not frequently switch devices.

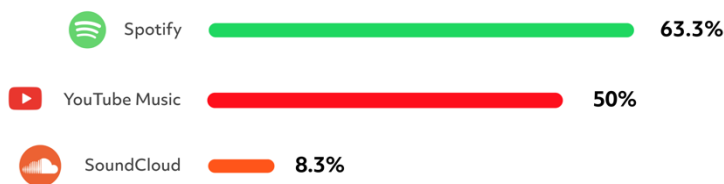


Fig 4.3 – Results of the questionnaire: What are the primary music applications you are utilising at the moment?

4.1.1.3 User Experience

Based on the feedback from the survey, which can be found in **Appendix 1**, certain factors significantly impact user satisfaction with a platform. Among these factors, functionality was ranked as the most important by 60% of users. The following closely followed was the attractive design, which was selected by 58.3% of respondents. However, intuitive design was ranked as the least crucial factor affecting user satisfaction.

Regarding design preferences, the survey revealed a clear preference for rounded edges over sharp edges for elements. 91.7% of respondents indicated that rounded edges gave a more user-friendly feeling. In contrast, only 8.3% of users preferred sharp edges.

83.3% preferred a design with consistent rounded edges when asked about visual consistency. Only 16.7% of users selected a design that mixed sharp and rounded edges.

Finally, we asked our users about their preferences for colour contrast. The results were evenly split, with 51.7% of users preferring a high-contrast colour scheme and 48.3% selecting a low-contrast colour scheme.

4.1.2 Survey Findings Analysis

The survey, details of which can be found in **Appendix 1**, was instrumental in providing valuable insights into our research. These insights will significantly influence the direction of our design recommendations and guide us in developing solutions tailored to meet users' needs and preferences.

The demographic information of our respondents is quite diverse, with a balanced representation in terms of age, occupation, and gender. We found this diversity particularly encouraging as it implies that our findings are based on a wide range of experiences and perspectives, thus enhancing the reliability and validity of our study. Although most respondents are residents of Sweden, the insights we have derived from this survey are still likely to hold relevance on a broader level. This is because music streaming applications are widely used across different demographics and regions globally. As such, understanding the user experience from a diverse demographic perspective gives us robust data upon which we can base our design considerations.

Regarding user behaviour, our comprehensive survey findings suggest a dominant preference for smartphones as the primary device for accessing music streaming applications. This critical insight underlines the importance of optimising user experience, particularly for mobile devices. Moreover, the marked popularity of Spotify among our respondents has given us a benchmark against which we can measure and compare the user experience of other music streaming applications. An exciting trend from our survey is that many users frequently switch between devices when using the same music application. This behaviour emphasises the need for a seamless and consistent user experience across different devices.

On examining the user experience feedback from the survey, which can be further explored in **Appendix 1**, we found devices whose users value primarily functionality and attractive design. This finding underscores the importance of these elements in driving user satisfaction and gives

us a clear direction for our design focus. Interestingly, the strong preference for rounded edges over sharp ones suggests that users associate a more user-friendly and approachable design with softer, rounded elements. This essential aesthetic consideration can greatly influence user perception and satisfaction with the application. The split opinions regarding colour contrast preferences indicate that this aspect is highly subjective among users and could be offered as a customisable feature in the application.

Analysing the survey findings has provided a comprehensive understanding of the user experience in music streaming applications. It has highlighted the importance of functionality, design aesthetics, and device compatibility and provided a clear direction for our design recommendations. By focusing on these critical areas and tailoring our solutions to meet the needs and preferences of users, we can significantly enhance the user experience in music streaming applications. We aim to apply these insights to develop a modified prototype that meets user expectations and delivers an exceptional, satisfying, and seamless user experience across various devices.

The data from our survey, particularly those related to user behaviour and experience, align closely with our theoretical framework. This framework emphasises the importance of understanding user needs, preferences, and behaviours to enhance the design and functionality of music streaming applications. The robust user preference for functional and aesthetically pleasing design and the need for a seamless experience across devices reinforce the principles and theories outlined in our theoretical framework. This convergence of theory and practical findings validates our approach and further strengthens the reliability of our research. For a detailed understanding of our survey and its findings, see **Appendix 1**.

4.2 Usability Test

In usability testing, we presented participants with specific tasks designed to evaluate the current state of the application's unification across desktop and mobile platforms, specifically the "SoundCloud" music streaming application. The primary objective was to encourage participants to articulate their thoughts and reactions in real time as they interacted with the application. In the interest of comprehensive data collection, we sought consent from each participant to audibly record their thoughts throughout the usability test.

The tasks focused on three main pages of the application: the home page, my library, and the search page. Participants were asked to navigate between these pages on both mobile and desktop versions of the application, paying close attention to the main composition of the pages. The goal was to gather valuable user feedback on the existing design and possible

improvements. Subsequently, participants were presented with four inquiries to enhance their initial impressions. For more detailed observations corresponding to the questions, refer to **Appendix 3**.

4.2.1 Usability Test Findings

The Usability Test Results, found in **Appendix 3**, showed that participants displayed a marked enthusiasm when comparing the mobile and desktop pages of the original SoundCloud platform with the restructured wireframes. Nevertheless, when giving a verdict on the consistency of one of the versions, substantial disparities and factors influencing the participants' decisions were observed; these ranged from technical considerations to personal preferences and requirements.

After thoroughly examining each page from both versions, the initial question was designed to prompt respondents to select one of the versions. Overall, participants deemed the structure of the redesigned version to be more consistent. However, one participant expressed uncertainty regarding which version maintains a more consistent main composition, as seen in **Fig. 4.4**. The participant expressed uncertainty due to the disparity in functionalities between the desktop and mobile versions of the original SoundCloud application. The ambiguity was further amplified by the discrepancies observed in the variation of modes transitioning from one to another in the revised application. More specifically, these discrepancies were most noticeable when comparing the layout differences on the pages between the mobile and desktop versions and the absence of the account icon in the mobile version (see **Appendix 2**). Four participants asserted that the revised version offered a more comprehensive presentation of information, attributing this enhancement to the ample spacing between the elements. Several participants indicated that they perceived the redesigned version as more functional. The response towards the revised version was favourable.

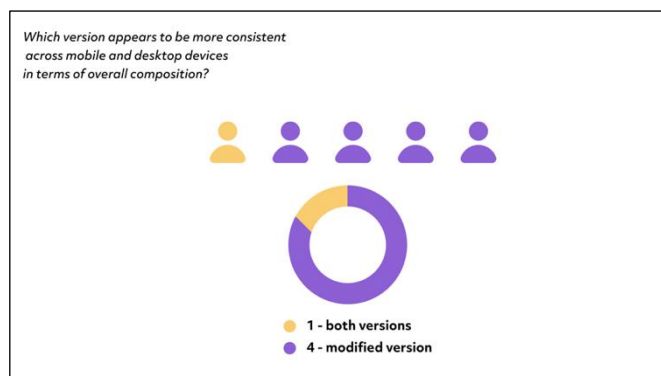


Fig 4.4 – Results of the questionnaire: Which version appears more consistent across mobile and desktop devices in terms of overall composition?

Table 1 Cross-tabulation of choices made on the most unified designed version of SoundCloud by gender.

<i>[RQ1]: Which of the versions appears more consistently designed across both mobile and desktop platforms?</i>		<i>Gender</i>		<i>Total</i>
		<i>Male</i>	<i>Female</i>	
Participant have chosen	The modified version	2	2	4
	Struggling to answer	-	1	1
	The original version	-	-	-
	Total	2	3	5

Fig 4.5 – Results of **usability testing** questionnaire: [Q2] Which of the versions would you like to use – the original or modified one?

The second query, as shown in **Fig. 4.5**, was posed during the brief introduction, with the aim to discern the participants’ preferences in the hypothetical scenario where they found themselves having to choose between the original or the redesigned interface of a music streaming service, specifically SoundCloud. The ultimate objective was comprehending which design solution the users would resolve more deeply.

Out of the participants, four expressed preferences for the redesigned version. However, one participant indicated they would opt for both versions under different circumstances. The following participant articulated a preference for a hybrid utilisation of the application, electing to employ the redesigned mobile version in conjunction with the original desktop version. Upon evaluation, the original desktop prototype exhibited more structure than its redesigned counterpart. Contrary to the prevailing statement, one participant experienced confusion due to the disparity in light mode presentation between the mobile and desktop versions of the original design. Other participants appreciated the revised version's streamlined design while finding the original format's mobile iteration excessively cluttered. The preference for a minimalistic approach and wider spacing was evident among participants. This preference stemmed from adopting iOS’s features and rounded corners in design, which rendered the original desktop version antiquated in the comparison.

