A Work Project, presented as part of the requirements for the Award of a Master's degree in Impact Entrepreneurship and Innovation from the Nova School of Business and Economics.

CREATING SPORTS COMMUNITIES TO FOSTER HEALTHY HABITS AND PREVENT LONELINESS:

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PROMOTING PHYSICAL, MENTAL AND SOCIAL WELLBEING WITH THE CONNACTIVE APP

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13/01/2023

Abstract

Even though society has never been as digitally connected before, the number of people suffering from loneliness has been increasing dramatically over last years.

Within the Connactive App we aim to develop a digital solution to address the problem of rising loneliness in urban city's in order to promote physical, mental and social well-being among people. Doing this we build a first version of our digital platform: a location-based app for organizing and participating in sports events and activities to support healthy and connected communities and thus create a positive social impact. In order to realize this idea, we used an agile low-code development approach through the platform *OutSystems* to set up our first version of the *Connactive* app.

Keywords: *Agile Product Development, Platform Application, Entrepreneurship, Social Innovation, Social Development, Low-Code Product Development, Agile Development*

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

1 Introduction

As one of the key strategies to contain the spread of the global COVID-19 virus, individuals all over the world have been urged to practice social distancing. While avoiding physical proximity and limiting human contact helped to limit the transmission of the disease, social distancing has heavily contributed to isolation and increased loneliness of individuals (Hartt 2021, Baarck, et al. 2021). This increase in loneliness, a subjective emotional state of solitude, has profound consequences for individuals and society (Tiwari 2013, Beutel, et al. 2017). As research indicates, loneliness poses a major risk of triggering or aggravating a number of severe disorders. These can be both physical and psychological in nature and are a wide-ranging social problem for people of different ages (West 1986, Beutel, et al. 2017, Cacioppo and Cacioppo 2018).

In light of the serious consequences that loneliness poses to society, it is critical to provide interventions to address it effectively. This is especially important when it comes to providing preventive solutions rather than tackling the symptoms when they are already present. In this context, several studies emphasize the role of physical activity and the effects it has on people, reducing anxiety, stress, and depression (Coalter 2005, Hiremath 2019). These positive effects occur in both short- and long-term and directly influence the physical and mental health of people. In addition, physical activity provides an important vehicle for community-building (Coalter 2005, Schulenkorf 2012). Conversely, this means that better access to sports activities can be leveraged as a possible solution to the problem and the subsequent effects of increasing loneliness.

1.1. Objective

Increasing loneliness seems rather paradoxical in view of the modern opportunities for networking. On the one hand, research shows that more and more people feel lonely. On the

other hand, we live in a time where digital technologies and access to social networking are possible for a wide range of people. This raises the question of whether digital technologies, such as social media, are in fact achieving their purpose of connectivity, referring to the connection and the bonds people create by using them (Van Dijck 2013, Twenge 2013). In this context, researchers in the field of psychology frequently highlight the so-called social media paradox, describing how social networks enhanced connectivity, while at the same time increased the loneliness people feel (Tate 2018).

Following an analysis of the underlying problems of loneliness and identifying the role that physical activity plays in addressing them preventively, the question arises as to whether digital products can effectively resolve this issue. Especially, when it comes to digital platforms, which provide greater opportunities to engage in sports activities, strengthening communities and preventing the rise of people feeling isolated.

Based on this, the main objective of this work is to address two main questions:

- Can a digital platform leverage the positive effects of physical activity and encourage users to actively organize and/or participate in sports activities?
- How should such a digital product have to be designed to meet user needs and to enable physical engagement?

As part of this objective, the questions will be validated in order to provide a possible solution. Subsequently, the findings will be incorporated into developing a digital platform. As the final result, this platform is made available as a mobile web application, developed by means of a low-code programming software.

1.2. Approach

In order to test the underlying assumptions presented in *Chapter* 1.1 and consequently, to develop a software application, we proceed in two phases.

