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Addressing Loneliness and Isolation with a Mobile Application

Connecting People through Sports and Shared Interests.

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Abstract

Prior research has indicated that humans are born with the need to connect with others. Making friends and forming relationships are integral traits that ensure people have sound support systems when they need them. Even with such evidence, Loneliness and isolation is still a problem in our present society.

This study developed a mobile application to help address loneliness and isolation by connecting people through sports and shared interests. Surveys were conducted to find out people's perceptions about loneliness and isolation, how connected they are to their communities, thoughts on a mobile application that connects people through sports and shared interests, whether they were willing to use a mobile application to communicate with other people.

Data were collected from respondents in Finland and outside Finland. The study employed a mixed method of quantitative and qualitative data collection. Results show that 59.3% of respondents felt connected to their communities, 40.7 did not feel connected. Though many people felt connected, about 64.9% of respondents had experienced moderate to high levels of loneliness within the past two years. About 92.6% of respondents were willing to use a mobile application connecting people through sports ad shared interests.

A prototype of the mobile application was developed using Figma. Focus group interviews were used to conduct user-experience surveys to collect views on the features users wanted to see in the applications. Respondents' important recommendations were implemented through the various focus group interviews to improve the application, and a final design of the mobile application named InterestConnect was developed.

Keywords/tags (subjects)
Loneliness, Isolation, Social Connections, Mobile applications, User-centered design, Life-based service design.

Miscellaneous (Confidential information)

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1 Introduction

Mobile applications have become a valuable tool that helps individuals and businesses communicate and interface more easily. By developing mobile applications, companies aim to improve customer engagement, create entertainment social connections, collect customer feedback, etc. Well-designed IT systems can enhance the quality of life for the users (Newell et al., 2006). The statement suggests that the involvement of the possible users in mobile application development can improve their lives, keeping them active both physically and Intellectually. Ling (2004) indicates that technological advancements have become part of our daily activities. Also, new devices are constantly under development and introduced into the market. While the initial intention of most technologies was to increase effectiveness and efficiency, the context of social use has become an integral part as advances are made (Andersen et al., 2006). These advancements in technologies have brought about the development of mobile applications which target social interactions.

De Jong Gierveld et al. (2006)defines social isolation as the absence of relationships with other people. As per this definition, individuals with a limited number of deep ties feel socially isolated. Parkhurst and Hopmeyer (1999) described loneliness as "*a sad or aching sense of isolation, that is, of being alone, cut-off, or distanced from others . . .associated with a felt deprivation of, or longing for, association, contact, or closeness" (p. 58).* This definition reveals that loneliness involves an emotional feeling of not having excellent or meaningful connections with people or in an individual's immediate community. Loneliness and Isolation are among the risk factors for the youth's social, psychological, physical, and cognitive well-being (de Minzi and Sacchi, 2004). Also, loneliness is a significant factor that affects self-esteem, feelings of hopelessness, and the harm it brings to young people's social and psychological development. Loneliness and isolation are a phenomenon that affects everyone, either young or old. Loneliness and isolation can lead to depression as they affect people's ability to make decisions, solve problems and get rid of certain negative self-beliefs.

Social Connection was defined by Seppala et al. (2013) as "*a person's subjective sense of having close and positively experienced relationships with others in the social world.*" The definition implies that social connections are necessary for humans since it fulfills the psychological needs of being wanted, loved, and achieving a sense of affection. When the social connection is absent, the individual's ability to relate to others and form meaningful relations becomes problematic. Individuals in such situations begin to feel isolated, which leads to low self-esteem, difficulty trusting others, and disconnecting from their surroundings. The Covid-19 pandemic prompted safety measures through various restrictions, including lockdowns, social distancing, remote work, and studies. These restrictions meant people were not allowed to meet and interact with each other. The pandemic caused many people to be socially isolated and disconnected from friends and family. For individuals with limited ties within their immediate surroundings or communities, such as international students or immigrants, restrictions further isolate them.

Wu (2020) discusses how important it is to develop innovative technologies to improve social connections. According to Wu (2020), mobile technologies are essential tools that people can use to increase social interaction, and the development of people-centered applications is a solution that needs more consideration. Leikas (2009) asserts that technology development should focus on enhancing people's quality of life rather than efficiency and effectiveness as they do not connect human life to technology. This assertion agrees perfectly with Wu (2020) that technology must be more user-centered since it can improve the quality of life. Current social media platforms like Facebook, Twitter, and Instagram have grown to expose people to more damaging and divisive content, which further increases the feeling of Loneliness and isolation, affecting the quality of life.

In line with the assertion of Wu (2020) and Leikas (2009), the thesis seeks to help address the feeling of loneliness and isolation by developing a mobile application that connects people to be socially and physically interactive. Thus, the application's primary purpose is to connect people through sports and shared activities. Such an application can improve people's lives through learning, sharing ideas, meeting people, and, more importantly, social inclusion.

1.1 Research Question

This section discusses the research question, and for this thesis, the research question is:

How can a mobile application help connect people to reduce feelings of loneliness and isolation?

Advances in technologies have created reliable ways to communicate with friends and associates. Wu (2020) and Leikas (2009) opines how important it is for technologies to help improve social interaction and users' quality of life. Therefore, it is critical to research how a mobile application can help people connect people to reduce loneliness and isolation. Finding the answers to this question is a means of validating the idea, establishing a need, and developing the solution.

1.2 Research Objectives

This section discusses the objectives and questions this thesis seeks to answer. The research objectives are to understand the following.

1. What are people's emotions and psychological mindsets on loneliness and isolation?
   Designing a technology like a mobile application requires the designer to understand and share the end-users needs and motivations. This research question will help understand how people feel about loneliness and isolation.

2. Do people feel connected in their communities?
   The purpose of designing the mobile application is to create connections. For connections to be reliable and realistic, it is crucial to understand how users are connected emotionally and physically to their communities and environment.

3. How do people feel about a mobile application to connect through sports and shared interests?
   After empathizing and understanding the user's emotions and psychology, another critical question is how users feel about using mobile technology to help them connect through sports and shared interests. Knowing how comfortable people are to use a mobile application will help develop the idea

further. This question will also provide an insight into what users expect from a mobile application to address such a problem.

4. Will they be willing to use an application to connect to others?
   This question will further validate the idea of the mobile application. Knowing how willing users are to connect to others through a mobile application will establish the need for this kind of mobile application. The question will also generate further proposals and suggestions from users regarding their expectations and needs.

5. What are the tools and platforms needed to develop a mobile application?
   It is necessary to identify the modern tools and platforms needed to develop a mobile application. Understanding the best front-end and back-end technologies required to design and develop a mobile application is necessary. Further, finding answers to how to market and monetize the mobile application and ensure its sustainability is also essential.

1.3 Thesis Structure

The structure of this thesis is as follows: The second chapter details the literature review of the study by discussing the various concepts, theories related to loneliness and isolation, social connection, and assumptions of the thesis. The third chapter, research method, explains and justifies the choice of research methods and details the data collection and analysis methods employed in this research. The fourth chapter examines and analyzes the results from the data collection. The fifth chapter reviews the development of the mobile application, and the sixth discusses the benefits, ethical concerns, business, and marketing Ideas for the mobile application. Finally, the seventh chapter summarizes and concludes the thesis.

2 Literature Review

Designing and developing a mobile application that addresses human emotional and psychological problems such as loneliness and social isolation is complex. It requires a detailed understanding of these problems and how technology can play a role in addressing them. This section will review various literature on loneliness and isolation, social connections, and technology's role in human life. Furthermore, theories on Life-based service design and user-centered design will form the framework in understanding how to design technological solutions for the benefit of its users. Lastly, this thesis will state the assumptions.

2.1 Loneliness and Social Isolation

From de Jong-Gierveld (1987) perspective, loneliness is when a person or an individual experiences a situation where they do not have deep and quality social relationships. Loneliness also includes cases where the person or individual has a small number of people or groups to relate with and cannot achieve a certain level of intimacy. According to Blai Jr (1989), loneliness occurs in two forms: The first one is when an individual does not have a deep association with an attachment figure, and the second is the feeling of exclusion or not being accepted in one's immediate community. Furthermore, low self-confidence is a significant factor that influences Loneliness in most people. Blai Jr (1989) explains that loneliness occurs within some social situations. These situations include marriage, relationship, and friendship breakups, imprisonment, retirement, educational settings such as moving into residential accommodation and graduate schools, geographical locations such as moving houses or migration.

Weiss (1973) outlined two types of Loneliness, namely, Emotional and Social loneliness. Emotional loneliness was described as a sentimental reaction to an absence of close attachments, while social loneliness is an inability to connect or blend within a social network. From the types of loneliness outlined by Weiss (1973), people can experience emotional loneliness when an individual lacks some form of a romantic relationship; also, not having someone to talk to about problems ongoing in

one's life can cause emotional loneliness. On the other hand, people experience social loneliness when they do not feel belonging to their community, peers, or group. When individuals do not have a wider circle of friends or people, they may feel isolated. For example, when an individual attends a public event and cannot identify with any person and cannot communicate with anyone, such a person experiences social loneliness. Analyzing these two types of loneliness, one can assume that creating and maintaining a sound support system can help deal with emotional loneliness. The remedy to social loneliness is getting involved in social events such as sports, volunteer groups, dance classes. The antidote to social loneliness will be to make a conscious effort to connect and create lasting relations. Diehl et al. (2018) researched loneliness at universities. The study found that even though some students were socially connected and thus had people with shared interests such as playing sports and attending events, those connections lacked emotional connections, leading most students to feel emotional loneliness.

The definitions of loneliness above all recognize some similar traits. These are the absence of deep or meaningful relationships, lack of social networks, and feelings of not belonging in a community or group. These definitions do not include the conditions or situations that necessitate such feelings of loneliness described by Blai Jr (1989). This thesis, therefore, defines loneliness as follows:

"Loneliness is the absence of deep social, personal relationships and connections influenced by several factors such as geographical locations (moving houses, migration or changing jobs), low self-confidence, old age, and relationship breakdowns."

In their research, Barke et al. (2018) opined that loneliness occurs through many factors, including those defined by this thesis. The study cited health and mobility, transport, digital capability, income, literacy, poverty, and relationships, especially for older people. The research also indicated that retirement or leaving school could lead to the loss of personal networks which offer support and friendships.

Loneliness is a problem that is usually assumed to affect only older people. But the reality is that Loneliness affects people of all ages. A study conducted by Child and

Lawton (2019) found that young adults with all their large networks expressed more days of loneliness than late middle-aged adults. The study suggests that having many friends or large networks does not exclude people from feeling lonely. The quality or meaningfulness of those friendships or networks can keep people from those lonely feelings. For example, having people who share specific interests or enjoy the same activities can create meaningful relationships to address people's loneliness, either socially or emotionally. Barke et al. (2018) suggested that an intergenerational skill-sharing project can help reduce Loneliness amongst both young and older people.

Furthermore, using technology is one of the ways to reduce this problem. Again, the research also suggested that online communities can provide a form of support for individuals that feel lonely. However, the study by Barke et al. (2018) admitted that there are some problems associated with the use of social media, which might add to the feelings of loneliness. But if the platform offers support for creating positive relationships, this can help to reduce the feelings of Loneliness.

According to Biordi and Nicholson (2013), social isolation is when individuals disconnect or distance themselves psychologically or physically from their relationships with other people or networks. Social isolation may be an intentional or unintentional decision that loses an individual a place within their networks or groups(Biordi & Nicholson, 2013). The study suggests that some people isolate themselves and do not participate in social activities. Such people choose to remain private to make changes or take certain decisions. On the other hand, when individuals seek social relationships or connections that those around them cannot meet, unintentional social isolation becomes the result.

Biordi and Nicholson (2013) explain that social isolation can occur in four major areas. i.e., community, organization (school, workplaces, churches), Confidantes (family, friends, spouses, etc.), and personality. Individuals can either feel connected or integrated within a community or feel isolated. Similarly, within organizations such as schools, churches, or workplaces, some people may also feel socially isolated or connected due to various reasons. People closer to an individual called Confidantes can also make them feel socially isolated due to their actions and inactions. Finally, an individual's personality can also cause social isolation. Thus,

their ability to analyze, understand, and interpret relationships, in general, can also cause social isolation. According to Weiss (1973), boredom, marginality, and exclusion can be signs of social isolation. The statement suggests that boredom happens due to an individual's work or daily routine not being validated. On the other hand, marginalization is when individuals feel excluded from groups or networks they desire to join. Loneliness, anger, despair, sadness, frustration, and relief are various emotions attributed to social Isolation.

This thesis suggests that social isolation is not merely an intentional or unintentional decision of an individual to disconnect from their immediate surroundings. It includes the marginalization and exclusion of individuals within their community or networks and the boredom of routine work. So, this thesis defines social isolation as:

"When individuals purposely or inadvertently disconnect themselves from their community, groups, networks, friends due to boredom, exclusion or marginalization."

It is worthy to note that both Loneliness and isolation involve similar traits. People are disconnected or unable to find deep ties they desire within their surroundings due to feeling marginalized excluded, changes in their lives such as relocation, or failures in relationships. Brajša-Žganec et al. (2011) found in their study that participating in leisure activities helps people find and build social connections. These connections then translate into having positive emotions acquiring additional skills and knowledge, which improves the quality of life. In other words, participating in leisure activities such as sports and having people with shared interests such as hobbies can be a solution to combating Loneliness and Social isolation. Leisure activities create social connections.

The Nomad Today (2019) revealed that 21.12% or 950,000 Finns aged 16 or older felt lonely, most of the time or some time. The largest share of the population that felt loneliest were those aged 75 or above. 7.3% within the age of 75 and above felt lonely all the time or most. 28.7 % within 75 and above were lonely at least some time. This data was in 2018, when there was no pandemic. There is a high possibility the figure mentioned by Nomad Today (2019) might have increased during the era of the Covid-19 pandemic.

The figure below shows the data reported by The Nomad Today (2019).

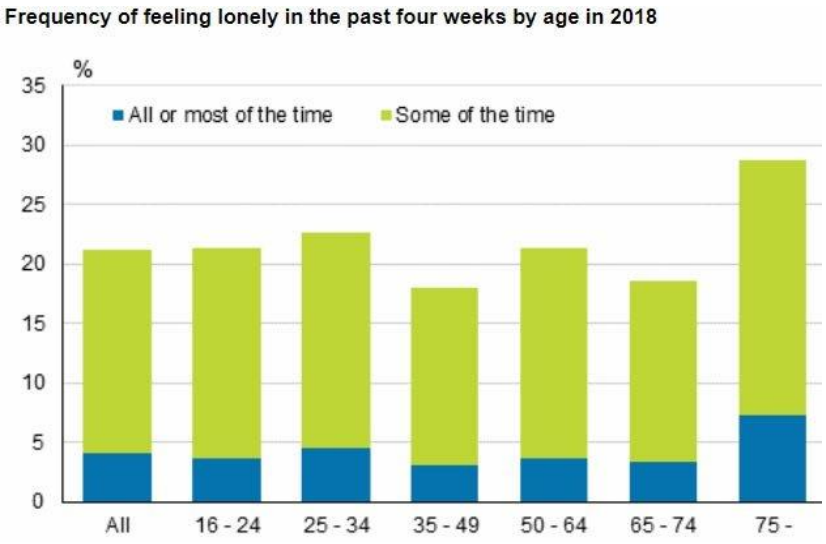


Figure 1:Loneliness Survey

According to the Finnish Redcross (2021), loneliness has increased dramatically in Finland since nearly one in three Finns is suffering from loneliness. Further, the Finnish Redcross (2021) states that the number has increased since one in five Finns previously suffered loneliness. Loneliness has increased due to restrictions associated with the Covid19 pandemic, leading to prolonged loneliness and other harmful health effects.

Further, Varrella (2021) published a worldwide survey about loneliness among adults by country in 2021. According to the study, 33% of adults experienced feeling loneliness worldwide. 50% of respondents from Brazil expressed feeling lonely either often, always, or sometimes. Between 43-46% of respondents from Turkey, India, and Saudi Arabia also expressed some feelings of loneliness. The study published by Varrella (2021) stated that the COVID-19 pandemic has cut off people from their social life and, as a result, does not have the companionship needed. The figure below shows the survey conducted in 2021.