Table 2 Cross-tabulation of preferences for using one of the versions of the SoundCloud application by gender.

<i>[RQ2]: Which of the versions would you like to use - the original or modified one?</i>		<i>Gender</i>		<i>Total</i>
		<i>Male</i>	<i>Female</i>	
Participant would like to use	The modified version	2	2	4
	Struggling to answer	-	1	1
	The original version	-	-	-
	Total	2	2	5

Fig 4.6 – Results of usability testing questionnaire: [Q2] Which of the versions would you like to use – the original or modified one?

The objective of the third query, as illustrated in **Fig. 4.6**, was to identify potential improvements for the redesigned version by aligning it with the users’ preferences and established user experience principles. All participants found the rounded corners in icons to present a more user-friendly and contemporary aesthetic. During the usability testing, an intriguing pattern emerged in participants’ responses regarding the light mode feature. The majority, four participants, showed a preference for the light mode. Intriguingly, two participants expressed a desire for a feature that would allow for the effortless switching between the light and dark modes, asserting the importance of user choice in interface customisation.

Conversely, one participant preferred the dark mode, arguing that it provided a more organic aesthetic for a music streaming application. After the redesign, the user underlined the enhancement of compositional unity in both the mobile and desktop versions. However, she noted a perceived lack of contrast, suggesting a need for further distinction between icon subgroups. The participant proposed that the design could be improved by incorporating highlights for sections such as “Recently Played” or tracks frequently listened to by the user. Additionally, she recommended including a more prominent exploratory icon or highlight for new album releases from users’ favourite artists.

Furthermore, it is worth mentioning that the participants took note of the unconventional redesign of the music player. It emerged that three of the participants preferred maintaining the music player's original design. Interestingly, this was explicitly about its positioning at the bottom of the desktop interface. The participants preferred the original music player layout, emphasising their familiarity with its position at the bottom of the desktop interface. However, two participants admired the music player's size and iOS-inspired design in the modified prototype. These participants explained that their prior experience listening to smartphone music made them more receptive to the enlarged buttons and rounded design. They found this

design more accessible to navigate, thus demonstrating the positive impact of familiarity on user experience.

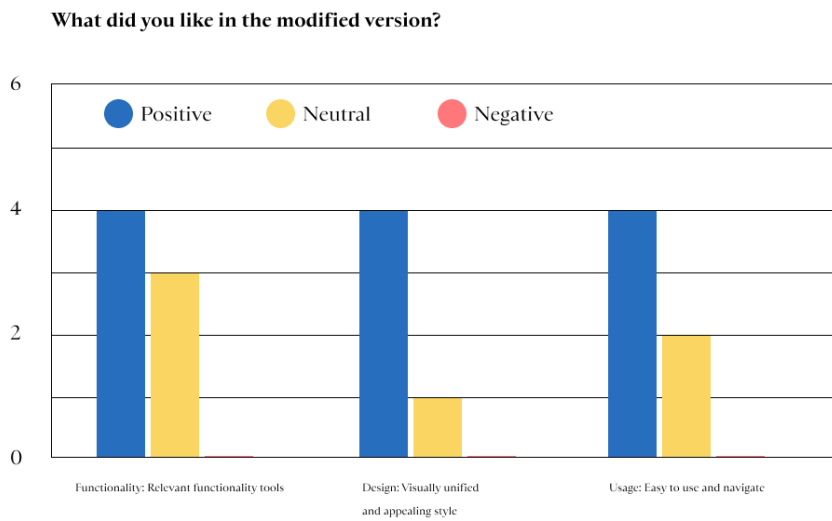


Fig 4.7 – Results of Question 3 (Q3) in usability testing.

The results are organised in a tabulated manner. Functionality: music player, sidebar within the listening history. Design: edges of icons, interface spacing, icons design, unification of interface elements. Usage: navbar, bar icons, navigating within the application process.

The fourth query, as depicted in **Fig. 4.7**, illuminates aspects of the original design that could be preserved or serve as inspiration for future modifications. Two participants noted that the original desktop interface exhibited a more organised structure than the redesigned version. Furthermore, these participants preferred retaining the listening history in the desktop interface, though not necessarily in the sidebar. In conclusion, most of the feedback regarding the original version was predominantly negative, with only a few specific features receiving positive remarks. These included the order of the playlist icons and certain layout adjustments, which were commended for their compelling design.

What did you like in the original version?

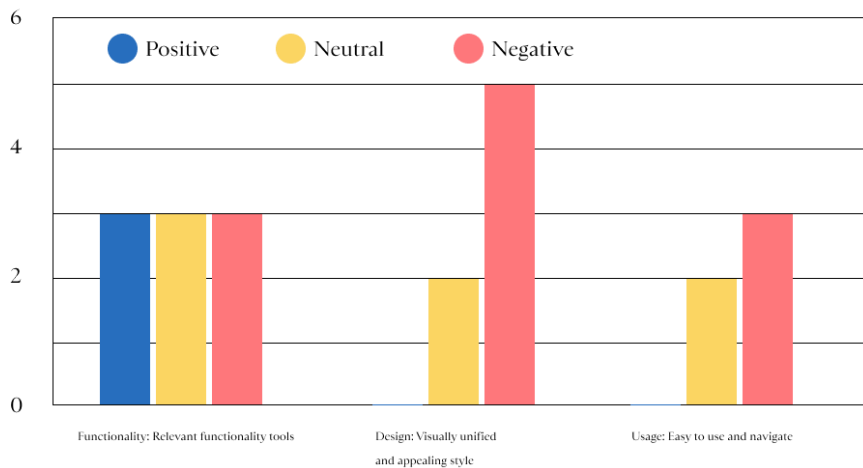


Fig 4.8 – Results of Question 4 (Q4) in usability testing.

Functionality: music player, sidebar within the listening history. Design: edges of icons, interface spacing, icons design, unification of interface elements. Usage: navbar, bar icons, navigating within the application process.

4.2.2 Usability Test Analysis

In analysing the usability test findings depicted in **Fig. 4.8**, we got valuable insights into user experience in the context of music streaming applications. The first and most prominent observation was users' value of a consistent interface design across different platforms. The redesigned version of the music streaming application, which was aimed at providing a uniform experience across both mobile and desktop versions, was favourably received by most participants. This reaffirms the hypothesis that consistency in interface design plays a crucial role in enhancing user satisfaction.

Looking further into the design aspects, we noticed a clear user preference for a minimalistic, streamlined design. Participants favoured designs with ample spacing between elements and a user-friendly aesthetic, such as using rounded corners. In contrast, the cluttered presentation of the original mobile version could have been better received. This feedback underscores the importance of simplicity and clarity in interface design. It supports user-centred design principles, prioritising ease of use, intuitive navigation, and a clean aesthetic. This is a crucial consideration for designers and developers as they strive to create visually appealing and user-friendly applications.

Another crucial insight from the usability test findings was the importance of user choice and customisation. Participants desired a feature allowing them to switch between light and dark modes effortlessly. This demonstrates that flexibility and customisation are vital features that can significantly enhance the user experience. The ability for users to modify their interface

according to their preferences is a critical element of user control. This aligns with the concept of user control in the field of user experience design, which states that users should be able to tailor their interface as they see fit.

An intriguing pattern emerged from participants' responses to the redesigned music player. Some participants appreciated the enlarged buttons and rounded design, attributing their preference to their prior experience listening to smartphone music. They found this design more accessible to navigate, thus demonstrating the positive impact of familiarity on user experience. However, other participants preferred the original layout due to its familiarity. This suggests that while innovation and modernisation are essential in redesigning an application, maintaining certain familiar elements can be beneficial in preventing user disorientation and promoting ease of use.

In conclusion, the usability test findings provide valuable insights into user preferences and expectations. These insights offer clear direction for further refinement of the music streaming application to enhance user experience, leading to increased user satisfaction and engagement.

5 Discussion

This study's findings, mainly related to interface inconsistencies in music streaming applications, align with previous research in the field. For instance, Shin's (2016) research emphasised the significant impact of design consistency on user experience, evident in our study results as users expressed dissatisfaction with inconsistent application interfaces. The feedback indicated that some aspects of the original design were practical and could be incorporated into future modifications. For example, the original desktop interface's organised structure and the presence of a listening history were positively received by participants. This feedback highlights the importance of retaining practical design elements even as improvements and modifications are made.

The importance of a seamless and harmonious experience across platforms, as highlighted by our research, was also a central theme in Salazar's (2023) study. The findings further support this by demonstrating that consistency in design elements can disrupt the user's interaction with the application, leading to a disjointed and unsatisfactory user experience.