The first phase of the work includes identifying the problems and the underlying consequences to subsequently ideate a possible solution. In doing so, the solution addresses the facilitation of physical activities through digital platforms. This is based on the finding that current digital platforms and services do not provide a sufficient solution and are only partially used to organize and participate in sports events.

In the second phase, after validation of the results obtained in the first phase, the actual development of the mobile application is implemented. This entails the process of designing the application, including the user story mapping and the user interface and user experience design (UI/UX design). Subsequently, the application is coded using the OutSystems low-code platform. To create a product that meets user needs, different software development processes were combined to enable structured implementation with continuous user feedback. This included the implementation of a product backlog containing user stories and implementing them using agile development. By leveraging different software development principles, such as applying iterative cycles of user testing, continuous product discovery was facilitated.

Finally, to lay the basis for further development of the idea into a business model, we focused on the social impact created. Therefore, we design a theory of change (ToC) to describe the intended outcome that user experience from using the mobile application.

The developed application can be accessed using the following QR codes:

iOS

Android

1.3. Scope

This work elaborates on the identified problem of increasing loneliness and its consequences. In addition, the scope of the work includes analyzing and creating a digital product that aims to address the underlying issues by providing easier access for people to physical activity. In doing so, the purpose is to develop a solution that leverages the positive characteristics of digital platforms, namely the low-threshold access to networking with other people.

The final result, which is created as digital software, is developed using OutSystems and is limited to this platform. The process of integrating users in the development of the digital solution described in *Chapter* 1.2 is constrained to users from the environment of the Nova School of Business and Economics (Nova SBE) in Lisbon. In the process, only students from different disciplines of the university are considered as users.

In this work, the focus is only on the product development process aligned with identified user needs. Therefore, the primary goal is to develop a software as a solution. However, the aim is not to disseminate the developed application extensively. Furthermore, the objective of the work is not to develop a complete business model, but to identify a need in the market and the subsequent opportunity. This includes the concrete identification of how a possible solution needs to be designed to capture user demands.

1.4. Challenges

Inherent to developing a software project that addresses user needs, various challenges emerge. These exist primarily on two levels, more precisely the technical implementation and the interaction with potential users.

As described in *Chapter* 1.2, the technical implementation and development of the application is enabled using the low-code application provided by OutSystems. This allows to develop a digital product without requiring extensive programming skills. Nevertheless, having a certain technical understanding and background knowledge, e.g. in handling data, is beneficial to work

with the program. Since we have limited programming experience, this poses a considerable challenge to us. Furthermore, such a low-code platform has limitations with regard to the scope of functionalities and customization.

The second level of challenges is the scope and the possibilities to interact with users. As we implement a software development process that is adapted and focused on implementing user requirements from an early stage, user engagement is crucial. In doing so, there are two critical interactions where we aim to engage with users to sufficiently capture and tailor their demands. The first interaction is in developing the user story map and building the UI/UX design to identify core features and the appearance of the application. The second interaction takes place in multiple cycles, where we incorporate continuous feedback loops from users during the different stages of the product development. These interactions are critical to enable the outcome of a user-oriented application. However, finding these users and getting sufficient feedback poses a key challenge.

1.5. Document Structure

In *Chapter* 0, an outline of the objective and the approach of the work is provided. In addition, an overview of the scope and the challenges of the development process is presented.

Following, the approach of low-code product development in relation to the OutSystems agile platform is outlined in *Chapter* 2. In doing so, the individual components that the platform includes in order to develop a mobile application are examined.

Subsequently, in *Chapter 3*, a synthesis of the findings related to the problem of increasing loneliness is illustrated. In the process, the underlying issues are outlined in an issue tree. Furthermore, the process of ideating and validating a possible solution is described in detail.

In *Chapter* 4, a description of the developed idea, more precisely of *Connactive* is given. Subsequently, the concrete process of the software development is outlined. This includes the planning of the product development, as well as the design, the implementation, the testing and

the deployment of the mobile application. In addition, an overview of the final result, which is the most important outcome of the work, is provided.