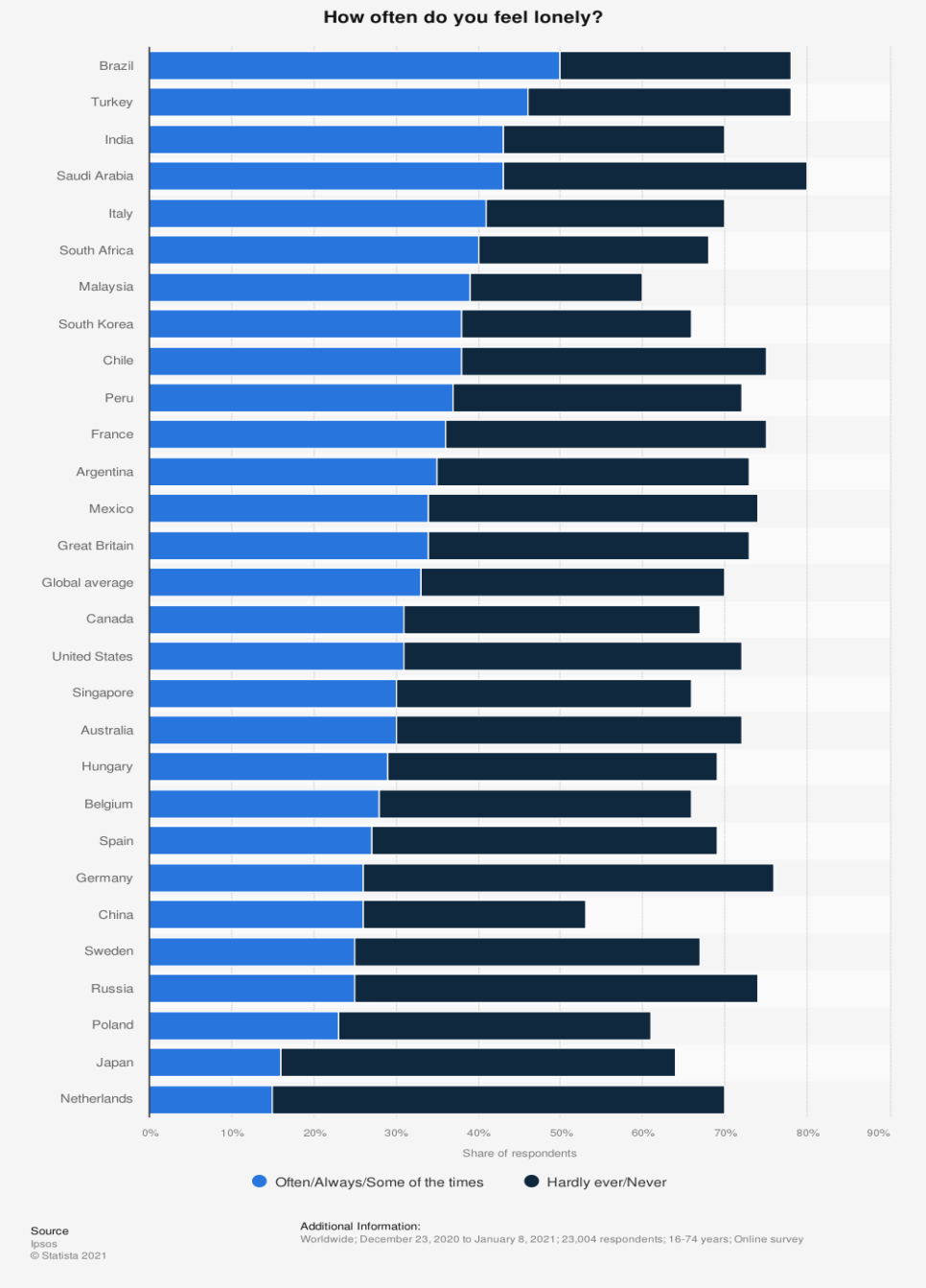


Figure 2:Worldwide; December 23, 2020, to January 8, 2021; 23,004 respondents; 16-74 years; Online survey

2.2 Social Connection

Maslow (1943) theorized that physiological needs are essential in humans. When physiological conditions such as hunger and safety are satisfied within humans, the need to be loved, affection, and belonging become very critical. Maslow (1943) suggests that social connections are vital for human needs.

Seppala et al. (2013) defined social connection as a subjective impression of having intimate and pleasant interactions with others in the social environment. The definition means that having an affectionate and loving relationship with people is vital for every human. Human health and well-being, which includes other needs like having close bonds with people around us, is referred to as social connection (Cacioppo & Patrick, 2008). From the definition by Cacioppo and Patrick (2008), one of the fundamental needs to have a healthy lifestyle is fostering close relationships with people and avoiding being isolated or feeling lonely.

Furthermore, Cacioppo and Patrick (2008) explain that the need for social connections in humans has deeper roots. Feeling isolated can affect the human ability to think, human intelligence influences social relationships. For example, from childhood, our thinking and behaviors are shaped by the people around us, i.e., through family, friends, or community. Such thinking plays a massive role in how we connect with others socially. Seppala et al. (2013) explain that when a person feels some form of familiarity with a group of people or community, they feel socially connected. In other words, having familiar interests, hobbies or sports can foster social connections.

Ullrich-French et al. (2012) contend that physical activity-based programs enhance social connections. Physical-based activities promote physical, psychological, and emotional growth, allowing people to build meaningful human relationships. In other words, when people part-take in activities such as sports, hobbies, and other interests, it creates an emotional and physical bond that enhances social connections.

There is a correlation between suggestions made by Seppala et al. (2013) and Ullrich-French et al. (2012) that social connections develop when people share similar interests, hobbies, or sports, and it is further improved when they perform activities involving those common interests. Butt et al. (2016) point out that participating in sports creates memories that can last a lifetime. In so doing, it helps to build valuable social connections that have positive impacts in life. Further, Butt et al. (2016) explain that sports participation can build teamwork, increasing a person's ability to create and nurture relationships with other people. Also, sports improve

persons have long-term commitments. Thus, they can build and maintain their relationships with people over a longer time.

This study assumes that humans, right from childhood, develop the need to connect socially. The family creates the initial avenue for a child to know and understand how to connect socially. After learning from the family, humans learn to develop friendships and relationships as they grow. People form friendships within the community or environment they find themselves in, e.g., at schools, churches, or public events. Marriages also create the conditions to build deeper ties and social connections. The social links made become very crucial in the lives of every human since it becomes an avenue to confide in people participating in activities such as sports. Creating and maintaining these relationships improves humans' physical and mental well-being due to the positive feelings it makes. The absence of these kinds of relationships causes loneliness and social isolation.

Technology has created many tools that help people to perform tasks efficiently. People can use and exchange information easily. The advancements in technology have made platforms for people to connect socially. The following section discusses how technology has affected human life.

2.3 How technology affects human life

Technology has become the primary agent of growth and increased quality of life in the current global economy. Various innovations in technology have contributed to how people communicate and interact with their immediate environments worldwide. Technological innovations have created better ways of educating people, increased healthcare accessibility, decreased greenhouse effects, increased safety, security, etc.

Atkinson and Castro (2008) state that Information technology has become a significant engine of progress and has altered human life in many areas. These areas are access to information (real-time information, travel information), healthcare treatments, consumer choices (access to goods and services), safety and security, communication, social activities, etc.

Access to Information: The influence of technology on how information is accessed cannot be understated. Deb (2014) points out that social attitudes change due to accessing quality information to make informed decisions. For example, students can study remotely due to the advancements in technology. They can also conduct research online as most educational materials have been digitalized and placed on the internet for easy access. Also, people can access information in real-time. People access current and real-time information about travels, sports, and politics through mobile phones and computers. People are also able to learn new languages through the internet. Easy access means people get the kind of information they want worldwide without leaving their country and in the comfort of their homes.

Healthcare Treatments: The treatment and diagnosis of patients have improved drastically due to the advancements in technology. Technology has made it easier to improve the quality of life and has saved so many people. White et al. (2001) makes a great point about how the internet has become a resource for accessing critical health information and purchasing medications. Telehealth has become necessary in treating patients due to the Covid-19 pandemic. White et al. (2001) defines telehealth as using technology to remotely support and manage patient care, education, public health, and health administration. The definition means hospitals and governments run healthcare through technology in so many areas, thus the implementation of Information systems to collect, store, and retrieve patient information to aid healthcare practitioners. The data acquired through information systems help increase communication between doctors and patients and avoid errors in diagnosis and treatment—for example, technologies such as 3D printing aid in creating organs used in surgeries. Wearable health care devices through IoT helps to collect instant data about patients, which further helps healthcare professionals diagnose correctly and efficiently.

Consumer Choices: Technology has enabled people to choose goods and services that meet their needs (Atkinson & Castro, 2008). People can search and buy products they need through the internet due to e-commerce. Many retail shops have websites that offer consumers the ability to shop from the comfort of their homes and have it delivered through the advancement of technology. Smaller can reach a broader

market through e-commerce websites like Amazon or eBay. People can easily purchase products they cannot find in shops easily purchased online. People can compare the prices of goods and services across different websites and make informed decisions based on their preferences. Therefore, consumer choices through technology give people more control over their daily activities and an essential say in businesses' decisions. Customer feedback through email surveys or website surveys has become a tool for companies to understand the consumer better and improve their products and services.

Safety and Security: Atkinson and Castro (2008) point out that to be safe, one has to get the correct information at the right time. Technology companies continue to create products that provide security measures for many people. Smart homes, for example, are modern trends of providing safety and security. Technology companies have developed applications to connect home appliances to IoT networks. Lights, home security, home entertainment systems can all be connected through IoT. Smart home devices include microphones and cameras, which help monitor the home in case of theft or burglary. The recordings from these devices are stored in the cloud and retrieved for investigative purposes. Aside from smart homes, cars also have cameras and parking assistants, which help to prevent accidents. Some vehicles like Tesla have automated driving assistants for driving long distances. These intelligent devices can expose private and sensitive information, but the benefits of it helping to keep us secure and protected are enormous. Mobile phones have GPS tracking systems that have enabled the police to solve many crimes. It also allows parents to monitor the location of their children in real-time. These are only a few mentioned ways that technology plays a considerable role in keeping us safe and secure.

Communication: Initially, communicating with each other was through letters and telegrams. Then through technology, the telephone was invented. Telephones made communication much more accessible but not mobile. Then there came the development of mobile phones, which meant communication could be on the go. The invention of mobile technology shifted interaction from voice only to text, whereby people could communicate faster and easier. There was also the

introduction of email communication through computers to replace the old systems of letters and telegrams. Communicating via mobile applications like WhatsApp, Telegram, Facebook Messenger, Teams, Zoom, Skype, Snap Chat, and Instagram has become well accepted and well used. Communication has become more accessible, faster, and more convenient through mobile messaging applications. These applications show how much technology has impacted humans in their everyday lives.

Social Technologies: People can now interact and communicate socially through the internet or mobile technologies. Blogs, social networking sites, and applications are ways people interact socially. For example, Facebook, Instagram, YouTube, Tinder are platforms people use to connect and interact socially.

In conclusion, technological advancements have brought a lot of benefits to human life. From security availability of information to communication, the everyday activities of humans have been made more convenient and more accessible. Technology has changed our attitudes, thoughts, and approaches to solving problems involving our daily lives.

The figure highlights some positive impacts of technology on human life Mirror Review Blog (2020).

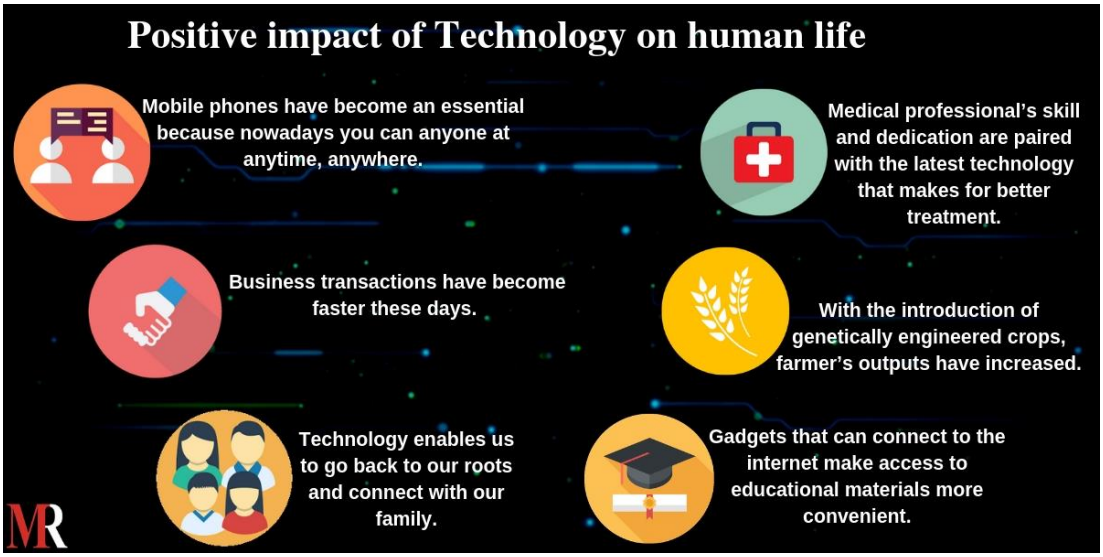


Figure 3:Impact of Technology on human life

Theories like life-based service design offer more insight into designing and developing technologies for human life. This thesis discusses Life-based service design is in the next section.

2.4 Life-based Service Design

"*Ultimately, the goal and focus of technology design should be to enhance people's quality of life, and traditional usability attributes, such as efficiency and effectiveness, have little to do with this desire as they do not connect technology to life.*"*(Leikas,* 2009*, p. 69).* The statement above means the most important thing to focus on when developing technological artifacts is improving the quality of life and how the artifact can connect with its target audience. Understanding how users can relate to the technology is significant and not just about using it. Leikas (2009) stresses that people would not use a technology that does not enhance their quality of life. Thus, technologies must focus on their users' socio-cultural and physiological needs.

Further, the design of technologies should not concentrate on dictating how users must behave when using the technology but should instead be on the wants and goals of people. In other words, the design must focus on what people want to achieve with the technology, why they need the technology, and what they want to do with the technology in their lives. For example, this thesis seeks to develop a mobile application to address loneliness and isolation and connect people through sports and shared interests. To design an excellent application to handle such a human issue, Saariluoma and Leikas (2010) suggest a systematic and careful approach to analyzing the problem, the needs of the target users, and the benefits they will gain from using such an application. Leikas (2009) proposes that to develop any technology for use by people, the "*form of life''* must be the basic concept used in analyzing the relationship between everyday life and technology. The idea of Life-based design by (Leikas 2009) is divided into several sections to help analyze and design technology products and services. These are:

Analyzing forms of life

- This section starts by first identifying the problem area. For example, this thesis has identified loneliness and isolation as affecting people of all ages and wants to find a technological solution.
- After knowing the problem, target users are identified. Leikas (2009) refers to the target user as the form of life in this cas*e*. Concerning this thesis, the target user or form of life is any human/person who feels lonely and isolated and wants to find someone to share a sport or interest. The form of life, in this case, includes the young, old, male, female.
- The next step is to understand the design problem. The design problem means there must be an analysis of what the intended product or service offers to solve the identified problem. In this case, this study aims to develop a mobile application where people can connect. The application will offer them a platform to meet people, play a sport, share hobbies, and learn from each other. Through such connections, people will make meaningful connections that can help them overcome loneliness and isolation.
- Another critical step is to analyze the rules following the actions of the targeted users. This step means the developer must understand the daily routines of its intended users. For example, the daily routine of an international student or any student involves the following actions: Waking up in the morning, having a cup of coffee or tea, attending classes, having lunch, visiting a bar during weekends, engaging in a sport or hobby, etc.
- When the daily routines are understood, typical actors who might use the application must be identified and explained.

Typical Actors

This thesis will use African, Finnish, and Asian as familiar actors. The choice of an African is because of having a personal background as a Ghanaian and experience of how mobile applications are becoming useful in Africa. Living in Finland, it was helpful to include the perspective and information from the Finnish society. It was also indispensable not to include an Asian as Asia has

the largest population and understanding their view will benefit the development of this mobile application. The table below highlights the Forms of life.

Table 1: Analyzing forms of life and rule-following actions by Leikas (2009)

Typical Actors	Rule Following Actions
Asian: **Student or Worker** **Age: 17-60**	Skills: • Excellent use of electronic gadgets • Varying levels of English fluency • Difference inhabits and Hobbies Culture: • Hanging out with other Asians • Open to making new friends • Hesitant to make first contact • Talk to already known acquaintances Other Background: • Hesitant to meet virtually • Food can be a way to connect • Open to meet and exercise
African: **Student/Worker** **Age: 17- 50**	Skills: • Fluent in English or French • Excellent use of electronic gadgets • Enjoys sports, especially football Culture: • Open Society where people come together easily • Ability to quickly make friends • Communal culture and group support system during bad times Other Background: • Have an attitude of quickly approaching people to talk. • Transfers that attitude of engaging people to new environments • Connect to new people through sports, hobbies, or food.
Finnish: **Student/Worker** **Age: 17- 60**	Skills: • Fluent in Finnish, Swedish, or English • Excellent use of electronic gadgets • Lives alone or with a partner • Enjoys Ice hockey, playing video games, going to clubs or pubs, eating out, tv, karaoke, to mention a few. Culture: • Usually reserved • Enjoys personal space • Hardly initiates conversations • Shy but friendly on getting to know people • Difficulty in making friends • Prefers to run or go to the gym

- Once intended typical actors are Identified, Understanding the context of use is crucial. The context of use means the actual conditions under which the target users will utilize service or technology developed daily. For example, this mobile application will provide information to users on activities, interests, events, and how to connect with other people; this will further help users share ideas, talk to new people, and help each other overcome loneliness and isolation. In addition, users will have meaningful social connections tailored towards their interests. There is also the possibility of meeting physically to undertake an activity that helps cement healthy friendships and relationships. Finally, the technical side of the mobile application will provide an interactive platform for connecting people quickly and flexibly.

- Finally, the design theme and purpose of the proposed technology or service and its contribution to quality life are simplified and explained. Concerning this thesis, the design theme is a mobile application used to connect people through sports and shared interests. The users will benefit from using this service because they have the intention to overcome loneliness and isolation in a relaxed way.