The implications of this study are far-reaching, particularly for designers and developers in the music streaming industry. This research suggests that a more unified and consistent user experience across different devices can enhance user satisfaction and trust. This, in turn, can contribute to the overall success of a music streaming application. Therefore, the industry

should prioritise design consistency when developing music streaming applications for different platforms.

However, this study has limitations that should be noted. Although the study used a case study approach and conducted online surveys to gather user feedback, the sample size was relatively small. This could limit the generalizability of the findings. Furthermore, this research primarily focused on SoundCloud, and the results might only partially apply to other music streaming applications with different design principles and user interfaces. Future research should consider a broader range of music streaming applications and larger sample sizes to validate our findings further.

In conclusion, this study contributes to the broader field of user experience design by shedding light on the importance of cross-platform unification. We hope the findings of this study will guide future research and practice in this area, ultimately leading to improved user experiences in the music streaming industry.

5.1 Result discussion

In this section, we will explore and discuss the findings of this study. We will link these results to our research questions and the broader literature on user experience in music streaming applications.

5.1.1 Research Question 1

The study's first research question, "*How does user satisfaction depend on consistent interface design across mobile, web, and desktop platforms?*" focused on the impact of a consistent interface design across mobile, web, and desktop platforms on user satisfaction. The data collected from the online survey discovered that a uniform user interface design across different devices significantly determines user satisfaction.

The survey collected feedback from users frequently using music streaming apps on multiple devices. The responses we received were diverse, reflecting a broad user perspective. However, a common theme emerged: the users' desire for a seamless experience when switching between mobile to web or desktop platforms. It was found that any disruption to the smooth experience, often caused by inconsistencies in design, was a significant source of user dissatisfaction.

This was further confirmed in SoundCloud, this research case study. The feedback indicated inconsistencies across platforms, such as changes in design elements and functionality when switching between devices, which were a primary cause of user dissatisfaction. Users expressed that these inconsistencies created a disjointed experience that negatively impacted

their interaction with the app. This was particularly noticeable when certain features were unavailable or functioned differently on different devices, leading to frustration among users.

Based on a detailed analysis of user feedback, this study has determined that maintaining consistent design across various devices is a crucial requirement for music streaming applications. Designers should ensure that design elements remain consistent across different devices to guarantee user satisfaction. Familiarity plays a vital role in the user experience, and any deviation from the established design can result in discomfort and dissatisfaction.

The findings strongly suggest that a consistent design interface across mobile, web, and desktop devices significantly influences user satisfaction with music streaming apps. These findings emphasise the importance of music streaming applications to prioritise design consistency across devices. This is crucial to ensure a seamless and satisfying user experience, and any failure to address inconsistencies could negatively impact user satisfaction.

5.1.2 Research Question 2

To address the second research question, "*How can we improve the usability of music app products to ensure user experience tends to design consistency across digital platforms?*" the findings have pointed towards the crucial role of design consistency across digital devices.

In this research, we found that keeping the design consistent across different platforms improved the usability of music applications. Users liked the high-quality prototype of our new design, which had consistent design elements across platforms. This consistency in layout, typography, and colour scheme made it easy for users to switch between devices, reduced mental effort, and improved overall user experience.

The study found that maintaining design consistency in music applications is crucial for improving usability and ensuring a consistent user experience across digital platforms. The research indicated that consistent design led to reduced mental effort, enhanced overall user experience, more efficient navigation, and reduced user error and frustration. These findings will guide our future design decisions and have significant implications for the usability of music applications.

Design consistency emerged as a recurrent theme throughout our investigation, ascertaining the findings of various research segments. The crucial insights from our usability testing phase highlighted the significance of familiarity and consistency in user experience. Our prototypes maintained the same design elements across different devices, reflecting this consistency in the application's layout, typography, and colour scheme across mobile, web, and desktop interfaces.

The positive feedback to our prototype affirmed the importance of design consistency in improving the usability of music applications. The users appreciated the seamless transition between various devices and reported an enhanced user experience, citing the consistency and familiarity of the design as the key factors. The user interaction data from the usability tests further reaffirmed this, as we noted patterns and trends in user behaviour that indicated efficient navigation and reduced instances of user error due to the consistent design.

In conclusion, exploring ways to improve the usability of music apps for our second research question revealed a key finding: maintaining design consistency across digital platforms is paramount. This insight will guide our future design decisions and is a valuable contribution to the broader field of user experience design.

5.1.3 User Feedback Implementation and Design Enhancement

In line with our exploration, we utilised the opinions and feedback of our participants to improve and enhance our modified application design (see **Fig. 2.2**). The feedback received was invaluable in identifying potential areas of improvement and enhancing the user experience. One highlighted feature we incorporated was adding a "recently played" section. This addition was in response to user feedback, emphasising the importance of easy navigation to their most recent music choices.

We designed our application's light and dark modes to cater to different user preferences. This was done for mobile and desktop versions, ensuring a consistent experience across various devices and platforms. We also gave special attention to the navbar in both sizes, incorporating an account icon as suggested by our users. This added feature was aimed at improving accessibility and user-friendliness.

All the recommendations we received were carefully considered and incorporated into our redesigned music application (see **Appendix 2**). This enabled us to create a user-centric design that catered to the needs and preferences of our target audience, thereby optimising user satisfaction and experience.

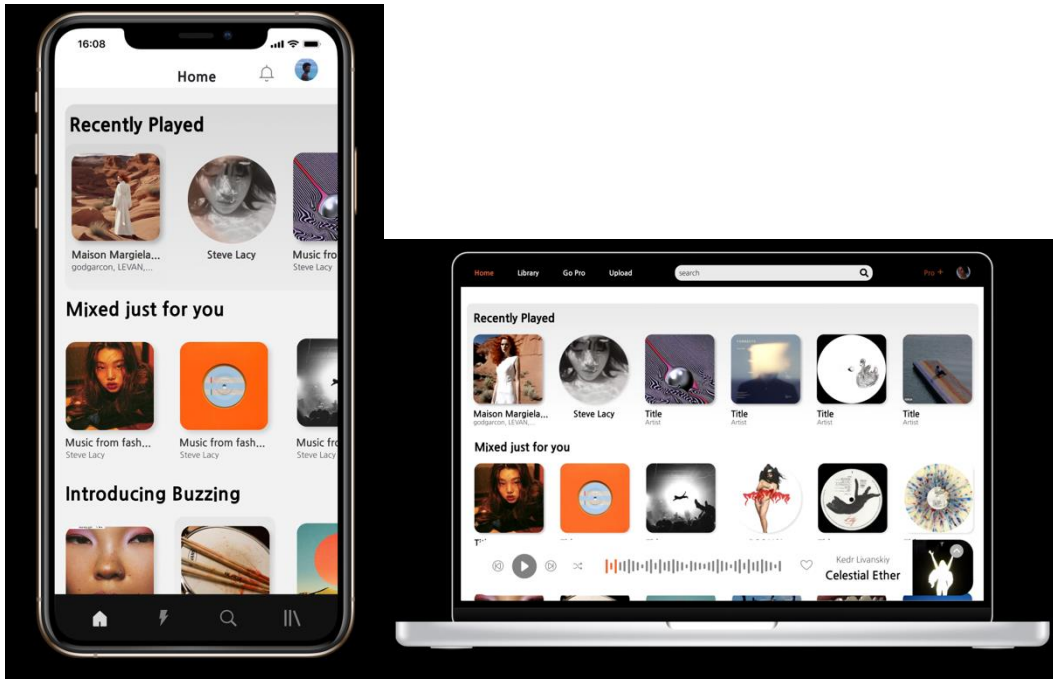


Fig 5.1 – Following the usability testing: Modified homepage on desktop and mobile devices in **light mode**.

5.2 Method discussion

This research approach was rooted in implementing qualitative methods, specifically online surveys and usability testing. This methodology was selected to ensure a comprehensive understanding of the user experience when interacting with music streaming applications across various platforms. These methods were instrumental in providing the groundwork for our research, paving the way towards addressing our research questions.

Implementing online surveys as our primary data collection method offered numerous advantages. Primarily, it enabled us to reach a wide array of respondents, thereby ensuring the efficient collection of a substantial amount of data. Close-ended questions streamlined the responses, reducing the risk of ambiguous or subjective interpretations. This method was invaluable in acquiring initial insights into user preferences and expectations. Such insights were critical in informing the design of our high-fidelity prototype for the subsequent usability testing phase.

Despite the strengths, the survey method also presented certain limitations. While we painstakingly strived to minimise bias in our survey design, the presence of self-reporting bias and potential misinterpretation of questions by participants remained a lingering risk. Furthermore, while providing valuable insights into user preferences, the surveys might have yet to capture the depth and complexity of user experience successfully. This is due to the inherent nature of surveys, which can limit the in-depth exploration of respondents' answers.