Chapter 5 addresses the aspect of the social impact created with the proposed solution. In this context, the Sustainable Development Goal 3 (SDG 3) and the subsequent theory of change are explained in detail.

Finally, the conclusions of the work are presented in *Chapter 6*. This includes a summary of the work experience, the limitations, and an outlook on the next steps regarding the developed product and the underlying concept.

2 Agile Product Development

2.1. Low-Code Product Development

With increasing digital transformation and growing demand for information systems, the role of low-code platforms has experienced a major push in recent years (Luo, et al. 2021, Elshan, Dickhaut and Ebel 2022). An important reason for this is that the process of development differs significantly from environments that require advanced knowledge and skills in programming. In contrast to traditional environments of software development, low-code platforms enable non-coders to develop their own products by providing "pre-written code components that focus more on innovation and less on technical know-how" (Olson 2022). The various providers of low-code platforms provide a "fast, continuous, and test-and-learn delivery" (Luo, et al. 2021) to accelerate the development process significantly, while decreasing the costs and required human resources for development. Low-code platforms are enabled by providing various functionalities such as graphical user interfaces and reusable components, allowing to develop a software with minimal code (Glib 2022). As a result, the developed products can be created in an efficient way by applying different techniques. For example, drag-and-drop techniques can be used to move visual models from one location to another, reproducing complex syntaxes

in a graphical interface. This eases software development, allowing quick adaptation with little effort, which facilitates an agile process of software development (Elshan, Dickhaut and Ebel 2022, Luo, et al. 2021). In addition, low-code platforms allow rapid testing of product ideas without the need for full-scale development, reducing the associated investment costs to test entrepreneurial opportunities remarkably. As a result, product ideas can be validated without the need of investing in skilled development teams and programmers. In addition, founders can validate hypotheses, test core functionalities, and ultimately identify concrete user requirements to understand market needs, attracting potential customers in an early stage of the opportunity identification (Glib 2022, Eccentex 2022).

2.2. OutSystems Platform

OutSystems is a low-code development and delivery platform, allowing to develop and deploy mobile and web applications for different use-cases (OutSystems 2022). In the platform, the lifecycle of the application, the code, and the development environment are managed, mapping different development roles using React for the front-end development and C# for the backend. Using OutSystems, software development can be managed in a flexible and thus agile process without requiring the user to have comprehensive programming skills.

2.2.1. OutSystems Architecture

OutSystems is a cloud-based application for rapid application development (RAD) that offers the possibility to concentrate all tools and resources necessary for the development of web and mobile applications in a single integrated development environment (Jacinto, Lourenço and Ferreira 2020). The architecture provided by OutSystems simplifies the development process at every stage of development and deployment while allowing for customization of the application. While users develop applications through low-code techniques, OutSystems compiles the code and generates a single page application in React using CSS, HTML and

JavaScript. At the same time, the logic on client and server side are executed and the data is retrieved asynchronously when needed (OutSystems 2020).

The underlying architecture in OutSystems consists of five layers, including the Service Studio, the Platform Server, the Service Center and the LifeTime and Integration Studio (Jacinto, Lourenço and Ferreira 2020, OutSystems 2022). In the Service Studio, the most important components of the app development environment are mapped in one single application. The development environment in Service Studio is divided in different components, including the interface, the logic, the data, and the processes (OutSystems 2022). The Platform Server is the runtime system of the OutSystems platform and performs all tasks related to the generation, optimization, compilation, and deployment of the applications (Martins, et al. 2020). This involves the compilation to C# or Java for web applications. Accordingly, mobile applications are compiled as required for Android or iOS (Jacinto, Lourenço and Ferreira 2020). Applications published on the Platform Server can subsequently be displayed in web browsers (Aguiar 2010). The OutSystems Service Center is the environment management console and is dedicated to the management of specific actions in the platform environment, such as managing roles, defining environment settings, and publishing modules (OutSystems 2022). The LifeTime Studio in OutSystems is a centralized console used to manage all environments, including users and security settings (OutSystems 2021). OutSystems offers a wide range of development resources that can be used to create applications. However, to address more specific requirements, OutSystems provides the Integration Studio. This allows developers to build and manage their own extension modules that can be integrated into applications created in Service Studio (OutSystems 2022). Once applications are created in OutSystems, they are deployed to a server using a Deployment Service, which allows subsequent installation of the applications (Martins, et al. 2020, OutSystems 2022).