Concept and requirements

During this stage, it is essential to understand and determine the role that technology plays in the form of life and Rule following actions. Leikas (2009) emphasizes that technology must be developed to improve task performance in the various aspects of people's lives and support practical, hedonic needs. The ease of use, safety, reliability, and intuitiveness of technology for all users are relevant for the adoption. Therefore, a valuable and successful technology will depend on how it is applied in real life, thus showing how technology can improve the quality of life. (Leikas, 2009)

Brainstorming for alternative solutions ideas to the proposed solution is also very important (Leikas, 2009). For example, alternative solution ideas identified include:

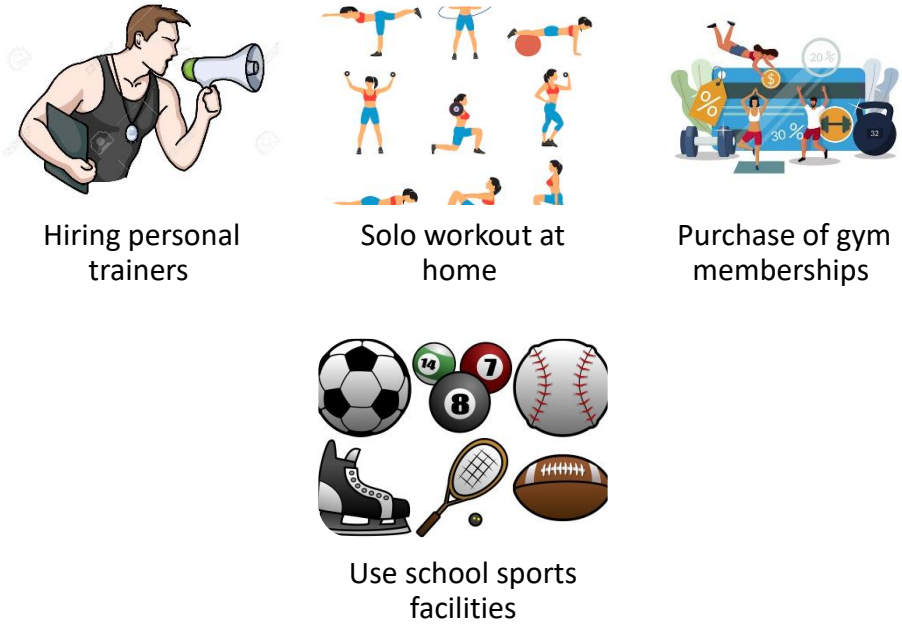


Figure 4: Brainstorming alternative solutions ideas by Leikas (2009)

The ideas from brainstorming must lead to an elaboration of possible solution models(Leikas, 2009). For instance, the targeted users have specific needs that they cannot fulfill. The proposed solution is a mobile application that will act as an intermediary and communication channel between the target users. There would be an establishment of partnerships with gyms, sports businesses, etc., who will be incorporated into the mobile application to advertise their services.

Once the concept and requirements are finalized, the research and design of User-Interface prototypes become necessary(Leikas, 2009). For this study, Figma is used to design a user interface. According to Dexter (2021), Figma has become the primary UI design tool with a use rate of 63%. The massive adoption of Figma is because of its web-based features that offer designers the ability to collaborate. Figma can be accessed anytime and anywhere, and it is compatible with all the major operating systems. Figma also offers animation capabilities, which are free to use (Dexter, 2021). The user interface will be the primary tool used to conduct interviews and modified based on the user feedback. A usability evaluation survey is necessary to understand from potential users more requirements based on how easy it is to navigate the application.

Lastly, the technical solution concept must be detailed(Leikas, 2009). In concept design, the idea is to develop a technical solution to solve difficulties or enhance

conceivable outcomes in a characterized circumstance in life. The technical solution entails the definition of people's actions backed by technology and the part of technology in realizing action goals.

The mobile application offers:

- an option for people or an opportunity to connect in distinct categories of sports or shared interests.
- Displays connection and sort by distance.
- Search based on a specific interest
- Connect random users within some distance

Each user needs an account that will be verified through email, phone number, etc.,

Fit for life analysis

This section examines the recommended planned solution and explains how it improves the user's quality of life and value using the mobile application. Ethical issues that may arise due to the proposed solution must be emphasized (Leikas, 2009).

The user's quality of life would be substantially improved for this mobile application. The technological solution would allow lonely or isolated people to connect with others while improving or learning new interests. The technology will enable people to network, connect, arrange events, and discover new sports or hobbies from the comfort of their homes. The proposed solution (mobile application) makes sense since it assists individuals in achieving some (simple) life aim. People would receive value from using this solution primarily in terms of social connection, which users achieve by making or maintaining friendships within their community.

According to Leikas (2009), whether the application fits life must be evaluated and answered. Thus, whether the application is the best possible one, how meaningful it is from the user's point of view to enhance the quality of their lives needs to be established. In this case, a mobile application is the best possible option. Mobile applications use tools that most people are already familiar with (mobile phones) as a medium for connecting them while also motivating them to enjoy the benefits of

regular exercise(sports) and learning new hobbies (shared interests). This solution fits nicely into the rule-following actions of many people. With lots of sporting facilities and events found in the city and study areas, users will find it easy to develop and incorporate new habits into their daily lives while meeting new people and making new friends. Making friends will decrease loneliness and social isolation, which would greatly help their quality of life. Adopting new habits through participating in sports and events could reduce health problems such as depression, obesity, diabetes, etc. (Plante et al., 2011).

The last point in this section is to answer the ethical questions (Leikas, 2009). A mobile application's possible ethical questions will be security and privacy issues, including privacy settings, the handling of personal information, etc.

Innovation design

Leikas (2009) elaborates on innovation design in the last stage of life-based service design. Innovation design involves the creation of a use culture of the proposed technological solution. This stage also needs to describe the infrastructure, marketing solutions, maintenance plan, and life-span plan.

For example, this mobile application would offer users the ability to create communities through social connections through sports and shared interests. Again, the mobile application would create an experience through gamification, which would make them enjoy using the application and, in so doing, keep them coming back. Lastly, the emotional, physical, and psychological benefits gained through the application will significantly be critical to the use culture. The infrastructure would have a client-side (Front-end, mobile phones, etc.) and a server-side (Back-end such as APIs, etc.). Maintenance will be done according to the feedback gained from users. The maintenance will be in regular updates and developing new ways for users to build and keep connections.

In conclusion, life-based service design is a comprehensive way of researching and developing technologies or services that will enhance the quality of life of its users. It involves a greater understanding of the intended users, how they behave, their

actions, what they want to feature in the proposed service or design, how it fits into their daily lives, and the best possible solutions.

2.5 User-Centered Design (UCD)

User-Centered design involves a multidisciplinary design technique focused on active user participation to increase understanding of user and task requirements and design and evaluation iteration (Mao et al., 2005). Norman and Draper introduced the concept of user-centered design (UCD) (Norman and Draper, 1986). The earliest application of user-centered design was in the field centered on computer design usability to assist consumers in learning how to use a product efficiently with minimal effort (Kwon and Remøy, 2021). Kwon and Remøy (2021) indicate that the concept of UCD requires proof that the design of an artifact is meaningful and therefore does not encourage designs based on personal perspectives. In other words, UCD encourages user evaluation when artifacts are being designed.

Initially, designs of artifacts heavily depended on the designers' ideas and considered users only from the designer's perspective. The concept of UCD puts the user at the center of the design process (Abras et al., 2004a). Therefore, the designer puts the user's interests and needs at the center of the design of products and services. Chammas et al. (2015) cite that UCD helps increase how users accept and use a product or service and their overall user experience.

Further, Chammas et al. (2015) state that UCD improves the efficacy, well-being of humans, accessibility, and sustainability of the designed systems. UCD considers the various implications that the systems designed will have on its users' health, safety, and performance. Norman (2012) states discoverability and understanding are the two most important characteristics of a good design. According to Norman (2012), discoverability means figuring out the actions and how to perform those actions. Understanding is knowing the product's meaning, usage, and clarity of the controls and settings within the design.

According to Norman (2012), the speed of technology has outpaced the current design methods. Design methods are evolving due to the increase in new

technologies and applications. The evolving nature of technology and methods means earlier challenges in the older design forms still exist and require a new approach. Norman (2012) suggests Human-Centered Design (HCD) as a new approach to solving the challenges in design methodologies. HCD is about putting the human needs, capabilities, and behavior first and designing products and services to meet those needs, abilities, and behavior (Norman, 2012).

Further, Norman (2012) indicates a good design begins with understanding psychology and technology. Communication between the product and its users is also essential for good design. The user must understand the actions involved when using such a product or service. HCD involves a profound understanding of people and their needs that the intended designs want to meet. For example, various research has established that Loneliness and isolation are significant problems affecting people of all ages, gender, and cultural settings. To develop an artifact or a technology to help people deal with a problem, there must be a deep understanding of people's feelings, views, and actions when they feel lonely or isolated.

Analyzing both UCD and HCD, one can conclude that both concepts consider users' needs, preferences, expectations, motivations, and emotions when designing a product or service. Abras et al. (2004) highlight identifying the users and their roles in the design process. After identifying the users and researching the user needs, the designer can develop design solutions that users can evaluate. The design solutions are in the form of wireframes or mockups, which the users can interact with, assess, and give feedback on their expectations and needs of the design.

According to User-Centered Design Basics (2017), UCD provides the phases throughout a design and development life cycle to better understand the product's user under development. Further, the creation of a product is predominantly based on understanding the user, tasks, and environments.

User-Centered Design Basics (2017) provides general phases of the UCD process in the table below.

Table 2:UCD Phases

Phase	Description
Specify the context of the use	• Identify users • What the product will be used for • Conditions of use
Specify Requirements	• Identify business requirements • Identify user goals to be met for a successful product
Create design solutions	• Create wireframes or prototypes
Evaluate designs	• Conduct Usability testing with users

In conclusion, User-Centered Design helps understand what intended users need emotionally and psychologically when developing or designing an application, service, or product. The inclusion of users during the design and development cycle is relevant in creating fit-for-purpose and fit-for-use products that are more efficient and will improve the users' quality of life. Developers can also manage their expectations since they know users' expectations through their feedback.

2.6 Research and Analysis of Similar Mobile Applications

Some mobile applications that offer services close to what is proposed by this thesis are as follows:

Meetup: This mobile application connects and allows people to search for others who enjoy your interests within a mile radius, but it charges by location, and so far, it's not that popular. Meetup had 8 million users in 2010, which rose to 25.5 users by 2013. However, it suffered a hacking incident in 2014. WeWork has acquired it since 2017 (https://www.meetup.com/)

Vingle: This application only offers the opportunity to talk to someone without meeting even though the application is interest-based. Vingles allows access to communities where users can follow others based on their interests similar topics. Users can sign in on web applications as well.
(https://www.vingle.net/users/sign_up)

Foursquare Swarm: This mobile application allows users to share their location with friends and create a profile of their experiences. Users can make databases of places they have visited to share with others. This application does not offer the ability to meet in person and undertake activities together. (https://www.swarmapp.com/)

Friender: This mobile application allows users to choose activities they are interested in, and suggestions are made for users who match with at least one favorite activity. The application is free to download but includes monthly VIP subscriptions of $6. (https://frienderapp.com/)

All the mobile applications mentioned above help users connect to create friendships. Compared to what this thesis proposes, the problem is that most of these applications have hidden costs. Users must pay to access certain features, which prevents users from using them, defeating the whole purpose. Though they have attracted some users, these mobile applications are not generally favored.

This thesis proposes a mobile application that has all features free for users. Users will meet in person, perform activities, share their experiences, and gain points through gamification. The idea is to encourage users to be more active and have positive experiences to help them mentally and physically. The table below shows the differences in the proposed mobile application and similar applications

Table 3: Differences between the proposed mobile application and similar applications

Proposed Mobile Application	Similar Mobile Applications
• Free features for Users • Focus on creating a positive experience • Employ Gamification techniques • Focus on sports and healthy living • Encouraging social and physical activities	• Paid features for users • No gamification features • Not all encourage meeting in real life • Not a lot of focus on sports or healthy living

2.7 Assumptions of this thesis

User-centered design and Life-based Service design suggest that developers understand their users' emotions and psychological needs. Understanding the requirements will help developers create solutions that users can be happy about and enhance their quality of life.

Loneliness and isolation are emotional and psychological problems that affect people of all ages. Solving this problem means people must be able to find meaningful relationships. People create relationships when they meet or get to know people, they can associate with to have the same interest through sports, hobbies, etc.

This thesis assumes that people will make new friends through this application, decreasing their loneliness and isolation. Secondly, this application will help people become more socially and physically active through their connections. The application will also improve the quality of life of the users. The figure below describes the assumptions of this thesis.

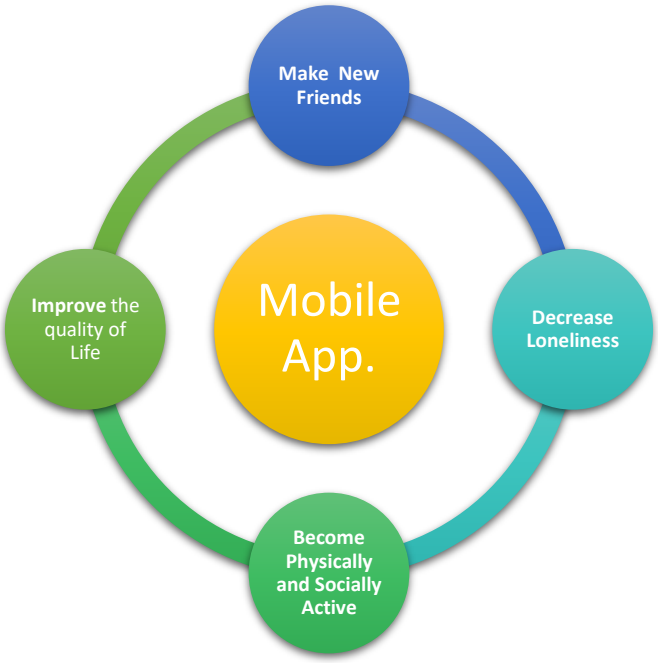


Figure 5: Assumptions of the thesis

3 Research Method

3.1 Research Design

This thesis aimed to help reduce loneliness and isolation by developing a mobile application that connects people to sports and shared interests. Mixed methods research design was the data collection method to understand potential user emotions, psychological state, needs, and expectations in developing the mobile application. Creswell (2014) defines mixed methods as combining qualitative and quantitative research and data in a research study. The quantitative data comprises closed-ended questions such as those found in questionnaires or psychological instruments, whereas qualitative is more open-ended with no pre-determined responses (Creswell, 2014). Further, Creswell (2014) explains that mixed methods allow the researcher to assume that diverse data collections clearly understand the problem under research than using either qualitative or quantitative research methodologies. In using mixed methods, the researcher starts with a broad survey, which helps generalize the results to a population and focuses on qualitative interviews to gather detailed opinions from respondents to explain the quantitative data collected.

3.2 Quantitative Research

Quantitative research explains phenomena using numerical data analyzed using mathematically-based methods, particularly statistics (Yilmaz, 2013). The quantitative analysis tests theories by examining the relationships between variables. The use of quantitative methods emphasizes the measurement of changes in a phenomenon or a situation (Kumar, 2018). Data collection methods involved in quantitative methods include surveys and experiments (Creswell, 1994). Yilmaz (2013) explains quantitative approach enables researchers to measure participants' responses to a limited set of questions, allowing them to compare and analyze data using statistical tools.

3.3 Qualitative Research

Hitchcock and Hughes (2002) explain qualitative research as allowing researchers to study first-hand the social world they are investigating through involving and participating in that world, focusing on what individual actors say. In other words, qualitative research investigates what and how people think, feel, and make sense of their environment and experiences. Yilmaz (2013) also defines qualitative research "*as an emergent, inductive, interpretive and naturalistic approach to studying people, cases, phenomena, social situations, and processes in their natural settings to reveal in descriptive terms the meanings that people attach to their experiences of the world*."

Qualitative research does not involve numerical data collection; instead, it involves non-numerical data such as text, video, or audio. Methods of gathering qualitative data include observations, Interviews, Focus groups surveys.

3.4 User Experience Evaluation Survey

User Experience is defined by Pallot and Pawar (2012) as *" a notable usage event or activity that the user memorized as a reference to this kind of situation and context in which it has occurred."* The definition above means that user experience combines the opinions and feedback of users who can understand, navigate, and interact with a product or system under development or already developed. To understand and collect the opinion and feedback of users, the user experience evaluation survey is a tool that enables developers to know what users think, feel, and like about their product or system and know what to change to ensure users are happy when using the system. This survey usually combines qualitative and quantitative questionnaires to help collect numerical and text data for analysis.

3.5 Sampling

During the data collection, people of all ages, gender nationalities living in, and outside Finland participated in the study. Convenience and Snowball sampling were the main sample designs adopted. Convenience sampling is choosing participants of

the study based on their proximity to the researcher (Acharya et al., 2013). The investigation started with convenience sampling to reach respondents who lived in Jyväskylä since they were easier to get to answer the survey. The respondents in Jyväskylä were encouraged to recommend and share the survey to friends and family across Finland. Respondents recommending and sharing the study prompted the snowball method. Snowball sampling means the researcher uses probability or non-probability to choose respondents, and then the selected respondents refer the survey to other people(Acharya et al., 2013). The survey was distributed through social media and instant messaging applications WhatsApp, Facebook, and Microsoft Teams. The participation was voluntary, and there were no gifts or vouchers used to attract respondents as a means of motivation.

3.6 Data Collection

Data collection started in September 2021 and ended in December 2021. The data was collected using Google Forms. The study used google forms because it is a free online tool that helps researchers gather data quickly and efficiently. It only requires having a Gmail account, and the interface is easy to use. Google forms also store the feedback and gives numerical data a graphical representation. It is also integrated with a spreadsheet, making it easier to quickly export and analyze the data. Sharing the survey on various messaging platforms was very easy and helped reach a larger audience.

The population sample consisted of people of all ages, gender, and nationalities living in and outside Finland. This sample population was ideal since the problem of loneliness and isolation cuts worldwide.

3.7 The Survey

The data collection consisted of four (4) sets of surveys. The first was the Loneliness and Isolation survey, the second was a Focus group interview, the third was the User experience evaluation survey, and a final Focus group interview to polish and improve the mobile application.

3.7.1 Loneliness and Isolation Survey

The study conducted this survey to understand the following:

- How people feel about the problem of loneliness and isolation.
- How it affects them and their daily activities.
- Whether respondents are willing to use a mobile application to change their situation.