Designing the prototype based on the survey data was an essential and challenging aspect of our study. The survey data gave us a broad understanding of user preferences and behaviours, which was the foundation for our prototype design. We aimed to incorporate as many user preferences as possible while ensuring design consistency across different platforms.

The survey data, while extensive, might not have fully covered all the aspects of user preferences, especially when it came to the more subjective aspects of design, such as aesthetics and visual appeal. This was a challenging aspect of prototype design, as we had to ensure that our design was semi-functional, visually pleasing, and aligned with user preferences. Connecting the survey data with the prototype design was critical to our study. We strived to ensure the prototype accurately reflected the user preferences identified through the survey data. We revisited the survey data multiple times during the design process to ensure alignment and adjusted the prototype based on these survey insights.

The usability test offered a deeper dive into the implications of our design decisions. This method allowed us to observe real-time feedback and user interactions, offering more detailed data. The face-to-face setting gave us a more nuanced understanding of the user experience and the potential to clarify any ambiguities immediately.

However, like most methods, usability testing also had its drawbacks. The most significant limitation was the number of participants involved. Although we strived to ensure a diverse range of users, the reality of our sample size needed to be bigger. This small sample size limited our ability to represent the broader population of music streaming application users fully.

The selected methods effectively addressed our research purpose and answered our research questions. The data collected through the surveys furnished a foundational understanding of user preferences. The subsequent usability testing phase allowed us to validate these preferences and refine our design accordingly.

Despite the effectiveness of these methods, they were not without their limitations. In retrospect, incorporating more open-ended questions in our survey or conducting in-depth interviews may have led to richer qualitative data and deeper insights into user experience.

These aspects of validity and reliability were constant considerations throughout the research process. We strived to ensure that our research methods accurately measured what they were intended to measure and that our results were consistent and reproducible. However, potential self-reporting bias in the surveys and the subjectivity in interpreting user behaviour during usability testing could have impacted the reliability and validity of the results.

Reflecting on this process, I see that there are a few things that we might have done differently. First, we might have included more open-ended questions in our survey to capture a richer and more detailed understanding of user preferences. This could have provided us with more detailed insights for the prototype design.

To summarise, while the methodologies selected effectively addressed our research questions and fulfilled our research purpose, they also presented some limitations and challenges. Reflecting on these limitations and challenges provides invaluable insights for potential improvements in future research. It underscores the importance of careful method selection and execution in achieving reliable and valid research findings. In any research process, it is crucial to continually reassess and refine the methods employed to ensure the most accurate and reliable results.

6 Conclusions and further research

In this final chapter, we draw together the conclusions of this study, reflecting on how the research findings contribute to the initial problem statement and examining the potential implications of this study. Furthermore, we propose possible directions for future research based on the findings.

6.1 Conclusions

Reflecting on the problem statement, this study intended to delve into the understanding of user experience in music streaming applications, focusing on the role of design consistency across different platforms. The aim was to identify the factors that could improve the user experience and satisfaction. This study's findings have significantly contributed to this aspect, shedding light on user preferences and behaviours and underscoring the importance of design consistency in driving user satisfaction.

This study conclusively demonstrates that a consistent design interface across different platforms—mobile, web, and desktop—plays a pivotal role in shaping the user experience. Such consistency fosters a sense of familiarity and comfort among users, heightening their satisfaction levels and enhancing their overall interaction with the application. Also, by understanding and implementing user preferences, we can create a more user-centred design that meets the needs of our users and provides them with a seamless and enjoyable music streaming experience.

6.1.1 Practical implications

The practical implications of these findings are profound, particularly for the music streaming industry. By highlighting the significance of design consistency across platforms, this research provides a clear direction for developers and designers to enhance user satisfaction. A more harmonious and seamless user experience, facilitated by design consistency, could increase user engagement, elevate user retention rates, and contribute to the overall success of a music streaming application.

Moreover, this study's implications extend beyond the music streaming industry. For society, our findings could serve as a valuable guide in developing more user-friendly digital services, thereby promoting digital literacy and inclusivity.

6.1.2 Scientific implication

This research contributes to the broader field of user experience design by bringing the concept of cross-device design consistency into sharper focus. This enriches the

ongoing discourse on best practices in UX design, adding a fresh perspective that future research in the field can build upon.

Our findings, which highlight the importance of design consistency across different devices, could be explored to study other domains. This opens exciting avenues for future research, encouraging more profound exploration of design consistency in various applications and digital services.

6.2 Further research

While this study concentrated on music streaming apps, future research could broaden the scope to encompass design consistency across various digital service applications. This study was primarily focused on SoundCloud as the case study. While the results provide valuable insights, they may only be partially applicable to other music streaming applications with different design principles.

Hence, further research could consider a broader range of music streaming applications to validate our findings more comprehensively. Also, considering larger sample sizes could enhance the robustness of the study.

Another intriguing direction for future research could be investigating the possibility of personalising interfaces according to individual user preferences while maintaining overall design consistency. This could lead to a more focused understanding of the delicate balance between personalisation and consistency in user experience design. These potential directions for further research underline the richness of the field and the myriad opportunities for continuing exploration based on our study's findings.

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8 Appendixes

Appendix 1 - Online Survey Result

Appendix 2 – Prototype Interfaces

Appendix 3 – Usability Testing Results

8.1 Appendix 1 – Online Survey Results

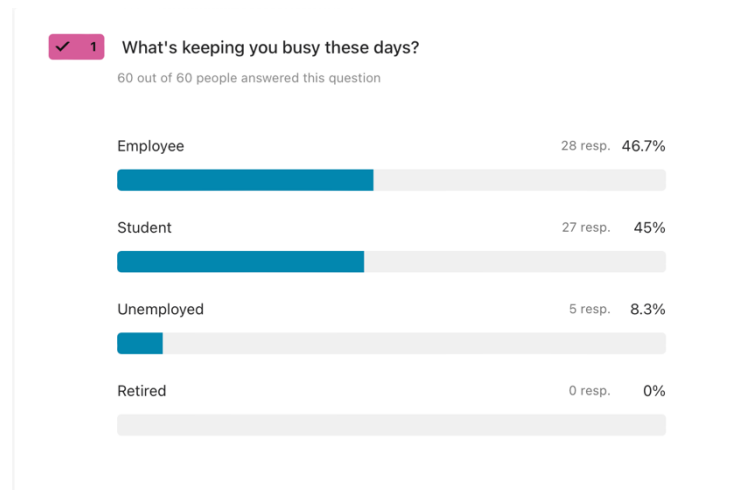


Fig 9.1.1 – Results of **online survey** questionnaire: [Q1] What is keeping you busy these days?

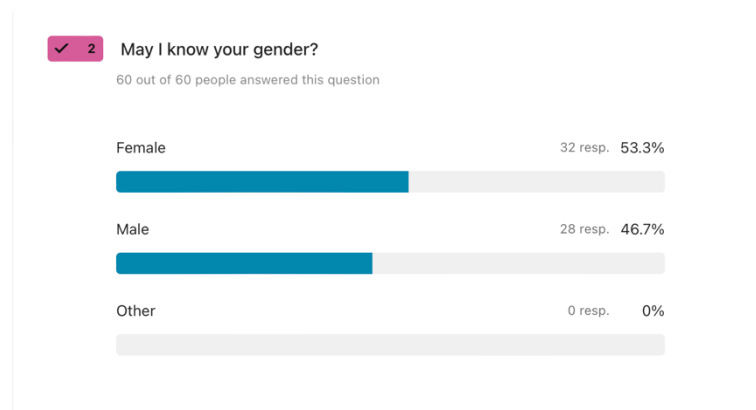


Fig 9.1.2 – Results of **online survey** questionnaire question: [Q2] May I know your gender?

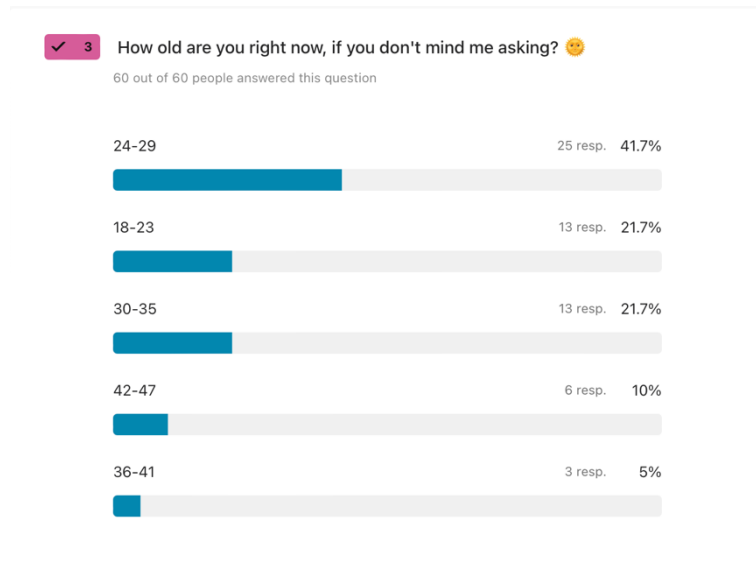


Fig 9.1.3 – Results of online survey questionnaire question: [Q3] May I know your gender?