2.2.2. App Development in OutSystems

OutSystems enables to create three different types of applications. It is possible to develop either traditional web applications, such as websites, or to build mobile or reactive web apps. The latter is aimed at enabling a richer interface and user interaction on the user end devices such as phones or tablets. Mobile and reactive web apps are very similar in their functionalities and their code reusability for running on devices (OutSystems 2020). However, the main difference between them is that reactive web apps are not installed on end devices and are accessed in web browsers instead. Mobile web apps, in contrast, are created for download for iOS or Android and to be executed natively on the end devices or as a progressive web application (PWA). Additionally, a mobile app provides a dedicated and dynamic user experience for the end user, tailored for smaller devices with touchscreen interactions and offline capabilities (OutSystems 2020, OutSystems Community 2022). Mobile apps ready for distribution are submitted to app stores for Android and iOS as a native app package.

2.2.3. Modular Programming

In OutSystems, applications are built using so-called modular programming. This means that all aspects for executing the functionality are contained in one module. At the same time, by separating different functionalities into modules, the modules become independent of each other and thus interchangeable (OutSystems 2020). Accordingly, modules are the place in OutSystems where the business logic and the user interface are managed. All modules that are used for the development of an app can be found inside the application, which means that one application can have multiple modules (OutSystems 2022).

Modules can be of different types and thus perform different functions. As an example, the app type as a module refers to the type of app that is selected, i.e. whether it is a reactive web app or a mobile app. Service modules enable the implementation of services, focusing on a domain and service-oriented structure. Library modules are used when highly reusable components are

created. Furthermore, extension modules are used for external integrations of for example databases or custom C# code (OutSystems 2020). Modules that share elements with other modules are called producer modules, while those that draw certain functionalities from other modules are categorized as consumers modules (OutSystems 2022).

2.2.4. Service Studio

The OutSystems platform is composed of different components, all being available in one desktop application, the Service Studio. This application is an integrated development environment (IDE) and allows to cover the whole cycle of development, deployment, management, and monitoring as a whole process in a visual approach (Carvalho Pires 2014). Service Studio entails all functions necessary for the development of applications, including the modeling of the user interface (UI), the business processes and logic of the application, the database, and the integration tool to integrate additional functionalities from external libraries, services, and databases (Golovin 2017, OutSystems 2022). In this way, OutSystems allows continuous management of developed digital applications, enabling agile software development (OutSystems 2022).

In the development environment of Service Studio, the modules used for the application are managed and integrated. In the modules themselves, there are different tabs that are used to create the different parts of the application. The interface tab contains all screens of the app and additionally maps the UI flow between them. In the logic tab, all logics of the application are being developed and managed, including client actions, server actions, integrations, roles, and exceptions. The data model of the application is managed in the data tab. Furthermore, processes and timers can be built in the processes tab.

In Service Studio, the low-code experience is realized using a visual programming language that allows to develop applications using simple drag-and-drop techniques. This approach makes it possible to describe and develop the processes in the applications in a visual way using

web screens and web blocks (Pulido 2019). The visual language is enabled by abstracting the way applications are designed and modeling them at a higher level through pre-defined constructs. These constructs interact and communicate with each other within the OutSystems platform, allowing the technical integration of applications and making it less prone to errors (Aguiar 2010, Pulido 2019, UX Design Institute 2022). Through the code generator in OutSystems, which operates as a compiler, the components used in the visual programming language are compiled in a native code, which is read by the OutSystems server. During code generation, a graphical analysis and optimization is performed to write an optimal code for all levels of the application (Martins, et al. 2020).