In effect, this survey was to help validate the idea of whether a mobile application to connect and meet new people who shared similar interests was needed. UCD principles require the designer to validate the concept through surveys.

The division of the survey consisted of three (3) main sections. The table below shows the areas.

Table 4: Sections of Loneliness Survey

Section 1	Section 2	Section 3
Background information: Date (completion of the form), Gender, Age, and Status.	Emotional and psychological responses: feelings and perceptions of loneliness and isolation within their communities.	Data on whether respondents were willing to use a mobile application as a tool to: a) connect and meet people who share similar interests. b) To help reduce their feelings of loneliness and isolation.

This survey combined both qualitative and quantitative data collection methods. Section 2 of the survey collected quantitative data from respondents, while section 3 collected qualitative data as part of section 2. Google forms was the primary tool used to design this survey.

3.7.2 Focus Group Interview

After validating the idea through the loneliness and isolation survey, prototyping the mobile application began using Figma. Respondents evaluated the prototype during this survey to get feedback on their thought about the design. This focus group interview collected qualitative and quantitative data, and no background information was collected. Respondents had to give explanations to every quantitative question answered. The survey mainly concentrated on gathering data on the UI design, attractiveness of the design, navigation of the application, ease of use, suggestions on what to change and add, and recommendations from users. This survey was conducted by sharing the design and asking respondents to share their opinions. The respondents who participated in this focus group interview were sampled through convenience sampling from the initial loneliness survey. These respondents were chosen because they were in Jyväskylä thus were easy to reach. The design was not interactive during this data collection round. The primary tool used to design the survey was google forms. The table below captures the Quantitative and Qualitative data collected.

Table 5: Focus Group Interview

Quantitative	Qualitative
• Rate Attractiveness of UI • Navigation of the application • Ease of use	• Opinion on UI design • Suggestions on what to change and add • Recommendations from users

3.7.3 User Experience Evaluation Survey

Based on the feedback received from respondents in the first focus group interview, the data showed a need for the prototype to be modified. After the modification, there was a need to develop a user experience evaluation survey to get more feedback from respondents on the improvement and new features. The UX model and Correlated Bipolar Survey were used to design a new survey to collect further

data on the mobile application. The survey was divided into six (6) themes, as Pallot and Pawar (2012) suggested. The themes are explained in the table below

Table 6: User experience Survey themes

Themes	Explanation
Emotional experience	Focusing on the attractiveness of the mobile application
Economic experience	Focusing on Usefulness and Pleasantness of the mobile application
Technological experience	Focusing on Friendliness, Efficiency, and Reliability of the mobile application
Interpersonal experience	Focuses on how influential, collective, and helpful the mobile application is
Ethical experience	Focusing on the Security of the mobile application
Sensorial experience	Focuses on respondents' perception, visibility, and recommendations

Google forms was the primary tool used to design the survey. Included in the questionnaire was the Figma link for respondents to view, interact with the mockup, and answer the survey. The mockup in Figma was interactive and allowed respondents to feel and use the application.

3.7.4 Final Focus Group Interview

Modifications made to the mockup due to the feedback from the User Experience evaluation survey meant there was a need to conduct a final focus group interview to verify from respondents how satisfied they were with the improvements made. Microsoft teams were the tool used to conduct online interviews of respondents. The respondents received the link to Figma through teams, and as they interacted with the mockup, there was a question-and-answer session. The questions fell under Four (4) sections. The table below shows the sections and related questions:

Table 7:Sections of Interview

Sections	Questions
Usability and System Performance	*"What do you think is the most important thing to be fixed?".*
Interaction Design	*"Does the navigation make sense?"*
Visual Design	*"If anything, what could be done to ensure that you use this system frequently?"*
Content Understanding	*" Is there any content you would like to see offered"?*

The interview was recorded and analyzed to get feedback. Also, handwritten notes were taken to compare with the recorded interview to check for any missing feedback.

3.8 Ethical Considerations

Following the ethical principles of JAMK University of Applied Sciences, the ethical issues that this thesis considered were on the privacy and confidentiality of respondents' information. The surveys made it clear to respondents that there was no requirement for personal information such as name, email, and phone number. This clarity emphasized how respondents' anonymity was paramount during data collection. Data collection was inclusive and diverse. This thesis followed the rules on citations of works by researchers.

4 Data Analysis

This section analyses and discusses the results from the data collected. The analysis includes data collected from the Loneliness and Isolation survey, Focus Group Interviews, and UX Survey

4.1 Loneliness and Isolation Survey

This survey aimed to validate the idea of a mobile application. The purpose of the study was to achieve the following:

- How people feel about the problem of loneliness and Isolation.
- How it affects them and their daily activities.
- Whether they are willing to use a mobile application to change their situation.

The first part of the survey collected the background information of respondents. A total number of 54 respondents participated in this survey. Below are the results.

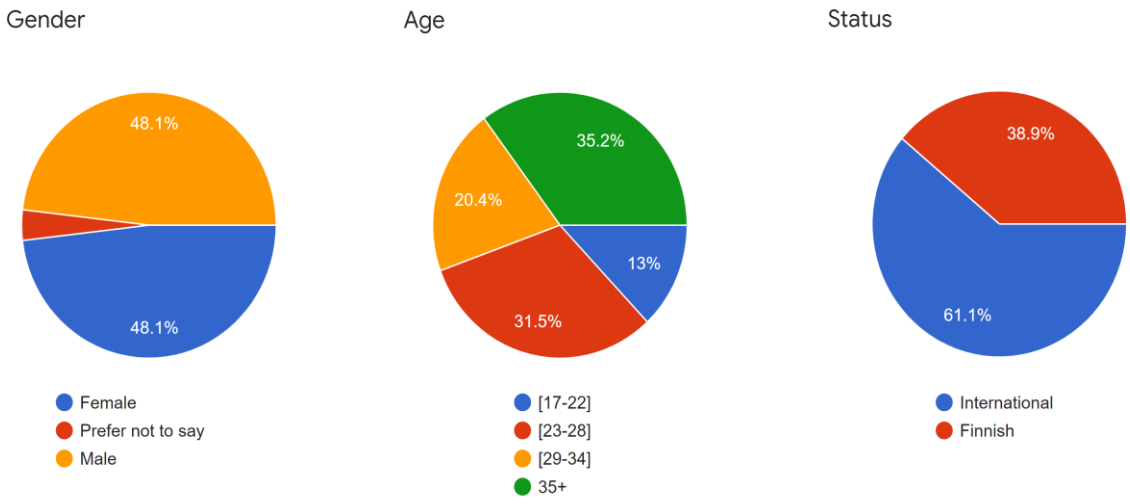


Figure 6: Background Information

The figure above shows the inclusive nature of participants in the survey. In terms of gender representation, the data showed an equal representation of both males and females. A small number did not disclose their gender since the survey was

anonymous. The survey also collected data from respondents of all ages, and respondents were from diverse backgrounds. The international respondents consisted of foreigners living in Finland and outside Finland.

The second part concentrated on respondents' emotional and psychological views on loneliness and isolation. The data collected was both qualitative and quantitative. The quantitative analysis is as follows.

The questions required respondents to answer if they felt connected in their communities, rate their feelings of connections, and then if they had experienced loneliness within the last two years. And the result is shown below.

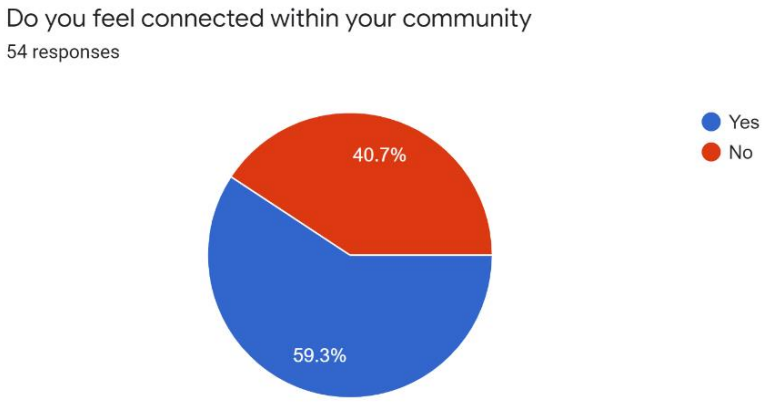


Figure 7: Connection in the community

In the figure above, respondents answered if they felt connected within their community. 59.3% responded they felt connected within their community. The number suggests these respondents thought they had some form of meaningful, intimate, and pleasant interactions with people within their social environment, as described by (Seppala et al., 2013). On the other hand, 40.7% responded they did not feel any connection within their communities. The data means such respondents do not have any belonging or interactions within their community. The data shows a worrying trend when such a high percentage of people do not feel like belonging within their community.

Cacioppo and Patrick (2008) explained that having close relationships helps create a healthy lifestyle. Also, belonging through relationships and interactions is deeply

rooted in human needs. The absence of such a human need of belongingness creates isolation loneliness.

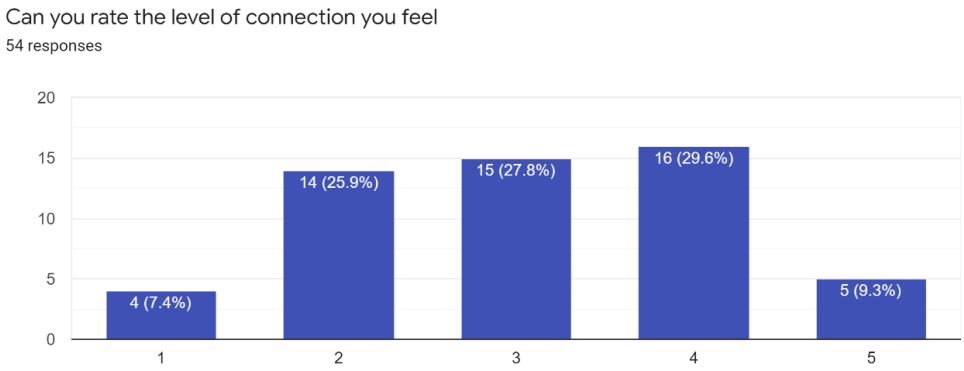


Figure 8: Rating of Connection

In the figure above, respondents were asked to rate the level of their connection through a linear scale of 1-5, with one (1) being Low connection and (5) five being high connection. 33.3% of respondents rated their connection level between 1 and 2 on the scale representing that their links to their communities were shallow. 27.8% rated their connection level as 3, meaning they felt their connection as moderate, while 38.9.% rated between 4 and 5, representing a high rate of connection. Compared to Figure 4, this data showed some mixed feelings. The question in figure 4 offered only two options, which clearly showed how respondents felt about their relationships with others in the community. In this case, though a sizeable number of respondents indicated they felt a low connection rate, those who felt a moderate connection or were in the middle were relatively high. The data suggests that though some respondents thought they had made meaningful relationships, they were unsure if those relationships were deep enough to last and satisfy their need to belong to a group or social environment. Therefore, such people will still need to find a wide range of people they can connect with and create longer-lasting bonds.

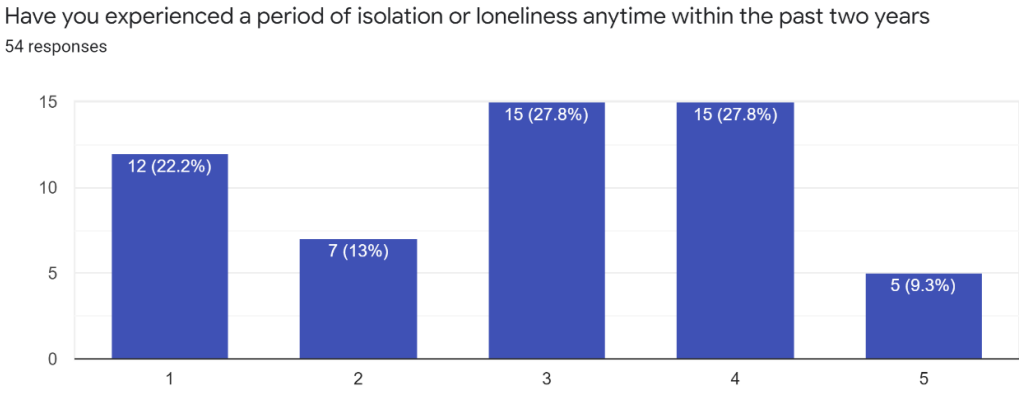


Figure 9: Loneliness experience

Respondents rated between 1-5 if they had experienced a period of loneliness and isolation in the past two years. One (1) on the scale represents Rarely lonely, while Five (5) represented lonely almost every day. The breakdown of the data showed that 35.2% of respondents rated their loneliness experience between 1 and 2, meaning they rarely experienced loneliness in the past two years. 27.8% of respondents rated their experience as moderate, meaning they had a mixed experience. Those respondents had days they felt lonely and did not feel lonely. 37.1% of respondents rated their experience between 4 and 5, representing an experience of feeling lonely almost or all the time. With respondents experiencing either moderate or high levels of loneliness, a deep-rooted problem where people lack deep personal relationships for various reasons has been exposed. These reasons may include moving to a new place, low self-confidence, old age, or breakdowns in relationships as described in the definition of loneliness by this thesis. Feeling lonely leads to isolation, and the implications on their mental health are detrimental.

Respondents were further asked if they were willing to use a mobile application to connect with people for sports and other interests to help reduce their feeling of loneliness, and the results are as follows.

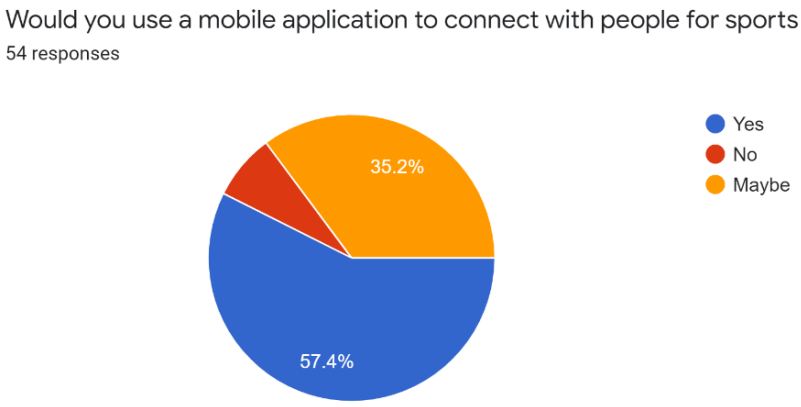


Figure 10: Mobile Application Use

As the data shows in Figure, 57.4% of respondents were affirmative to the idea of using a mobile application to connect with new people to do sports and share interests. 35.2 % responded to the option of maybe using a mobile application for such purposes, while 7.4% responded no to using a mobile application for connection. The responses validate the need and the idea of developing a mobile application as a tool to help people connect and perform activities together. Such a tool will help reduce feelings of loneliness and isolation and create long-lasting bonds and relationships.

Assumptions: making new friends, decreasing loneliness and isolation, and making people socially and physically active through the mobile application are valid.

Qualitative analysis

The qualitative data collected was in line with the questions asked in the quantitative data to understand why respondents offered these answers. Content analysis was the method utilized to analyze the data. According to Elo and Kyngäs (2008), content analysis helps analyze data in a condensed and broad description of the researched problem. The content analysis produces concepts or categories that help describe the research problem. In this case, the study will understand respondents' perception of loneliness and isolation through content analysis and illustrated in world clouds.

Below are the responses:

Rating of Connection

Respondents answered why they rated their connection level as represented in Figure 8 on a scale of 1-5 (1 -Low connection, 5 High Connection). All the responses are grouped into reasons for high and lower connection levels. The table below summarizes the reasons.

Table 8:Rating of Connection

Reasons for high connection level	Reasons for lower connection level
• I participate in activities and feel like I have access to the services and free-time activities I need. • I have many friends and good relationships with people here in Jyväskylä. • I try to engage in activities that allow me to be connected • I have friends who live near me • I get involved in certain activities in my community. • I can get information from everywhere and get along with everyone • I feel safe and appreciated in the community. • I feel energetic through social interactions • I am connected to mostly foreigners • I live and interact well with people around me • I feel like I'm part of the community, but sometimes I still feel lonely.	• It's hard for me to feel a connection with anyone or any community. • I do not have many interactions with community members. • I haven't been in touch with any meaningful community for me. • There is no support system available, and everyone struggles with the same problems. • Connected mainly through activities but not friendships • I do not feel part of the community • I have not added any new social contacts to my network from my community in several (4+) years of living in the same place • I have friends, yeah, but I would not say I am part of any community per se. • It is sometimes hard to get connected to Finnish people. • I don't understand most of the things said around me, am unable to read my mails

	in Finnish, and have a job that allows me to use my skills. • No such community exists. • I feel life in Finland is somewhat lonely compared to past experiences. • My neighbors are not so friendly • Lack of information where I can find people with the same interests • I am new to Jyväskylä (been here for two weeks), so I would like to be more integrated. • Because I'm not a Finn • People in the community and I don't socialize well enough

These responses provided a deeper understanding of how respondents felt and associated with their communities. As some were satisfied with how they interacted with their communities, others were not due to reasons like location, language barriers, culture, inability to connect to people, and lack of information, to mention but a few.

The number of respondents varied when expressing their feelings described in the word cloud. Not all respondents gave answers, and the table below shows the number of respondents according to each word cloud description.

Table 9: Number of Respondents per word cloud

Total Number of respondents	Loneliness Experience	Change Lonely State	Activities when lonely	Lonely	Connected	Activities for Connection
54	50	48	51	45	45	50

Loneliness experience

Respondents expressed how they felt when they did not feel connected to people. The common sentiments expressed by fifty (50) respondents are in the word cloud below.