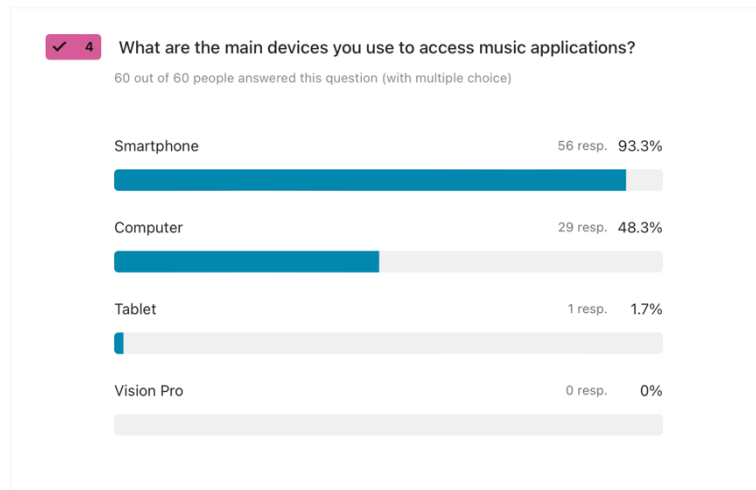


Fig 9.1.4 – Results of online survey questionnaire question: [Q4] What are the main devices you use to access music applications?

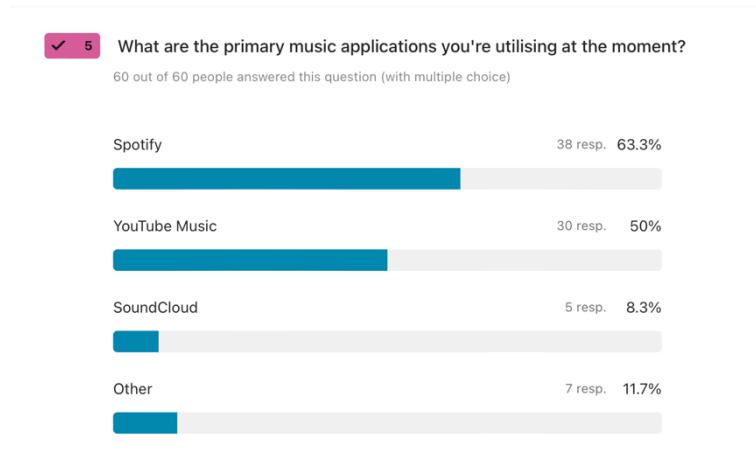


Fig 9.1.5 – Results of online survey questionnaire question: [Q5] What are the primary music applications you are utilising at the moment?

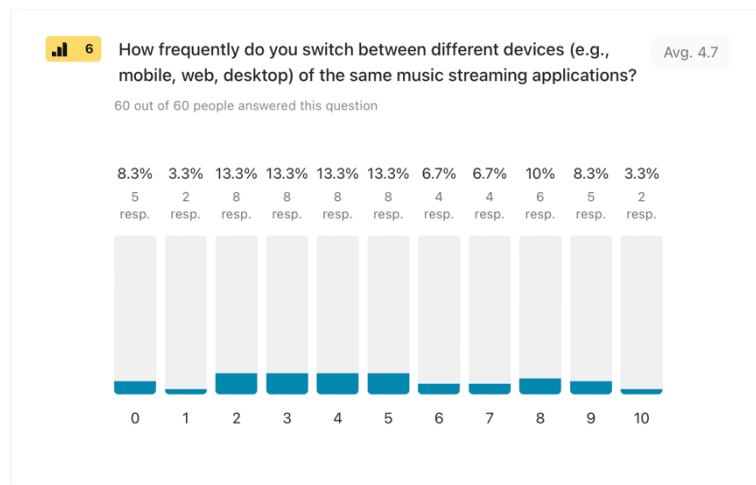


Table 1 Cross-tabulation of the frequency of switching devices while using music streaming applications by gender by age group.

[RQ6]: How frequently do you switch between different devices (e.g., mobile, web, desktop) or the same music streaming applications?		Gender										Total
		Male Age Group					Female Age Group					
		18-23	24-29	30-35	36-41	42-47	18-23	24-29	30-35	36-41	42-47	
Frequently switches devices	Frequently	1	7	1	-	1	5	5	2	1	2	21
	Struggling to answer	2	2	1	-	-	2	4	2	1	-	14
	Rare/Never	1	5	6	-	2	4	5	-	1	1	25
	Total	4	12	8	-	5	9	12	4	5	5	58

From 0-5 - Rare/Never

From 4-5 - Struggling to answer

From 6-10 - Frequently

Fig 9.1.6 – Results of online survey questionnaire question: [Q6] How frequently do you switch between different devices (e.g., mobile, web, desktop) or the same music streaming applications?

7 What factors affect your usability/satisfaction of a platform the most? Please rank them from most important to least important. Feel free to arrange the bars in the order that suits you best! 😊

60 out of 60 people answered this question

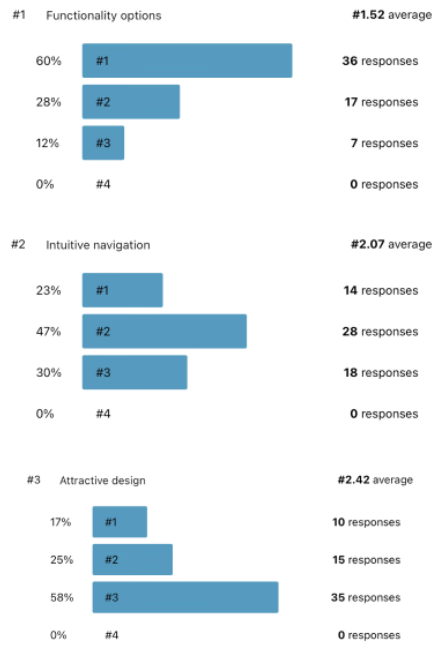


Fig 9.1.7 – Results of online survey questionnaire question: [Q7] What factors affect your usability/satisfaction of a platform the most? Please rank them from most important to least important.

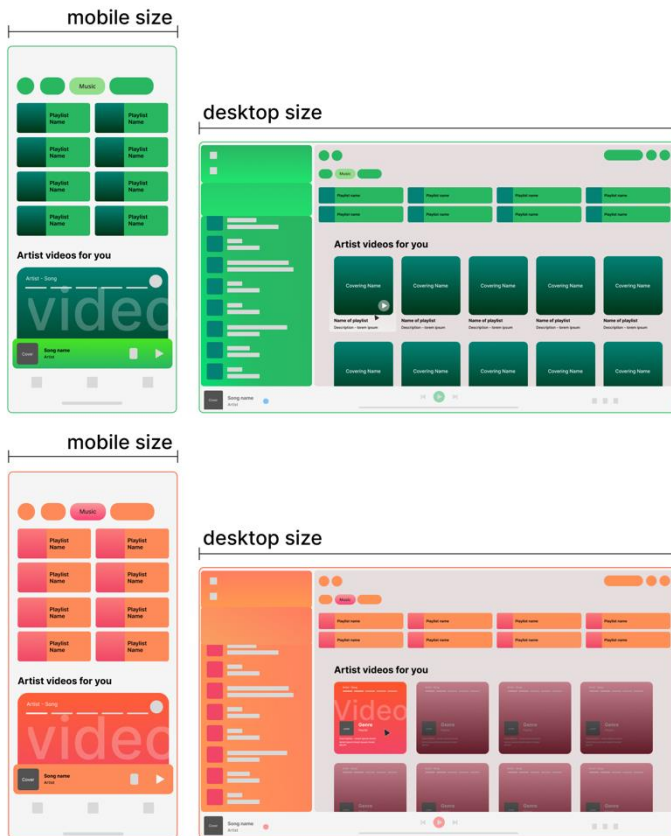


Fig 9.1.8 – The prototypes for the questionnaire [Q8] from the online survey.