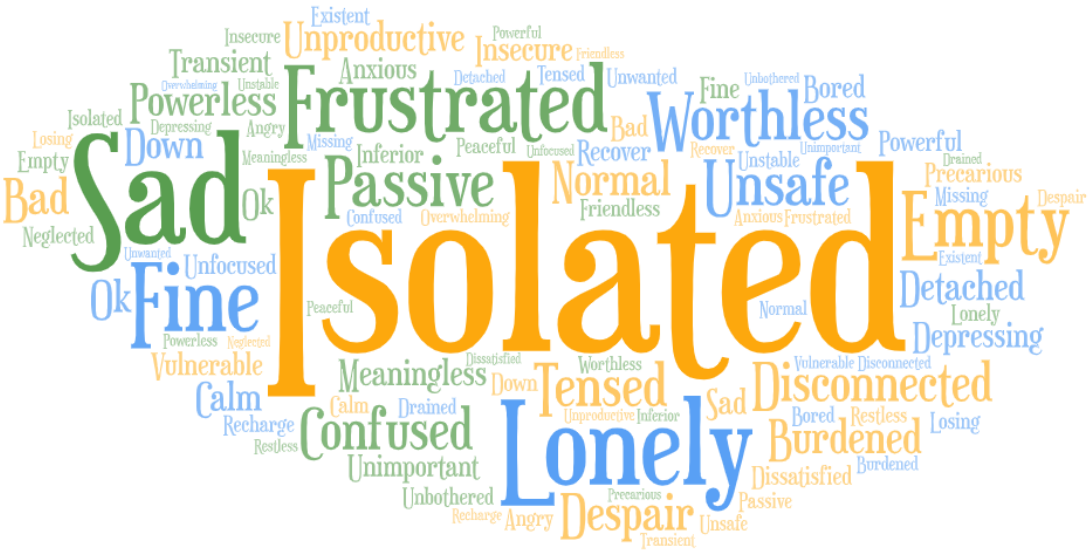


Figure 11: Loneliness Experience

As described in the Figure above, isolation was a primary concern for respondents when they did not feel connected to their communities or people. Some other concerns expressed by respondents include feeling frustrated, sad, passive, unsafe, empty, confused, powerless, worthless, detached, and depressed, mentioning a few. Others expressed positive feelings about not feeling connected. They described the situation as being ok, acceptable, peaceful, calm, and as a time to recharge. However, the majority expressed many negative feelings when they did not have meaningful relationships within their communities or environments. It is, therefore, necessary to create a community where people feel part and can find and maintain relationships that satisfy their needs.

Changing Lonely State

Respondents expressed their opinions on whether they wanted to change their state of loneliness and what they would do to change it. The most common suggestions to how forty-eight (48) respondents would change their lonely state are in the word cloud below.

Figure 12:Change Lonely Sate

In the Figure above, the data shows that respondents feel that social events, activities, hobbies, therapy, sports, friendships, and meetings are the best ways to change their state of loneliness. The responses align perfectly with Plante et al.(2011) that adopting new habits through participating in sports and events could reduce health problems such as depression, obesity, diabetes. This data further suggests that most respondents are willing to get out and meet new people to create long-lasting relationships through participating and engaging in social events and activities such as learning a new hobby or sports.

Activities when Lonely

Fifty-one (51) respondents also answered activities they perform when they feel lonely. The most common activities mentioned by respondents are in the figure below.

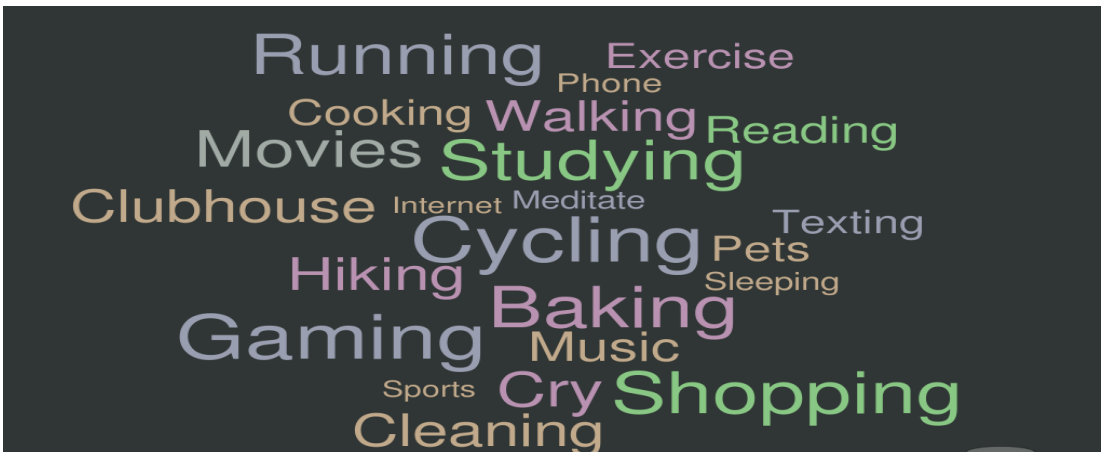


Figure 13:Activities when lonely

The Figure above describes the activities that respondents undertake when feeling lonely. Activities like hiking, clubhouse, meditation, walking, running, cycling, sports, exercise, reading, watching movies, listening to music, sleeping, cooking, and shopping, to mention a few, mainly were cited by respondents as activities that keep them busy during lonely times. The mention of crying from some respondents was fascinating because it reveals their deep-seated emotional traumas due to not having people to connect with and create relationships. Most respondents also think pets are essential options to help them during their lonely periods.

A memory of Feeling Lonely or Connected

Asked to remember moments they felt lonely or connected, forty-five (45) respondents gave several times and periods to suggest both situations. The data is in two sections, lonely and connected.

Lonely

Figure 14: Moments of Loneliness

As described in the Figure above, most respondents recalled the lockdown related to the pandemic as the period they felt very lonely. The suggestion is because they could not go out and meet friends. Weekends, winter, and Christmas seasons were periods people felt lonely. From inference, loneliness during winter and Christmas affects mostly immigrants and international students because they are far away from

their families and cannot see them. Since their social connections are low, they feel lonely and vulnerable. Others recalled feeling lonely when their friends slighted or overlooked them by not inviting them to some gathering, they attended. When people are ignored by their friends, it creates a notion of not being accepted by their peers. Such people begin to feel lonely and isolated. Others also mentioned going through their day without anyone asking how they were doing and, as such, felt no one cared about them as such, prompting the feeling of loneliness within them.

Connected

Figure 15: Moments of Feeling Connected

As an additional requirement, Respondents were to remember a time or moment they felt connected. The figure above gives a clear indication of such moments. Forty-five (45) respondents cited being on holidays with friends and family, visiting, meeting people at social events, church events, work, having birthday parties, meeting classmates in school. Others also mentioned attending sporting events, communicating with people, barbeques in the summer as some of the moments they felt connected to people and their community. They described their mood as happy, relieved, entertained, and having a space to talk and share their feelings. These responses affirm the point by Cacioppo & Patrick (2008) that the need for social connections in humans has deeper roots and people are much happier when they make meaningful connections with people in their communities and environments.

Activities to help get connected in the community

Fifty (50) respondents suggested activities they would engage in to help them get connected within their community. The suggestions are in the figure below:

Figure 16: Activities to Connect

The survey further asked respondents to suggest what in their opinions are the activities that will help them get connected. Respondents believed that events like art, sports, games, hobbies, handcrafts, celebrations, and interactions, to mention a few, will make them feel connected and happy within their communities. These views were that such events and activities are community-based, and there is always the possibility of meeting new people who have the same passions and interests. They can create and maintain friendships through meeting people, which will eventually help reduce their lonely feelings.

Mobile Application

As follow-up answers to Figure 10, respondents expressed their views on why they would or not use a mobile application to connect with people. The summary of responses is in the table below.

Table 10:Decision to use or not use a mobile application

Use Mobile App	Not Use	Might Use
• Easier to connect with people • Very Convenient • Learning from others • Sharing experiences • Well-designed UI • Getting people to do activities • Bringing people together • Feeling of belonging • Finding people with common interests • Breaking barriers such as shyness • Expand my knowledge on new things	• No application of this nature. • Communication by the mobile application does not provide the sort of connections I crave in a community. • People on mobile apps may not be honest or likable in real life. • Not interested in sports • Connections made online do not fulfill me • I use Facebook groups	• I may not need it because I make friends quickly. • I may try since it is related to sports. • I may not have the courage to try this application. • It depends on what can be achieved through the application. • I like face-to-face meetings.

Many respondents were willing to use the applications from these responses; some were skeptical about using the application. It is worthy to note that such skepticism about using a mobile application to connect with people may be due to trust issues, low self-confidence, and uncertainty about how the designed application can help them meet and create meaningful relationships.

Assumptions: making new friends, decreasing loneliness and isolation, and making people socially and physically active through the mobile application are valid

Suggestion for Connections

Respondents gave suggestions on ways to connect. The feedback is grouped into 3, namely Community based activities, Events, and Sports. The table below contains the summary of various responses.

Table 11:Ways to Connect

Community-based activities	Events	Sports
• NGO and voluntary based activities for likeminded people • Be open and talk to everyone you see. • Physical connections at Church **and** School • Volunteering in different places • Join an association • Social media groups • Building/neighborhood communities • Safe groups with free admission and easy access • Regular visits	• Concerts • Take an active role in joining events • Weekend trips • Free time club • Work Events • Join clubs of common interest • Online communities • Partying together • Festivals and outdoor social events	• Team sports outside • Games • Gaming platforms

From the category of community-based activities, most respondents believed that volunteering, joining an association, church, school to mention a few where they get to interact with new people physically, was an excellent way to make connections. Others also felt that openly engaging people in conversations and visiting neighbors and friends regularly was very effective in building friendships and creating relationships.

In the events category, respondents believed that festivals, concerts, parties, trips, and social meetings created conducive ways to connect with people. There were other exciting suggestions like free time club and joining clubs of common interests. The two proposals mean respondents will be happy to meet and perform activities with people they share common interests through sports or hobbies to build friendships.

Concerning sports, performing team activities through games was a significant suggestion. Others also believed online gaming communities were an option.

4.2 Focus Group Interview

Following the Loneliness survey, Figma was the tool used to develop an initial mockup design of the mobile application. A focus group interview of 6 respondents was used to collect data. These respondents were sampled from the loneliness survey through convenience. Though no background information was required, the respondents were diverse. Respondents evaluated the design of the mockup to gather feedback on their opinions. The survey mainly focused on the UI design, Navigation, Ease of Use, Suggested Changes, Suggested Additions, and Recommendations. All figures in the quantitative feedback are attached in **Appendix 5**. The quantitative breakdown of the results are as follows:

Quantitative Feedback

UI design:

Respondents rated between 1-5, with one (1) presenting Not attractive and five (5) very attractive. Four (4) out of six (6), representing 66.7%, rated the initial UI design three (3), meaning they found it somehow attractive. Two (2) respondents representing 33.3% rated the UI four (4), suggesting it was attractive. This data meant that there had to be a lot of improvement in the UI design.

Navigation:

Respondents evaluated if the mobile application was easy to follow. Four (4) out of the six (6), representing 66.7%, indicated that the application was easy to follow and navigate. Two (2), representing 33.3%, responded maybe, indicating these respondents were not entirely convinced of navigation, and therefore more work is needed on the navigation of the application.

Ease of Use:

Respondents evaluated if the mobile application was easy to use. Four (4) out of the six (6), representing 66.7%, indicated that the application was easy to use and navigate. Two (2), representing 33.3%, responded maybe, indicating some respondents did not find the application easy to use

Suggested Changes

Respondents evaluated if there were some changes, they wanted. Two (2), representing 33.3% each, responded yes, no, and maybe, indicating a split in responses on whether changes should be made in the design of the mobile application.

Suggested Additions

On suggested additions, 50% believed that some additions could be added to the application, while 16.7% indicated no additions. 33.3% of respondents were not sure if the application needed additions.

Qualitative Feedback

Respondents expressed their views on the various questions based on the data collected. The table below contains the views expressed. The number of Respondents was Six (6).

Table 12:Qualitative Feedback

UI design	Suggested Changes	Suggested Additions	Recommendations
Easy to use Good Idea Great Simple	More Color Dropdown Select option Add text to Icons Selection Page looks Confusing	Find and Invite Friends Word Blurring More Color for Interests Improve pages since they look boring Creating customized events Events for selected people (private/non-public events)	Create a more interactive mockup

The feedback from table 2 above helped make the necessary improvements to the mobile application design. After the changes, there was a need to conduct a user experience survey to gain more feedback for further updates.

4.3 User Experience Evaluation Survey

To collect feedback on the updates made to the mockup of the mobile application, a UX model and Correlated Bipolar Survey were designed. Seven (7) respondents participated in this survey. Respondents rated the application on a scale of 1-5.

The survey fell under six (6) themes, and the feedback is as follows. All figures of the quantitative feedback are attached in **Appendix 6.** Firsts, the quantitative feedback:

Emotional experience:

Under this theme, evaluated the attractiveness of the applications based on the modification. The responses are as follows:

The attractiveness of Mobile Application

Respondents evaluated the attractiveness by rating from 1-5, where one (1) is unattractive and five (5) very attractive. Two (2) out of the seven (7) representing 28.6% thought the application was somehow unattractive. Two (2) more, representing another 28.6%, believed the application was somehow attractive, while one (1), representing 14.3%, thought the application was beautiful. Finally, two (2), meaning another 28.6%, believed the application was attractive.

Economic experience:

The usefulness of the mobile application

Under this theme, respondents evaluated by rating between 1-5 if the application is useful to their needs. One (1) representing not useful, and Five (5) represents very useful. Two (2) respondents, 28.6%, rated the usefulness between 1-2, meaning they did not see the application useful. Five (5) respondents, 71.5%, rated the usefulness between 4-5, meaning they believed the application would be useful and meet their needs.

The pleasantness of the mobile application

On a scale of 1-5, respondents evaluated if they were satisfied or enjoyed the application's design, view, and use. Two (2) representing 28.6% rated between 1 and 2, meaning they did not find the application pleasant. Another Two (2), representing 28.6%, believed that the application was somehow lovely but needed more work. Three (3) respondents representing 42.9% rated the pleasantness of the application between 4 and 5, meaning they were satisfied with the design, view, and use.

Technological experience

The friendliness of the mobile application

On a scale of 1-5, respondents evaluated the application's design as user-friendly. Three (3) respondents representing 42.9% rated the friendliness of the applications between 1 and 2, meaning they thought the mobile application model was too complex. One (1) representing 14.3% believed the design was somehow friendly but needed more work. Further, three (3) respondents representing 42.9%, rated pleasantness between 4 and 5, signifying the application was easy to use and understand.

The efficiency of the mobile application

On a scale of 1-5, respondents evaluated the efficiency of the application design. Two (2), representing 28.6%, took the position that the application was not engaging, and many improvements were needed to ensure usage was efficient by rating it a 2. A further Two (2), 28.6%, were somehow convinced with the efficiency in the design with a rating of 3 and three (3) rated 4, indicating they were of the view that the efficiency was good.

The reliability of the mobile application

Respondents evaluated the reliability of the application on a scale of 1-5. Two (2), 28.6%, of respondents offered a rating between 1 and 2, suggesting they don’t believe the application can work correctly without defects or downtime. Three (3),42.9% rated reliability 3, meaning more improvements to convince them of a

defect-free application. Two (2) respondents, 28.6%, rated reliability as a 4. The ratings indicate there need to be significant improvements and updates.

Interpersonal experience

How influential is the mobile application?

Respondents evaluated how influential the application is on a scale of 1-5. Two (2), 28.6%, of respondents, offered a rating of 1, suggesting they don't believe the application will positively influence users. Four (4),57.1% rated reliability 3, meaning the application has some potential to influence the users positively. One (1) respondent, 14.3 %, rated the influence of the application on users as a 4.

The collectiveness of the mobile application

Respondents evaluated how collective the application is on a scale of 1-5. Three (3), 42.9 %, of respondents offered a rating of 2, suggesting they don't believe the application will not represent the feelings and actions shared by many. Only one (1) respondent rated 4 for the application as being collective. Three (3) respondents, 42.9 %, offered 5 ratings for how collective the application is. The ratings suggest a higher percentage believed the application would represent the feelings and actions shared by many.

The helpfulness of the mobile application

On a scale of 1-5, respondents evaluated how helpful the application would be to users. Two (2), 28.6%, of respondents, rated the helpfulness of the application as 2, suggesting the application could not help solve the problem of loneliness and isolation. Four (4),57.1%, and one (1) 14.3%, on the other hand, rated helpfulness as 4 and 5, respectively, thus suggesting that application would help address loneliness and isolation.

Ethical experience

The security of the mobile application

Respondents evaluated how secure the application will be on a scale of 1-5. Two (2), 28.6%, of respondents, offered a rating of 1 and 2, suggesting they don't believe the application showed enough security measures to prevent data breaches and hacking. Four (4),57.1% rated reliability 3, meaning the application has some security measures, but robust security measures were needed. One (1) respondent, 14.3 %, rated 4, indicating the application had enough security measures. These ratings suggest users must be convinced of the confidentiality, integrity, and availability of the information when using the application.

Sensorial experience

The visibility of the mobile application

On a scale of 1-5, respondents evaluated how visible the application would be to users. Two (2), 28.6%, of respondents, rated the visibility of the application as 2, suggesting the application did not have enough elements pictures, and that designs were not consistent. One (1) respondent, 14.3 %, rated visibility as 3, meaning the app had visible elements: two (2), 28.6%, each rated visibility 4 and 5, respectively. All the ratings suggest the application had enough apparent features and some consistency issues and needed further upgrades on the design.