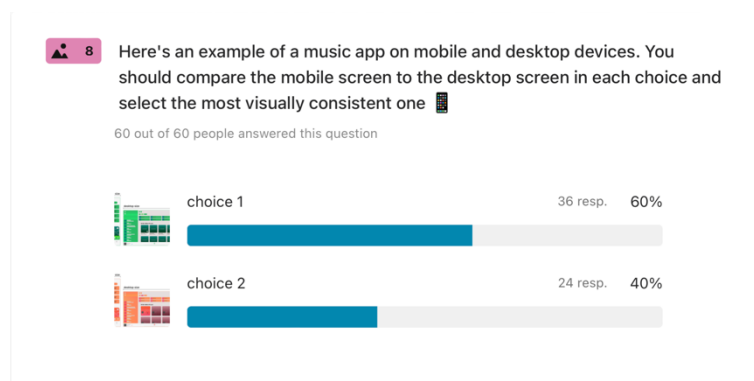


Fig 9.1.9 – Results of online survey questionnaire: [Q8] Here is an example of a music app on mobile and desktop devices. You should compare the mobile screen to the desktop screen in each choice and select the most visually consistent one.

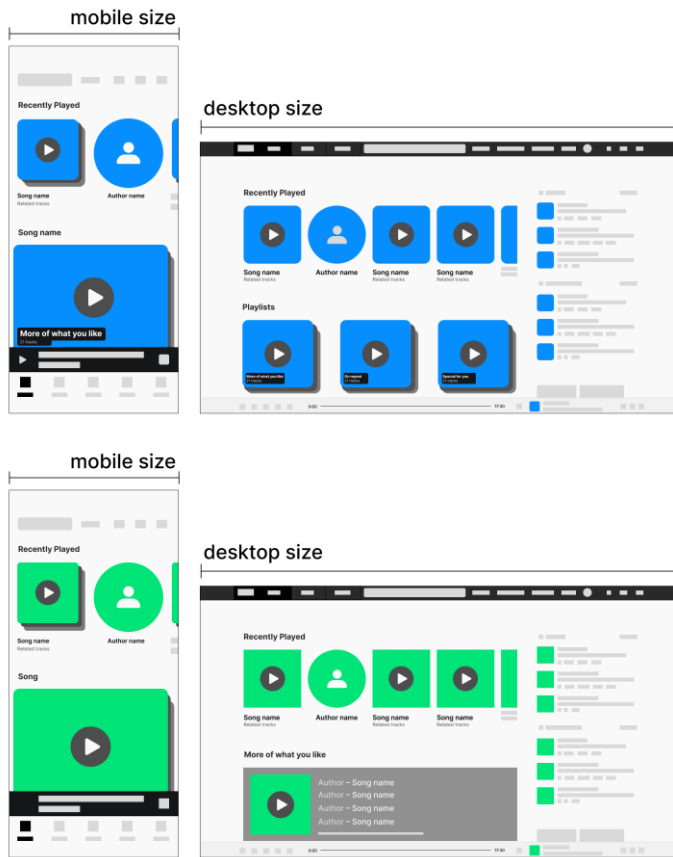


Fig 9.1.10 – The prototypes for the questionnaire [Q9] from the online survey.

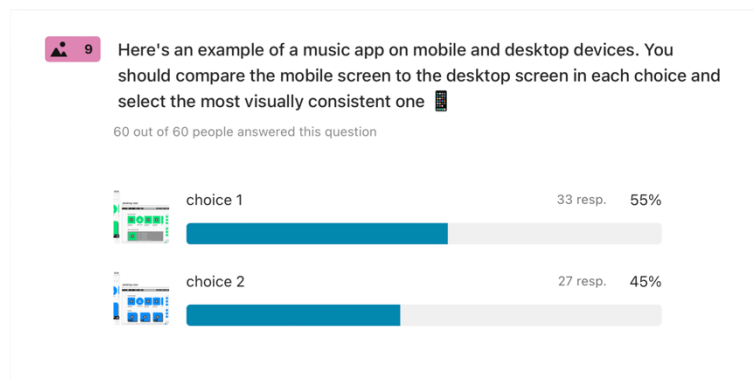


Fig 9.1.11 – Results of online survey questionnaire: [Q9] Here is an example of a music app on mobile and desktop devices. You should compare the mobile screen to the desktop screen in each choice and select the most visually consistent one.

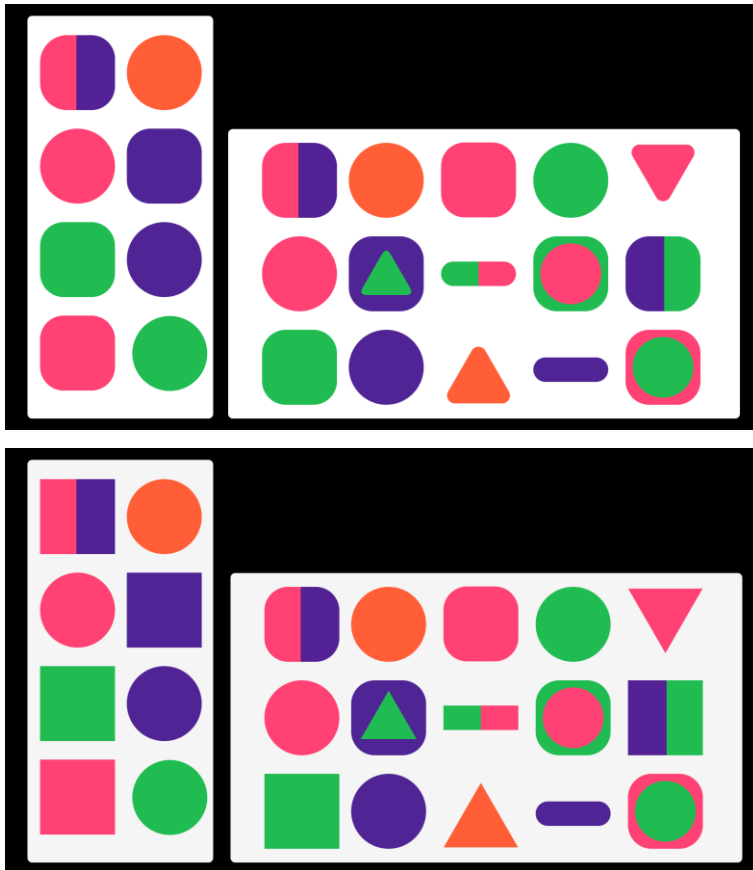


Fig 9.1.12 – The prototypes for the questionnaire [Q10] from the online survey.

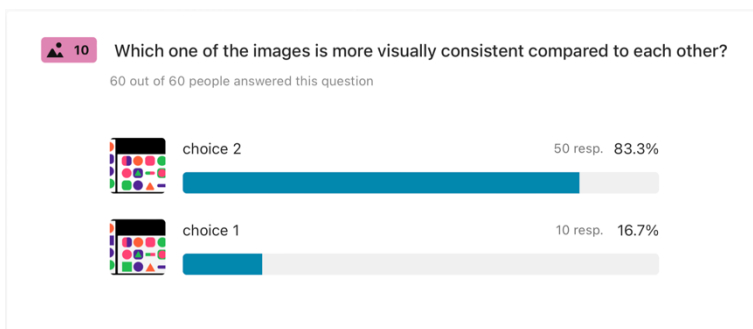


Fig 9.1.13 – Results of online survey questionnaire: [Q10] Which one of the images is more visually consistent compared to each other?

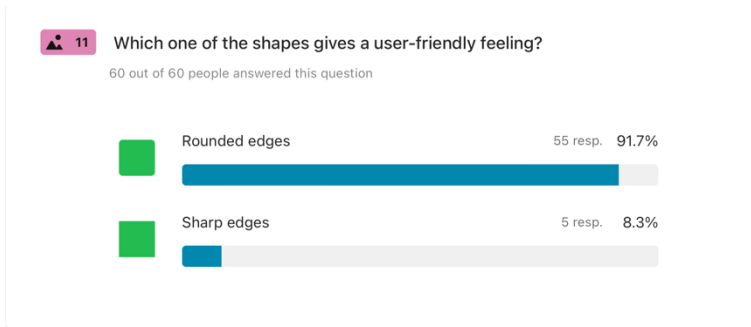


Fig 9.1.14 – Results of online survey questionnaire: [Q11] Which one of the shapes gives a user-friendly feeling?