Means and Standard Deviation of the Quantitative feedback

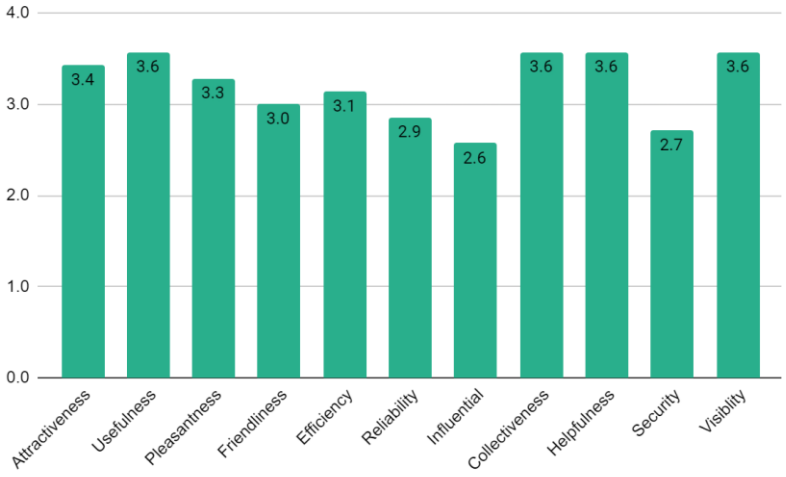


Figure 17: Means of Quantitative feedback

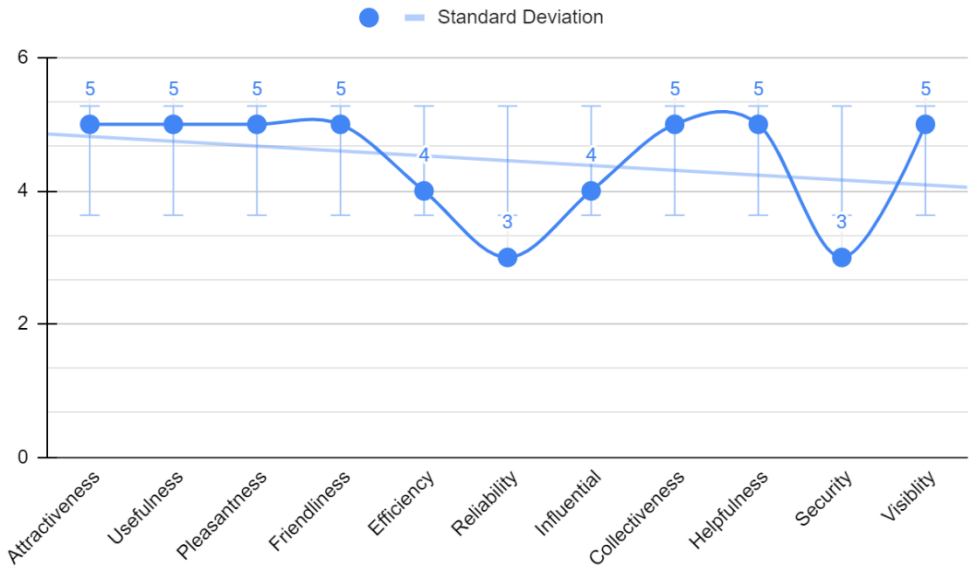


Figure 18: Standard Deviation of Quantitative feedback

The averages of all the ratings were calculated to give a clear idea based on the feedback from respondents. Most themes had averages above 3.0. The means for reliability, security, and influence were below 3.0, suggesting respondents had significant concerns about those three themes.

Though the means of three themes were below 3.0, the standard deviation shows that respondents were much more concerned with the mobile application's reliability

and security. The ability of the mobile application to function correctly with less downtime and the safety of user data is critical to the adoption and use of this mobile application. Therefore, a lot of work had to be done to ensure users had confidence in the application.

Qualitative Feedback

As part of the quantitative feedback, respondents gave reasons for their ratings on each theme. The reasons cited by respondents are shown in the table below.

Table 13:Qualitative Feedback (UX survey)

	Feedback	
	Negative	**Positive**
Attractiveness	Lacks personality. Complex screen.	Good basic UI. Almost ready for production. The is a clear, light theme layout and a structured overview of UI.
Usefulness	Similar Apps.	Highly useful for all individuals who desire to connect with like-minded people. This app is an excellent alternative to other social media applications.
Pleasantness	Review image. Too many features. Non-Cohesive Design.	The UI is very concise. There are no excessive elements with a trivial purpose of the function.
Friendliness	Too many screens. Too complex. Some views could be simplified.	Simple to use and understand. In general, the adoption is close to effortless.
Efficiency	More menu options.	Engaging with the app would require only a couple of minutes.

Reliability	Privacy rules, Data protection.	Hard to imagine how the app could generate a sense of unreliability.
Influential	Still too virtual. Less Influential for non-active users.	It can help to contact other users. For an active user, then quite influential.
Helpful	I don't think it could help solve the loneliness or isolation of people.	The potential helpfulness of the app would probably increase radically within a relatively short period. The app would be helpful.
Security	Robust security measures.	As secure as any other social media site or app.
UI Design	It could be simpler. It seems to be nice but too complex.	The idea is excellent, but it still needs work. Pretty good.
Visibility	Reconsider consistency in design.	Most elements are apparent.

The final stage in this survey was to ask respondents to give recommendations on improving the design of the mobile applications. The proposals are summarized below.

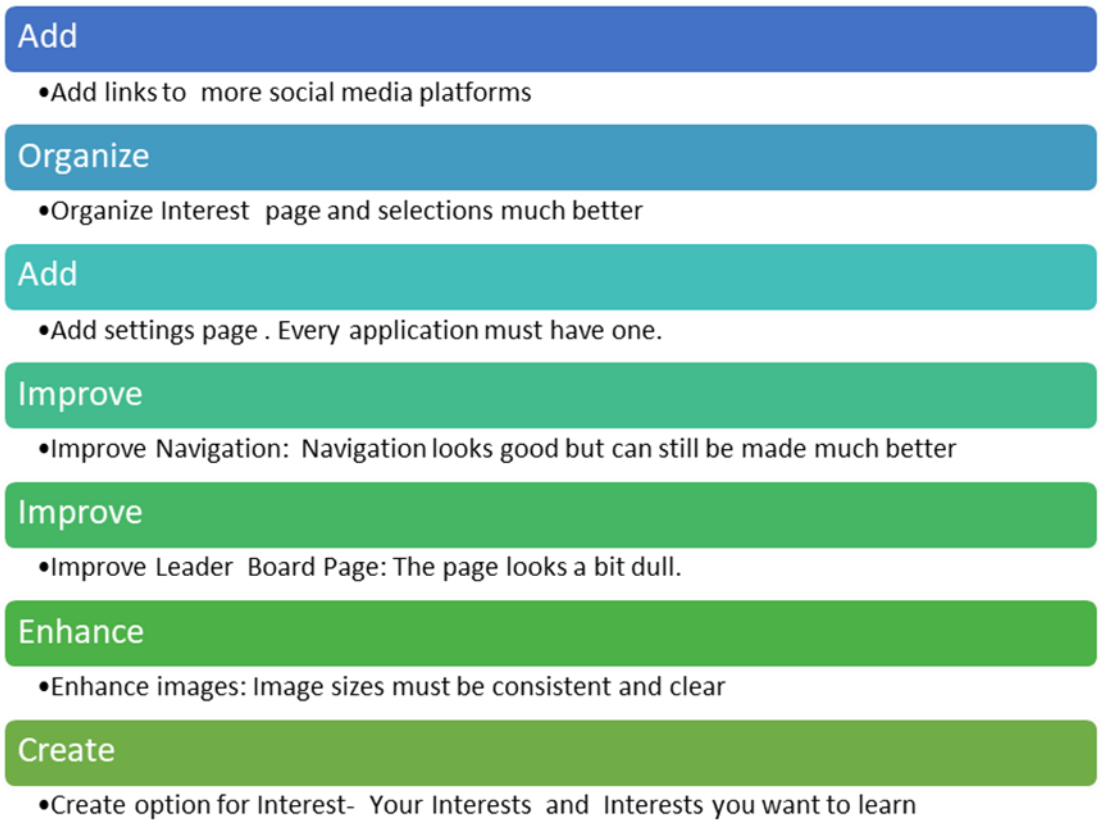
Recommendations:

- Refactor the UI to avoid complex features.
- Include more simple screens
- Improve chat windows to ensure users can communicate easily and directly.
- There should be Integrations to existing systems like calendars and other social media platforms.
- Improve and simplify the structure for "Recommended Groups."
- Include Bottom menu options to ensure cohesion and easy navigation

4.4 Final Focus Group Interview

The final focus group interview was conducted through Microsoft teams after improving the application based on feedback from the UX survey. Respondents had a link to the interactive version of the application on Figma. They responded to questions on Usability and System Performance, Interaction Design, Visual Design, and Content Understanding during their interactions. The interview was recorded, and the responses are summarized below. The number of respondents who participated in this interview was Six (6). Two (2) of the respondents were sampled from the loneliness survey, Two (2) from the first focus group interview, and Two (2) from the UX survey. The sample ensured capturing different points of view.

Table 14:Feedback (FGI)



These feedbacks were vital in the final design face of the application. It also indicated that respondents were much happier with the improvement earlier made.

5 InterestConnect Mobile Application

5.1 User Journey Map

Howard (2014) explains that Journey maps evolved from service blueprinting where organizations use it to improve their services. Initially, blueprints used flowcharts or maps to visualize the stages customers interact with an organization(Howard, 2014). Howard (2014) further states that the flowcharts are now modeled in journey maps to understand customers' or users thought processes.

A user Journey map helps to understand the motivations of users, their needs, and concerns about a service or product they use. The use of storytelling helps to explain the perspective and total experience of the user. The User journey map helped identify how users would engage with the application from various perspectives in developing this application.

The user journey map for the InterestConnect mobile application is in the table below.

Table 15: User Journey Map

Phase of journey	Registration	Onboarding	Event-Based User	Connection Based User
Actions:	Register with Email, Facebook, or Gmail Account. Create a profile Select Interests	Final Profile Notifications on Connections, Leaderboard, Groups, Sports, and Events.	Browse Events, Groups, and Sports. Join event or Sports Rate events.	Browse List of Connections. Initiate Contact. Choose and participate in activities with connections.
Touchpoints:	Welcome page. Signup. Select interests.	Profile Notifications Account Settings	Groups Events Sports	Leaderboard. List of Connections. Messages. Events.

				Sports.
User Thoughts	Can I find my interests? Will I meet like-minded people? Is this application free?	Will this take time? Where do I start? Is signup easy? Is my information safe?	Good list of events. I am connected and happy. I will create my event. Feedback was easy and smooth. I want more from this application.	Some connections were not fun. I didn't enjoy meeting this person. My connections are excellent.
User Feelings	Feeling curious. Happy and satisfied.	Anxious about using a new application.	Happy and satisfied with Events.	Mixed feelings about connections but enjoyable.
Process Ownership	Developers and Users	User	Event Creators	User and List of Connections.
Opportunities	Use a new and different application.	Meet new people and attend events. Be connected to your community.	Information on Events. Make new friends. Gain points for events organized or attended.	Learn new hobbies. Connect to new people. Feel less lonely and Isolated.

5.2 Mockup

According to Rivero et al.(2010), mockups help to capture requirements in agile methods. The statement above suggests mockups help designers and users define and improve the features of an application. A mockup or prototype shows how the product's final design or application will look. It features the visual design, such as images and colors representing the final design. In designing the mockup for InterestConnect, Figma was the preferred tool. Figma is a top-rated tool to create interactive websites, mobile applications, and logo prototypes. Figma is web-based and has a desktop application to develop prototypes while offline.

An initial mockup for the InterestConnect mobile application developed using Figma helped conduct the initial focus group interview. The figure below shows the first draft of the mobile application.

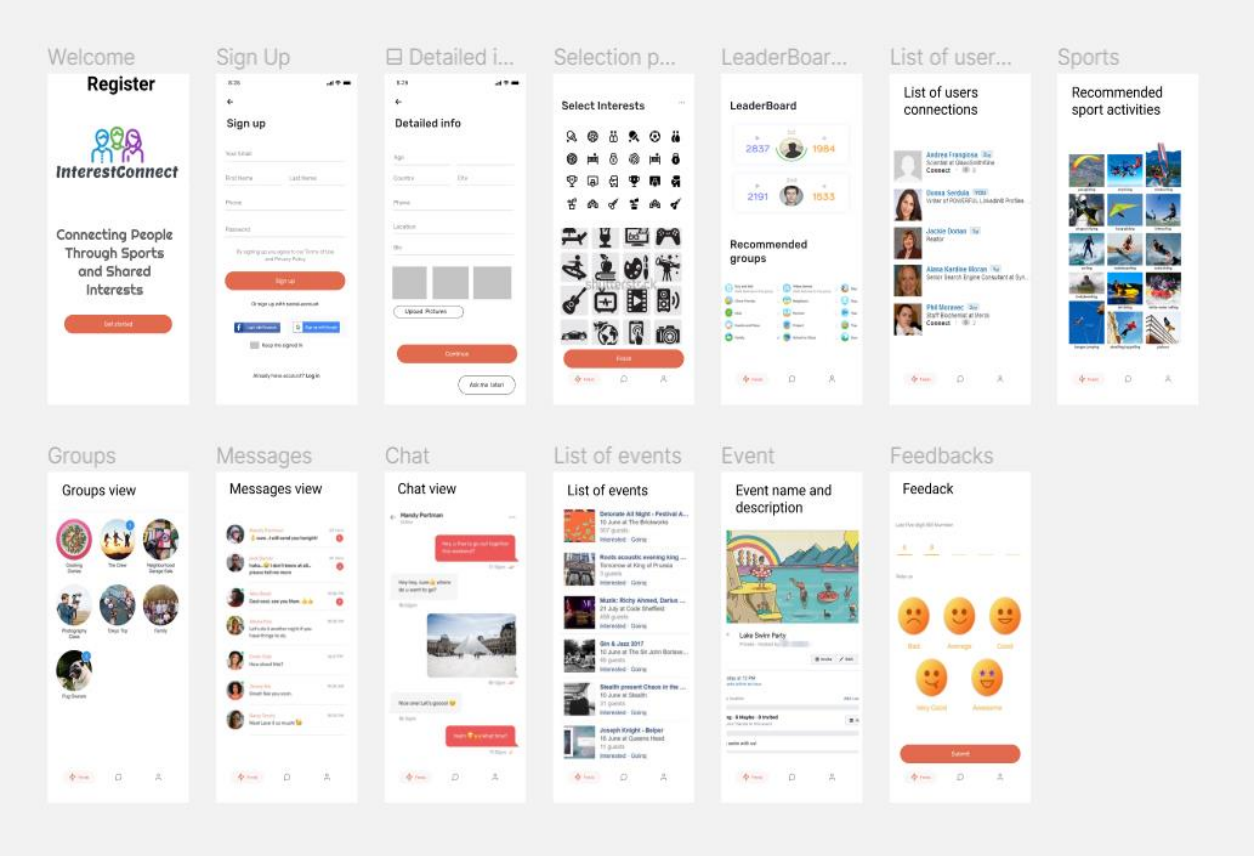
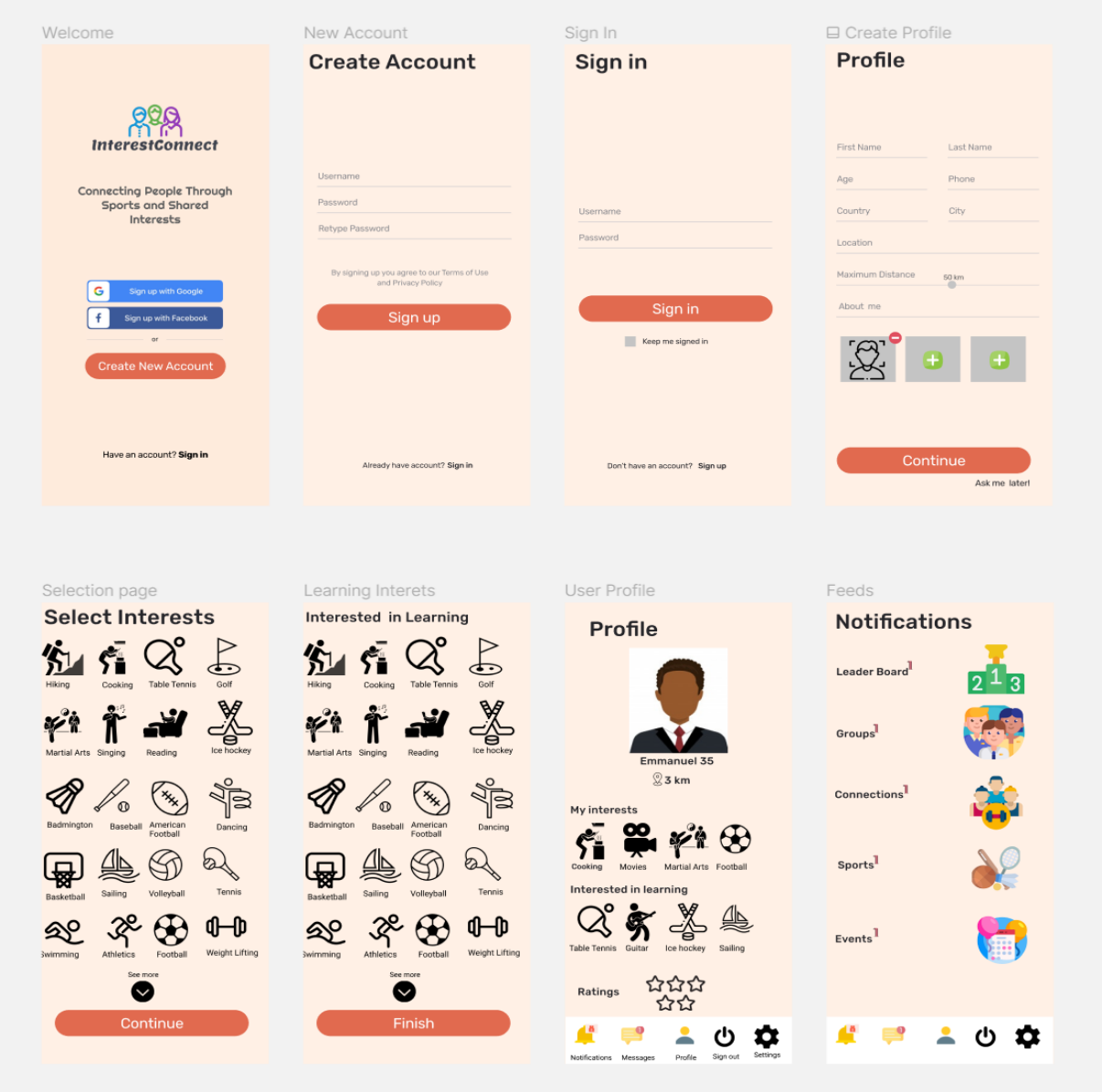


Figure 19: First Mockup Draft

Based on the feedback given by respondents during the first focus group interview, UX survey, and Final Focus group interviews, the mockup above went through various cycles of changes and modifications. New features that respondents suggested had to be included.

The figure below shows the final design of the InterestConnect mobile application.



This part of the figure shows the process of onboarding. A user can sign up with an email or social media account, create a profile, select their interests, and views notifications. The user can see various groups, events, connections, sports, and leader boards through the notices. The second part below shows how the user can navigate through the multiple pages of the application. Included here is a link to the Figma page. ([InterestConnect – Figma]())

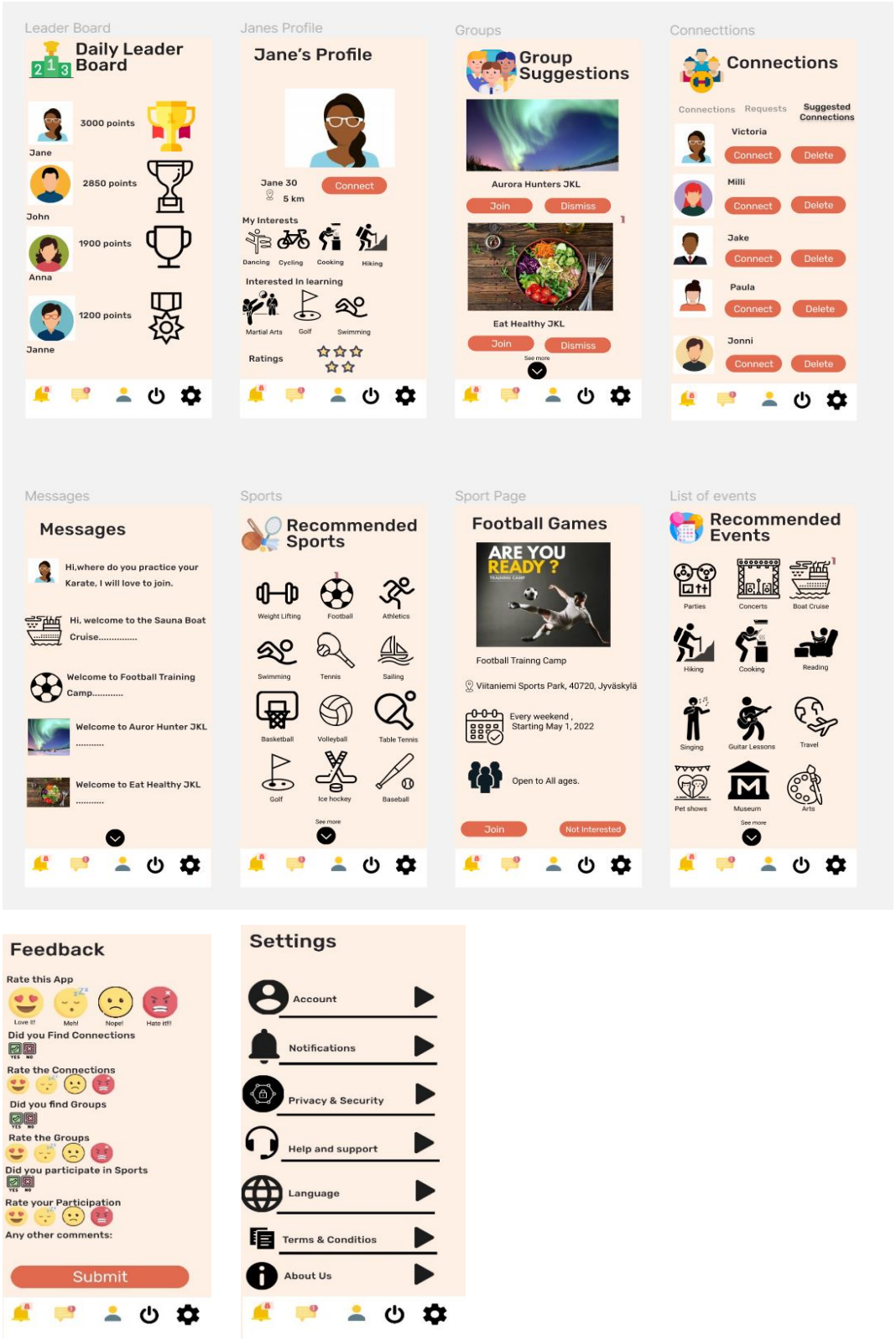


Figure 20: Final Mockup

5.3 Platform and Technologies

The platform of choice for developing InterestConnect mobile applications is the Android platform. Guo-Hong (2014) describes android as an open-source system based on Linux, used mainly for smartphones and tablets. According to Guo-Hong (2014), android creates a flexible environment to help software developers create applications. Google launched Android. Some of the reasons for choosing android as the preferred development platform are:

- It is open-source, and its tools can be accessed easily.
- It is flexible and can integrate with wearable devices and smart TVs.
- It is a cost-effective platform since the end devices and hardware are not expensive
- Developing applications on android has a faster development cycle. It reduces the time of development to market.
- Android can easily be customized and easily integrated with various multimedia tools.

Frontend Development

The frontend technology chosen to develop the InterestConnect Mobile application is Kotlin.

Kotlin is open-source and combines both functional and object-oriented programming. It is also statically typed and runs on Java Virtual Machine. Google uses kotlin as the official language for android development. From research on kotlin, it is easy to pick up and develop robust applications. Big technology companies like Google, Netflix, Amazon, Uber are using kotlin for their web and mobile applications. Kotlin is a powerful language and is very expressive and much more concise. It increases team efficiency through its intuitive syntax. The less time and fewer lines it takes to write and deploy a working code make kotlin very efficient. Kotlin is fully interoperable with Java and its related tools and frameworks. Most IDEs (integrated development environment) support kotlin. It is also easy to maintain. Kotlin provides a much more precise and compact

codebase, making production code more stable and consistent. Bugs are detected during the compile process, allowing developers to fix errors before they occur during runtime.

API (Application Programming Interface)

The InterestConnect mobile application would use a REST API for its backend development.

APIs act as an intermediary allowing two applications to communicate. It enables the easy and secure exchange of data between applications. The technology stack for this API development is Node.js, Express, and Mongoose.

Node.js is an open-source and cross-platform JavaScript runtime environment (nodejs.dev, n.d.). In its standard library, Node.js provides a set of asynchronous I/O primitives that prevent JavaScript code from blocking, and libraries in Node.js are generally written using non-blocking paradigms, making blocking behavior the exception rather than the norm (Nodejs. dev, n.d.).

Express simplifies common webserver tasks in Node.js and is standard fare in developing a REST API backend.

Mongoose connects the back end to a MongoDB database.

Below is a figure showing the architecture of a REST API with Node.js from (codetree. dev, 2019).

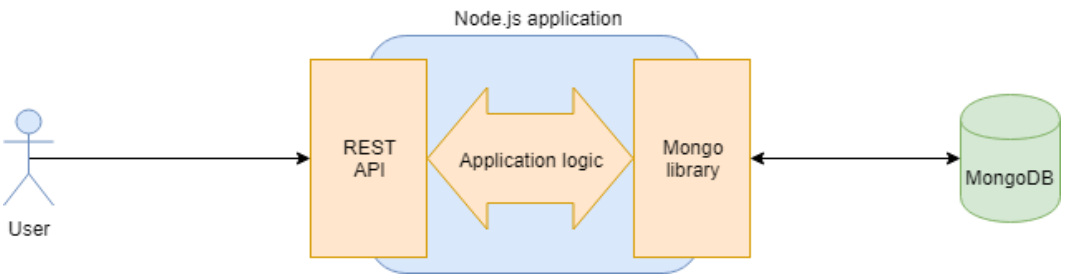


Figure 21: REST API by codetree. Dev

6 Discussion

This chapter discusses the potential benefits of using the InterestConnect mobile application, creating a use culture for the application, identifying ethical issues, and business and marketing ideas.

6.1 Benefits of connecting through InterestConnect application

- It offers robust and needed emotional services. This application will provide psychological and emotional support that can help users come out of a state of loneliness and isolation. Through meeting new people, creating friendships, and performing activities, emotionally isolated and lonely people will know and understand that they are valued. Building friendships and relationships through the application will help them feel a sense of belonging.
- Learning and sharing new hobbies and skills. This application encourages users to learn new things from each other. According to head to health (2019), learning new skills and hobbies can reduce stress, depression, and low moods. Further, participating in activities that get people out can make them feel happy and relaxed. Group activities also help to improve communication and relationships with people (head to health, 2019). The statements above show that this mobile application can help reduce stress, depression, loneliness, and isolation since it promotes positive experiences.
- Promoting a healthy lifestyle through sports. Manhattan medical Arts (2019) indicates that participating in sporting activities has a profound impact on the health and life of people. Sporting activities help prevent diseases like diabetes, improve the heart's functioning, help regulate and control blood sugar levels, and lower stress and tensions (manhattanmedicalarts, 2019). Through the InterestConncet mobile application, users would indulge in sports activities to help them lose weight, fight stress, and anxiety. Users will also meet like-minded people to share healthy eating habits and food recipes. This mobile application will add awareness of the need to live a healthy lifestyle, translating into good mental health.

Users will be more active and participate in community activities. As Cacioppo and Patrick (2008) explained, one of the fundamental needs to have a healthy lifestyle is fostering close relationships with people and avoiding being isolated or feeling lonely. Therefore, when people participate in community activities, they can feel a sense of belongingness, develop new skills, have better mental well-being, increase their social network, and as such, their support systems. When such people feel lonely and isolated, they can reach out to the people in their communities for support and help.

This application would help build the body, mind, spirit, and ultimately users' health, as depicted in the figure below.

Figure 22: Benefits of InterestConnect Application

6.2 Creating a use culture to retain users

The main objective of the InterestConnect mobile connection is to create an experience that will encourage users to linger and keep coming back. The experience promotes a positive culture of forming friendships and meaningful relationships. InterestConnect will differ from other social media platforms as there will be zero tolerance for bullying, spreading misinformation, fake news, and other forms of anti-social behaviors. Gamification, picture, and video pop-ups are examples of creating an experience to keep users coming back to the application.

Gamification

According to Hamari et al. (2014)**,** gamification uses game-like experiences to improve motivation and behavioral effects. The definition means game-like experiences are created as part of services to make the activities in the service more engaging. Using gamification helps support and motivate the users to engage with the services more regularly. Seaborn and Fels (2015) suggest eight (8) gamification techniques. These techniques include points, leaderboards, badges, progression, status, levels, rewards, and roles. The techniques mentioned motivate users to engage with the product or service more.

The mobile application will have Points, Leaderboard, and a Trophy (Badge). Users will earn points according to the number of connections and activities with other like-minded users. When users engage in a new sport or learn a new hobby that is not part of their initial chosen interests, the points will increase. A leaderboard will show the highest points earners along with a trophy. The added incentive of earning or being the highest point earners or leaders will encourage and motivate users to be more active on the mobile application.

Pictures and video pop-ups

As users become more active on the mobile application, further updates will include sharing pictures of activities, videos of healthy food recipes, and lifestyles. These features will appear in pop-up notifications and can be viewed by other users. A mash-up of all pictures and videos will be put together to show users how much their activities are appreciated and valued at the end of the week.

All features for this mobile application will be free for the targeted users; thereby, making it accessible will help retain and encourage users. Paid features will only deter users and defeat the primary purpose behind the development of this mobile application.

6.3 Ethical Issues

The ethical questions in the adoption and utilization of this mobile application are security and privacy issues. During the surveys, respondents voiced concerns about the application's privacy settings and their personal information stored and handled. Some respondents also wanted to know how safe it was to use the application since it could divulge the current location of its users. Other ethical questions may arise during the adoption and utilization of this solution, but these two are the most important ones that were highlighted. It is understandable for respondents to raise such concerns as security and privacy are essential. The General Data Protection Regulation (GDPR), (Regulation (EU) 2016/679), helps to protect the fundamental human rights of people on how their data is processed and used by organizations and businesses. Therefore, the developers of this mobile application need to consider the consequences of mishandling and misusing its users' personal information.

6.4 Business and Marketing ideas for the application

A business canvas model of the InteresctConnect mobile application has been developed to show how this application will be monetized to make some revenue. The figure below shows the plan. The Customer segments are highlighted in colors Blue, Green, and Yellow. Green represents developers, Blue represents partners, and Yellow represents users.

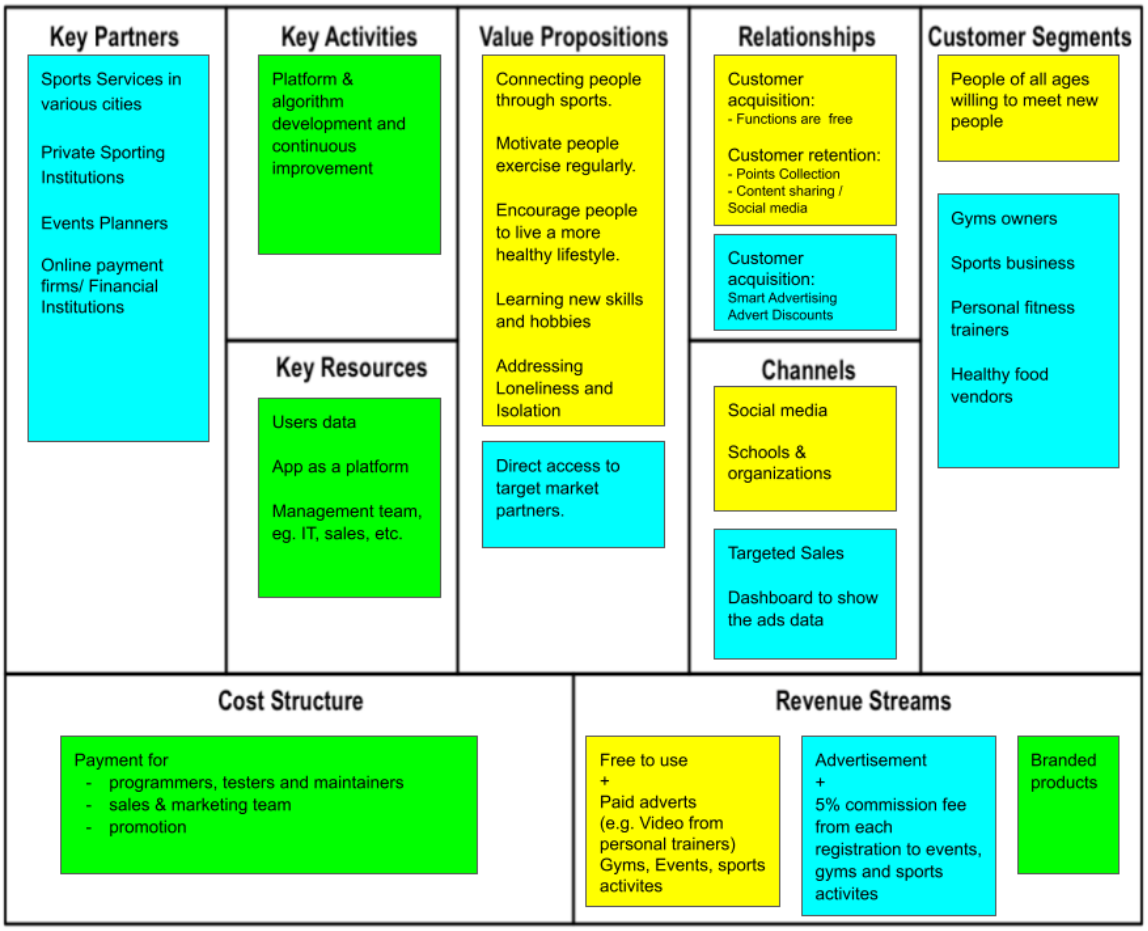


Figure 23: Business and Marketing Ideas

The main segments of the business canvas to be discussed are Key Partners, Value Propositions, and Revenue Streams.

Key Partners

The main partners are private and public sports services, events planners, online payments firms, and financial institutions. For example, gyms, football, hockey, basketball, and other sporting groups seeking to recruit new people can create a page on the application users can browse and join. Events like concerts, art shows, festivals, to mention a few, can also create pages for users to join. A fee is charged for any new customer gained through the InterestConnect application. Financial institutions and payment platforms like PayPal, mobile pay, pivo, and visa cards would be the primary payment medium.

Value Propositions

As described earlier, the primary motivation of this mobile application is to help connect people through sports, motivate healthy life through exercise, learn new skills and hobbies and ultimately help address loneliness and isolation. For sports facilities like gyms, the usual case is that most people go to gyms individually to work out and not to connect with other people. Through this mobile application, gym-goers can meet like-minded people to exercise together, share tips and help motivate each other to develop a good workout routine. This platform seeks to help various gyms reach out to new people. The same value proposition applies to different sporting facilities; thus, they access target customers. Facilities can offer discounts to new customers who join their gyms through the mobile application as a motivation.