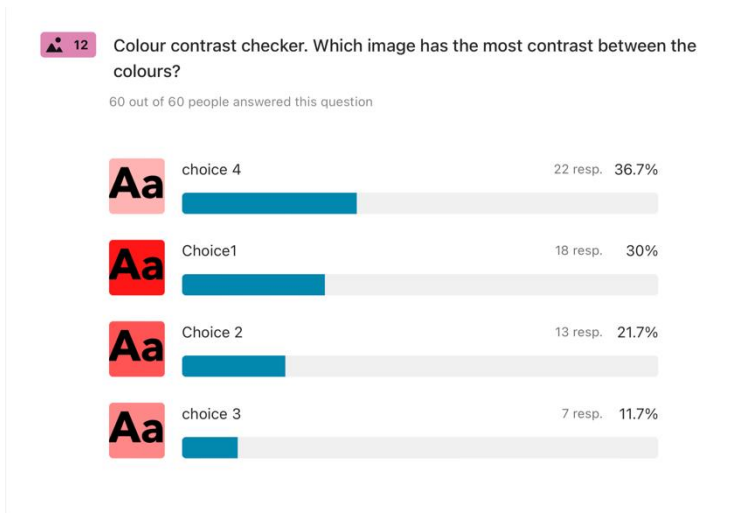
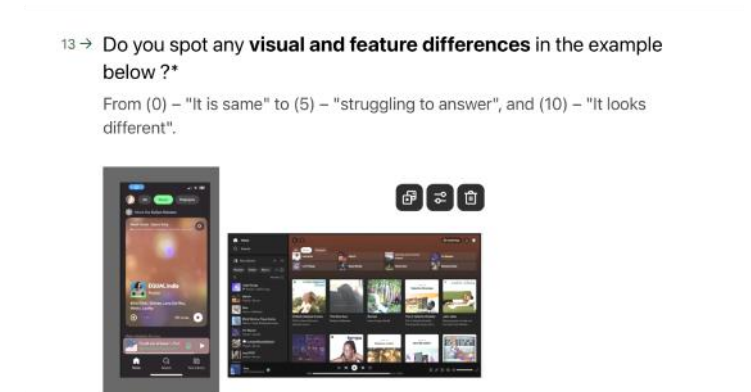


Fig 9.1.15 – Results of online survey questionnaire: [Q12] Which image has the most contrast between the colours?



60 out of 60 people answered this question

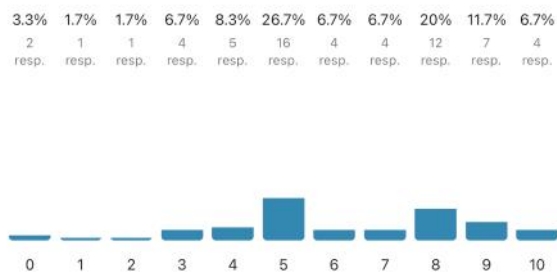


Table 2 Cross-tabulation of spotting visual difference in the given example by gender by age group.

[RQ13] Do you spot any visual differences in the example below?		Gender										Total
		Male Age Group					Female Age Group					
		18-23	24-29	30-35	36-41	42-47	18-23	24-29	30-35	36-41	42-47	
Spots visual differences	Yes/ It looks different	4	5	5	-	1	7	4	1	2	2	29
	Struggling to answer	-	6	4	-	1	-	6	2	1	1	21
	It is same/No	-	1	1	-	1	2	2	1	-	-	8
	Total	4	12	8	-	3	9	12	4	3	3	58

Fig 9.1.16 – Results of online survey questionnaire: [Q13] Do you spot any visual and feature differences in the example below?

14 How frequently do you encounter differences in visual elements when transitioning between different devices (e.g., mobile, web, desktop) of the same music streaming applications?

Avg. 4.5

53 out of 60 people answered this question

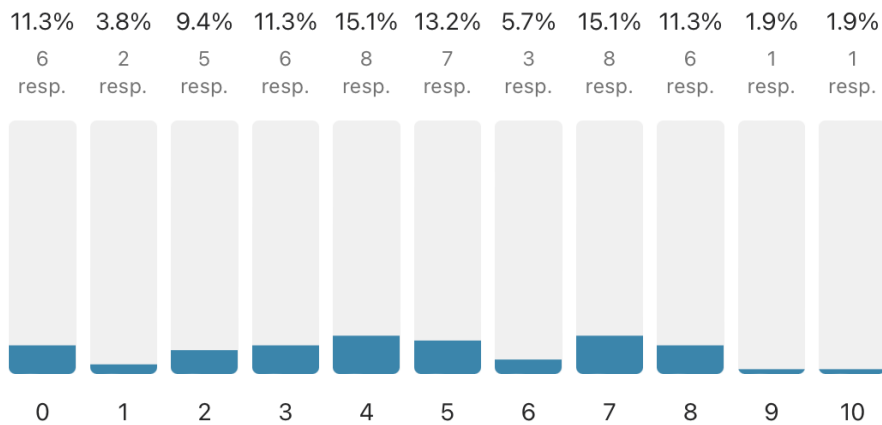


Table 5 Cross-tabulation of encountering differences in visual elements while transitioning between devices by gender by age group.

[RQ14] How frequently do you encounter differences in visual elements when transitioning between different devices (e.g., mobile, web, desktop) of the same music streaming applications?		Gender									
		Male Age Group					Female Age Group				
		18-23	24-29	30-35	36-41	42-47	18-23	24-29	30-35	36-41	42-47
Encounters differences in visual elements	0	2	3	3	-	-	2	4	2	2	1
	1	1	3	2	-	-	4	6	-	-	1
	2	1	5	1	-	2	2	3	2	1	1
	Total	4	12	6	-	3	9	12	4	3	3

The quantity of disregarded queries, evaluated within the corresponding age demographics.

Male Age Group: 18-23: -1, 24-29: -2, 30-35: -1, 36-41: -1, 42-47: -2

Fig 9.1.17 – Results of online survey questionnaire: [Q14] How frequently do you encounter differences in visual elements when transitioning between different devices (e.g., mobile, web, desktop) of the same music streaming applications?

15 How frequently do you encounter differences in app functionalities when transitioning between different devices (e.g., mobile, web, desktop) of the same music streaming applications? Avg. 4.8

54 out of 60 people answered this question

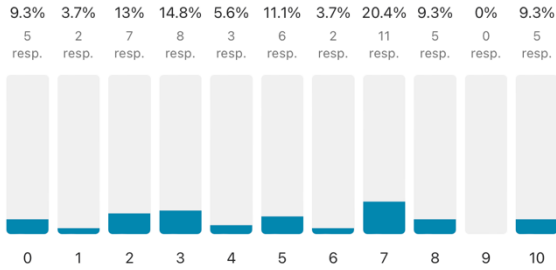


Table 4 Cross-tabulation of encountering differences in app functionalities while transitioning between devices by gender by age group.

[RQ15] How frequently do you encounter differences in app functionalities when transitioning between different devices (e.g., mobile, web, desktop) of the same music streaming applications?		Gender								
		Male Age Group					Female Age Group			
		18-25	24-29	30-55	36-41	42-47	18-25	24-29	30-55	
Encounters differences in app functionalities	Frequently	4	5	3	-	1	1	5	1	
	Struggling to answer	-	6	4	-	1	1	1	1	
	Rare/ Never	-	1	1	-	1	7	4	-	
	Total	4	12	8	-	5	9	12	4	

The quantity of disregarded queries, evaluated within the corresponding age demographics.

-2 -2

Fig 9.1.18 – Results of online survey questionnaire: [Q15] How frequently do you encounter differences in app functionalities when transitioning between different devices (e.g., mobile, web, desktop) of the same music streaming applications?

8.2 Appendix 2 – Prototype Interfaces

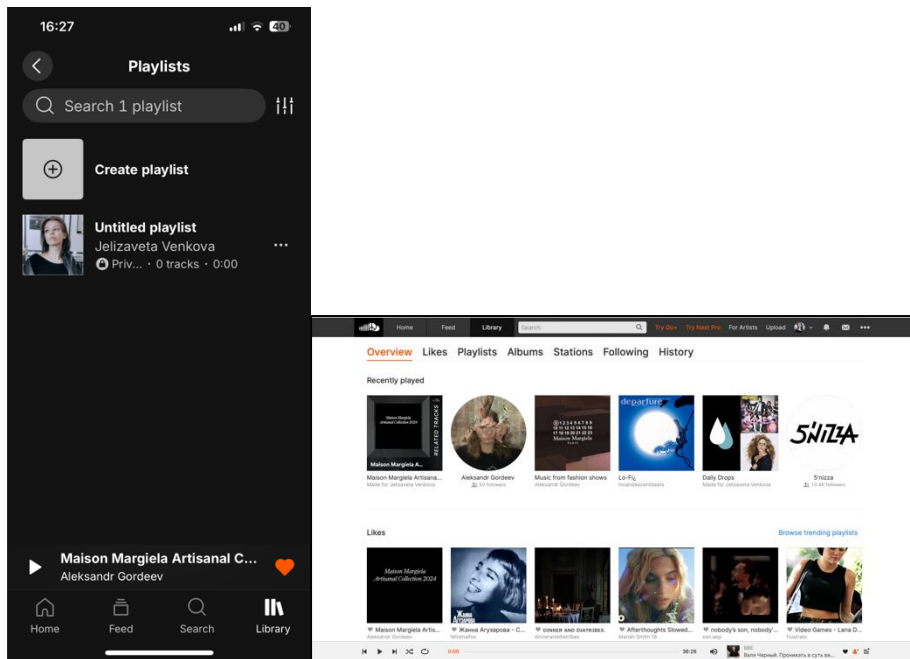


Fig 9.2.1 – The Library section pages on SoudnCloud’s desktop and mobile platforms.

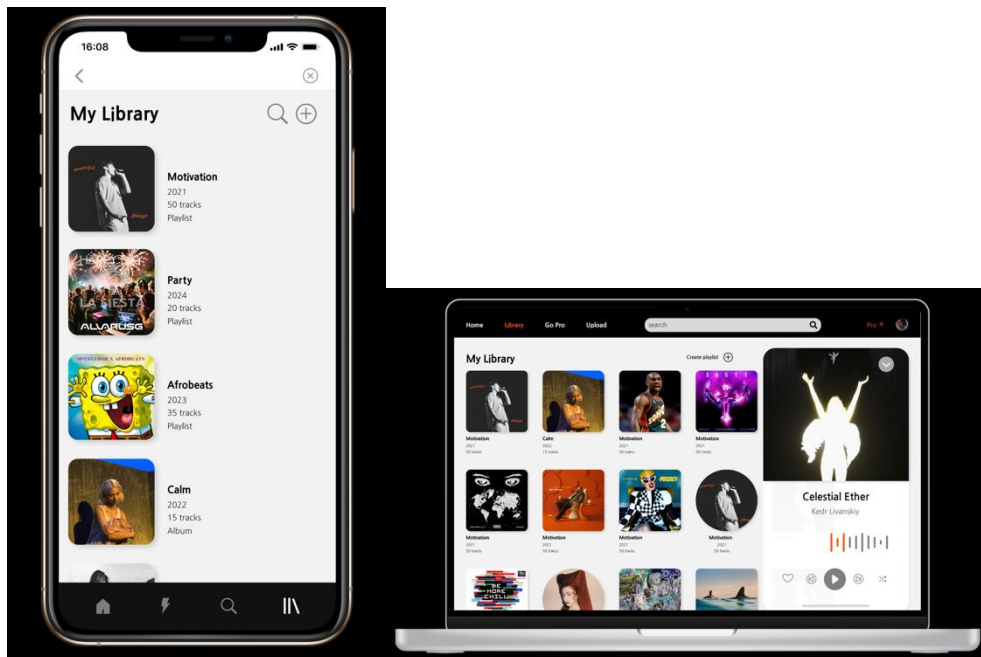


Fig 9.2.3 – Modified library page on desktop and mobile devices.

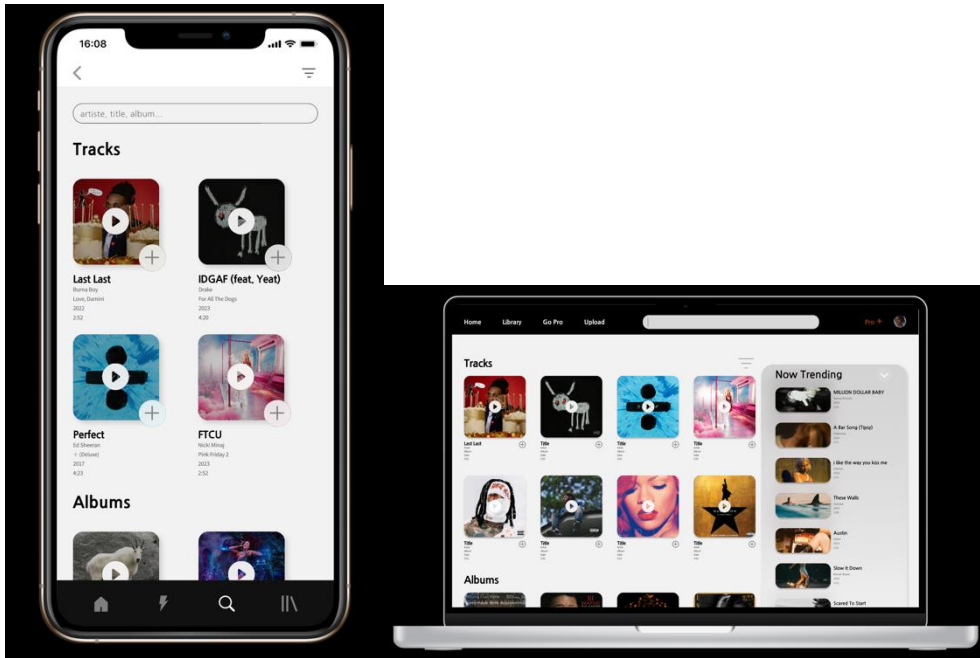


Fig 9.2.4 – Modified search page on desktop and mobile devices.

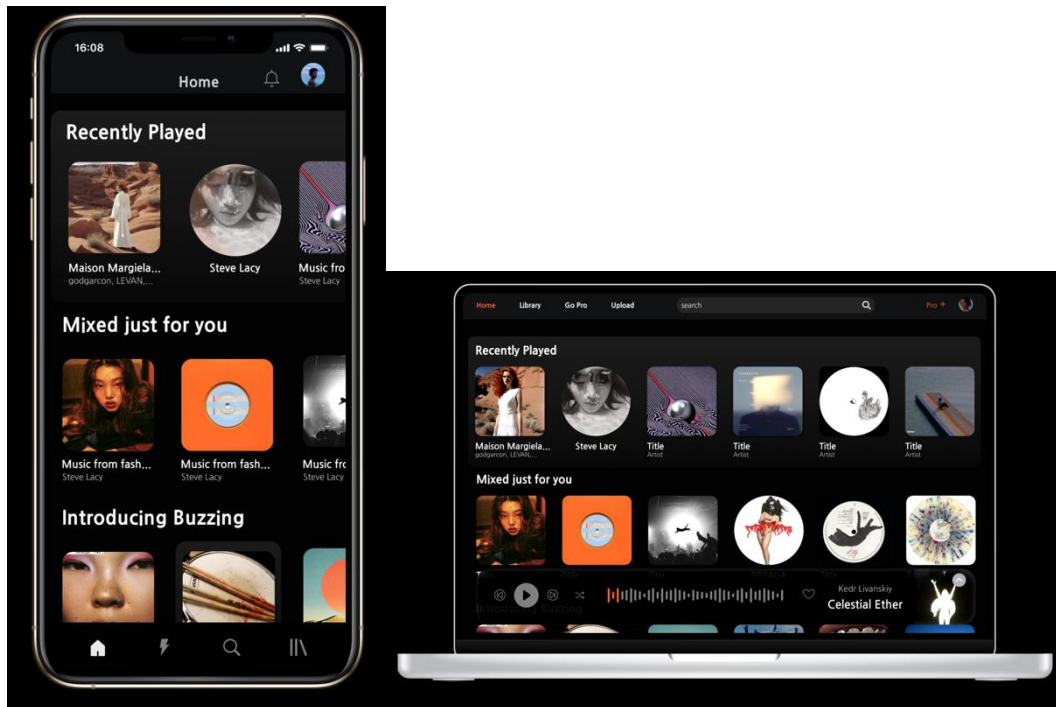


Fig 9.2.5 – Following the usability testing: Modified homepage on desktop and mobile devices in dark mode.

8.3 Appendix 3 – Usability Testing Results

Table 1 Cross-tabulation of choices made on the most unified designed version of SoundCloud by gender.

<i>[RQ1]: Which of the versions appears more consistently designed across both mobile and desktop platforms?</i>		<i>Gender</i>	
		<i>Male</i>	<i>Female</i>
Participant have chosen	The modified version	2	2
	Struggling to answer	-	1
	The original version	-	-
	Total	2	3

Fig 9.3.1 – Results of usability testing questionnaire: [Q1] Which of the versions appears more consistently designed across both mobile and desktop platforms?

Table 2 Cross-tabulation of preferences for using one of the versions of the SoundCloud application by gender.

<i>[RQ2]: Which of the versions would you like to use - the original or modified one?</i>		<i>Gender</i>	
		<i>Male</i>	<i>Female</i>
Participant would like to use	The modified version	2	2
	Struggling to answer	-	1
	The original version	-	-
	Total	2	2

Fig 9.3.2 – Results of usability testing questionnaire: [Q2] Which of the versions would you like to use – the original or modified one?