Revenue Streams

This mobile application will also provide fitness trainers and healthy food vendors with a platform to advertise their products to new customers. Through advertisements, this mobile application will be able to generate revenue. There will be sales of products branded with the name of InterestConnect, such as T-shirts, mugs, caps, to mention a few.

InterestConnect application will be free for all who desire to connect with other people except for businesses and events seeking advertisements. There will be no paid features, which will discourage use and defeat the fundamental aim of developing the application.

7 Conclusion

This study focused on developing a mobile application that connects people through sports and shared interests. This mobile application would end up helping to reduce the feeling of loneliness and Isolation. As a matter of necessity, there had to be an analysis of similar mobile applications. The analysis revealed that most of the existing applications had paid features or did not have a specific target like sports and shared interests, and that proved there was a niche to be created with this idea.

A survey to empathize and validate the idea of a mobile application was conducted to understand better how to build this mobile application. This study assumed that such an application could help make people socially and physically active. Focus group interviews and UX surveys were included to gather feedback on respondents' features, opinions, and ideas.

Results gathered from the data collection showed that loneliness was a problem many respondents shared and that they were willing to find new ways to meet and connect with people. The results validated the idea that there was a need for a mobile application that could connect people through sports and shared interests. Further, it proved the assumptions that people were willing to be socially and physically active.

A prototype of the InterestConnect mobile application was developed. Figma was the preferred tool for prototype development as it is top-rated for creating interactive websites, mobile applications, and logo prototypes. It is also readily accessible as a web application and desktop application.

The technologies chosen for the development of this application are Kotlin and Nodejs. Kotlin for the frontend and Nodejs for the backend. The decision for these technologies was to develop the application for the android platform, but upon further review, the exclusion of the iOS platform may not be a wise decision. As such, technologies such as React Native will be looked at as the primary alternative since it supports building mobile applications for both android and iOS platforms

Further, a business and marketing plan was developed for the mobile application. In the plan, all features will be free for the primary user as an incentive to encourage them to use the mobile application regularly. Advertisers of events and activities will have to pay to use the service, and the application will take a commission when users purchase tickets through the platform. An additional incentive of gamification where users earn points and rankings for participating in activities and events was included to make users more active.

This mobile application only seeks to promote positive sports experiences, new skills, and hobbies. The mobile application may only be a part of the solution. Further research is required to find alternative solutions to loneliness and isolation through technology. Though this solution is intended for all ages, the limitation is that more older adults may either not be interested or will not use the application. Therefore, there is a need for further research on finding a suitable technological solution for older adults concerning loneliness and isolation.

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Appendices

Appendix 1. Loneliness and Isolation survey

General Information

InterestConnect user survey.

This survey does not collect or require any personal information such as name, email, phone number, etc.

*Required

1. Date (completion of form) *

Example: 7 January 2019

2. Gender *

Mark only one oval.

Female

Male

Prefer not to say

Other:

3. Age *

Mark only one oval.

[17-22]

[23-28]

[29-34]

35+

4. Status *

Mark only one oval.

International

Finnish

Emotional and Psychology

5. Do you feel connected within your community *

Mark only one oval.

Yes

No

6. Can you rate the level of connection you feel *

Mark only one oval.

Low Connection 1 2 3 4 5 High Connection

7. Why do you choose this connection level? *

8. Have you experienced a period of isolation or loneliness anytime within the past two years *

Mark only one oval.

rarely 1 2 3 4 5 almost every day

9. How do you feel when you're not connected to people *

10. Would you like to change it? If yes, what would you do to change it *

11. What do you do when you feel lonely *

Can you remember a particular day when you felt really lonely / really happy or connected?

Can you tell what you did from when you woke up till you went to bed

12. lonely *

13. really happy or connected *

14. What kind of activity would you engage in to help you get connected within your community *

Mobile Application

15. Would you use a mobile application to connect with people for sports and shared Interests? *

Mark only one oval.

Yes

No

Maybe

16. If Yes, Please Explain

17. If No, Please Explain

18. If Maybe, Please Explain

19. Is there any other way you'd like to suggest for connection? *

Appendix 2. Focus Group Interview

Interest Connect Application

This is a focus group questionnaire to collect information on User experience based on the UI design.

1. What do you think about the UI design? *

2. Rate the attractiveness of the UI *

Mark only one oval.

1 2 3 4 5

3. Is the application easy to follow *

Mark only one oval.

Yes

No

Maybe

4. Is the application easy to use *

Mark only one oval.

Yes

No

Maybe

5. Are there any changes you suggest being made *

Mark only one oval.

Yes

No

Maybe

6. If yes, please give a reason *

7. If No, please give a reason

8. Do you have any suggestions of what can be added? *

Mark only one oval.

Yes

No

Maybe

9. If yes, state your suggestion *

10. If no, state your suggestion

11. Any recommendations? *

Appendix 3. Use Evaluation Survey

Interest Connect App UX Survey

Please find attached the link to our Figma. Please use the link to answer the survey questions.

https://www.figma.com/file/AXGdtn8wG4TgPfD0xJjs3C/InterestConnect?node-id=0%3A1

*Required

Emotional experience

1. Rate the attractiveness of the UI *

Mark only one oval.

1 2 3 4 5

2. Please explain your answer

Economical experience

3. Is the app Useful? *

Mark only one oval.

Useless 1 2 3 4 5 Useful

4. Please explain your answer

5. Is the app pleasant? *

Mark only one oval.

Unpleasant 1 2 3 4 5 Pleasant

6. Please explain your answer

Technological experience

7. How user Friendly is this app? *

Mark only one oval.

Unfriendly, 1 2 3 4 5 Friendly

8. Please explain your answer

9. How user Efficient is this app? *

Mark only one oval.

Inefficient 1 2 3 4 5 Efficient

10. Please explain your answer

11. How Reliable is this app? *

Mark only one oval.

Unreliable 1 2 3 4 5 Reliable

12. Please explain your answer

Interpersonal experience

13. How user Influential is this app? *

Mark only one oval.

Not Influential 1 2 3 4 5 Influential

14. Please explain your answer

15. How Collective is the app?

Mark only one oval.

Individualistic 1 2 3 4 5 Collective

16. How Helpful is the app? *

Mark only one oval.

Unhelpful 1 2 3 4 5 Helpful

17. Please explain your answer

Ethical experience

18. How Secure is this app? *

Mark only one oval.

Unsecure 1 2 3 4 5 Secure

19. Please explain your answer

Sensorial experience

20. What do you think about the UI design? *

21. How Visible is the application? *

Mark only one oval.

Not Visible 1 2 3 4 5 Visible

22. Please explain your answer

23. Any recommendations? *

Appendix 4. Final Focus group Interview

What do you think is the most important thing to be fixed?

Does the navigation make sense?

If anything, what could be done to ensure that you use this system frequently?

Is there any content you would like to see offered?

Appendix 5. Focus Group Interview

Figure 24:UI design

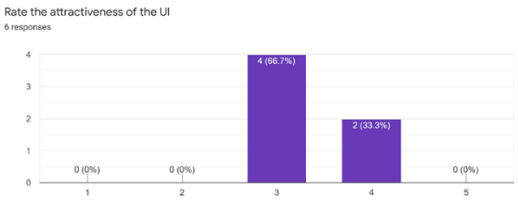


Figure 25:Navigation

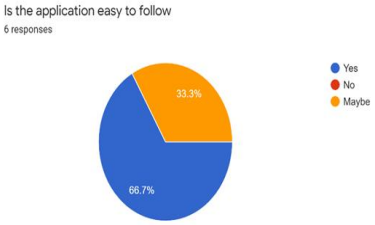


Figure 26: Ease of Use

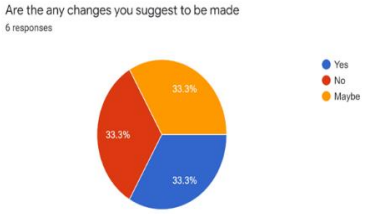


Figure 27:Suggested Changes

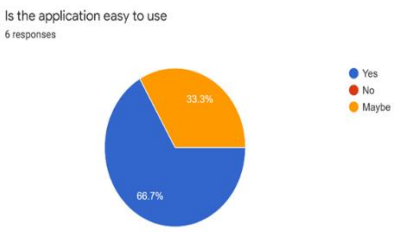
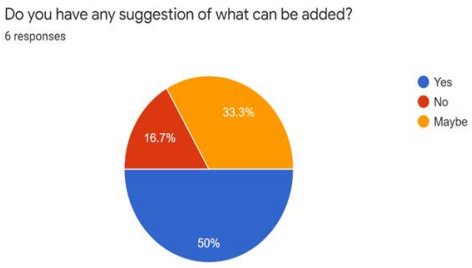


Figure 28:Suggested Additions



Appendix 6. Focus Group Interview

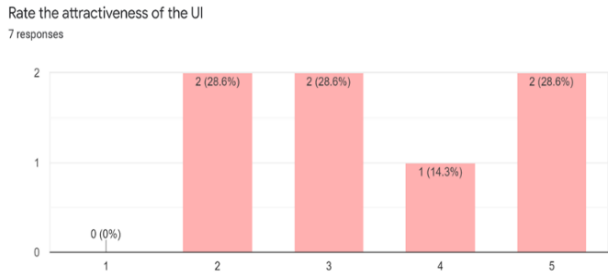


Figure 29: Attractiveness of the mobile application

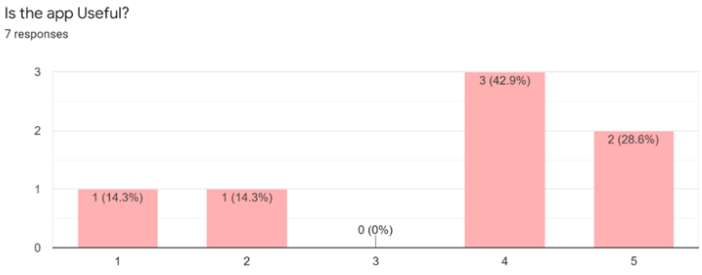


Figure 30: The Usefulness of the mobile application

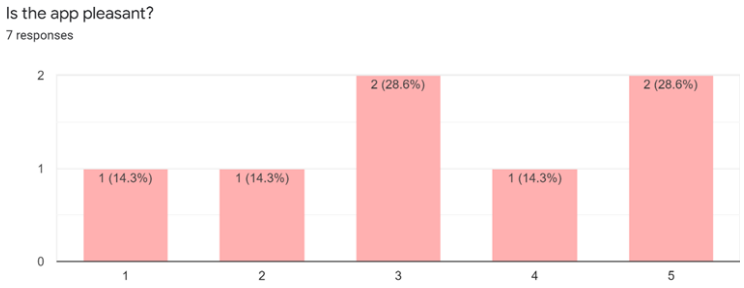


Figure 31: The Pleasantness of the mobile application

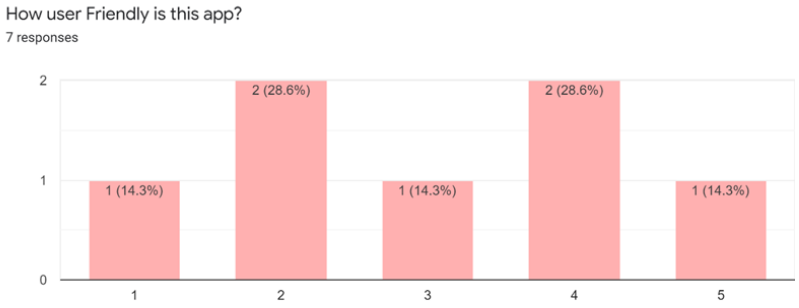


Figure 32: The Friendliness of the mobile application

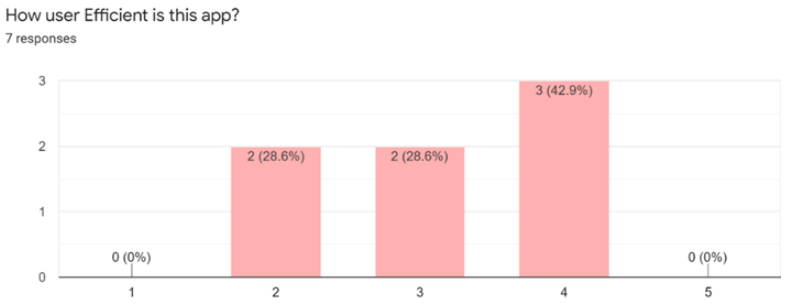


Figure 33: The Efficiency of the mobile application

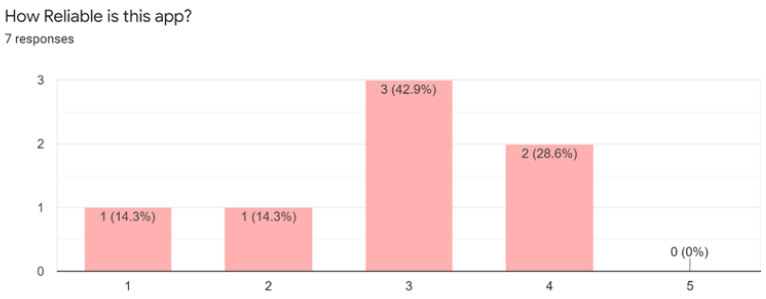


Figure 34: The Reliability of the mobile application

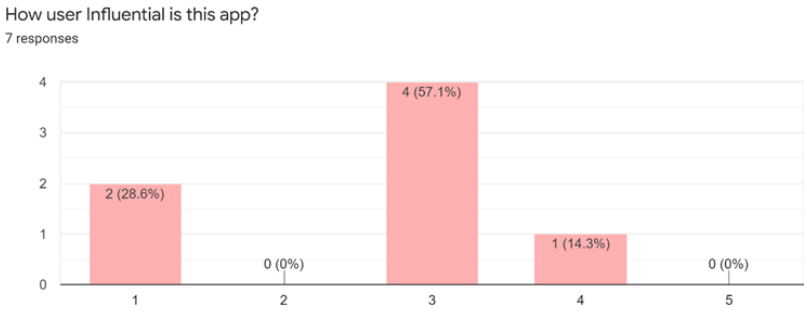


Figure 35: The Influence of the mobile application

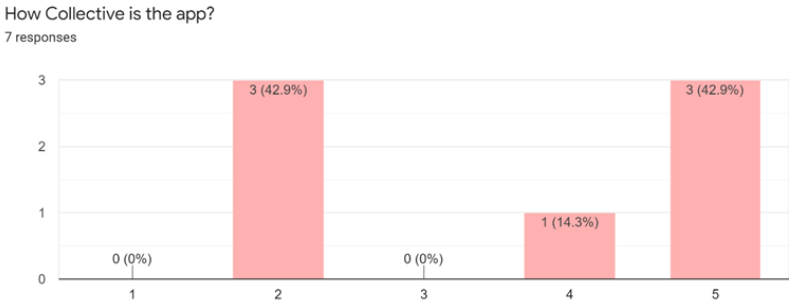


Figure 36: The Collectiveness of the mobile application

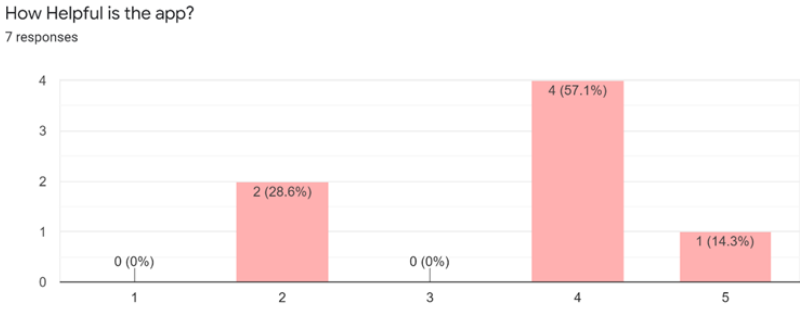


Figure 37: The Helpfulness of the mobile application

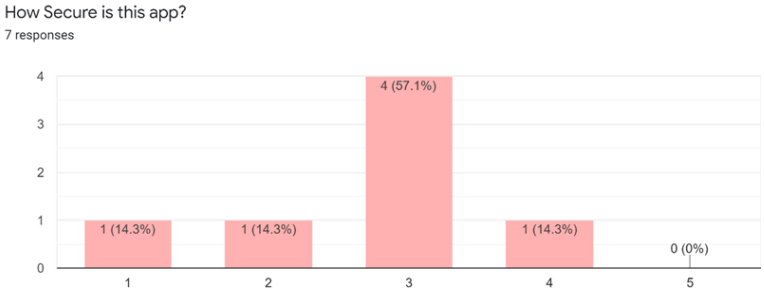


Figure 38: The Security of the mobile application

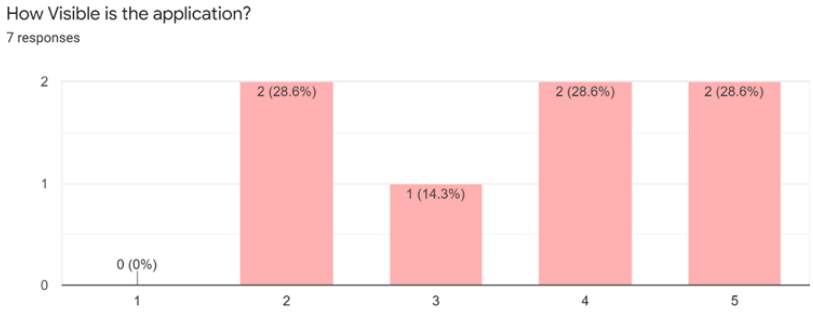


Figure 39: The Visibility of the mobile application