2.2.5. Data Modelling

To generate effective apps, a key component is the creation of a data model that supports the generation, storage, and provision of data. The data modeling in OutSystems can be conceptually compared with other relational databases. The interaction with the database takes place through structured query language (SQL).

The business concepts are represented as entities that are stored in a database and can be compared with the concept of tables. From the entities, data can be stored and retrieved at any time needed, allowing persistency and accessibility of the data (Singh 2021). In OutSystems, three different types of entities are available; entities, static entities, and OutSystems entities (Martins, et al. 2020). Entities contain different attributes, which are stored as records in each row of the entity. Each entity, when created, holds an Id, which serves as an identifier attribute. This Id acts as a primary key and is responsible for making each record from the entity uniquely identifiable. In addition, other data types can be created in an entity. These entity attributes are assigned to a data type according to their properties and are specified according to their requirements. When new entities are created, specific data actions are generated automatically in OutSystems. These data operations, based on the concept of CRUD (C: Create, R: Retrieve,

U: Update, D: Delete), can be used in the business logic development (Singh 2021). To generate entities that already have named and predefined values in form of a list, static entities are created (OutSystems 2022). They provide listed values, holding the data in the records folder. These static entities can be created during design and development and cannot be changed during the runtime of the applications (Golovin 2017, Martins, et al. 2020). However, attributes can be changed or added to static entities. OutSystems entities are generated automatically in the platform, for example, the user entity.

All entities in Service Studio can have relationships with other entities, defined by the reference attribute and represented as the foreign key (OutSystems 2022). The entity containing the reference attribute depends in the relationship on the "cardinality (one-to-one, one-to-many, many-to-many) and the optionality (mandatory or optional)" (OutSystems 2022). However, static entities can only have foreign keys of other static entities. It is important to mention that when creating relationships, it is necessary to define referential integrity mechanisms and to enable rules that apply when data is modified or deleted in existing relationships (Martins, et al. 2020).

3 Problem Identification and Research

3.1. Ideation

Following the findings of the issue analysis, the process of ideation was implemented which consisted of three steps. In the first step, an analysis of the role of digital media as a means of connecting people was conducted. For this, a literature analysis is performed on both the use and the importance of digital media in creating social connections. Building on the findings from the literature, in the second step a quantitative survey is conducted to identify general trends. From the results of the survey and the findings from the literature, a potential target group for a solution is identified. In the third step of the ideation process, the findings from the

quantitative survey and the literature are synthesized. As a result, a first proposal for a solution for the identified target group is formulated.

The role of digital media in society is much discussed in the literature, including the importance they play in the connectedness between people (Leung 2010, Sherman, Michikyan and Greenfield 2013). With the internet, smartphones, social media, platforms, and apps, people are becoming more and more connected in an online world, creating a digital society (Lindgren 2017, Çevik, et al. 2020). Using the various tools for online engagement, people become more decoupled from the localities they live, networking and connecting with others in a much wider area. This influences greatly the way local communities interact (Antheunis 2012, Sherman, Michikyan and Greenfield 2013, Verhoef, et al. 2017). Using digital tools to do social things is, therefore, as highlighted in the literature, becoming widely adopted (Lindgren 2017, Selwyn 2019). However, these digital tools have not only a significant influence on the social interactions between people, but also on people and their well-being. Among other things that result from the intensive consumption of digital media, researchers point out the potential influence these digital communication media have on the increasing loneliness of people (Twenge 2013, Yavich, Davidovitch and Frenkel 2019, Thomas, Orme and Kerrigan 2020).

To address this loneliness and the underlying consequences, as discussed in detail in *Chapter* **Fehler! Verweisquelle konnte nicht gefunden werden.**, various recommendations are made in the literature. Among these, one that is particularly highlighted is the practice of physical activity. In doing so, it is emphasized that participation in sports is inversely related to loneliness (Haugen and Ommundsen 2013). However, it is not only in the context of reducing the feeling of loneliness that physical activity remains an important global policy goal (Edwards 2015). As highlighted by the European Council, sports activities have a central function to prevent diseases and to promote public health “through casual and organized participation (and) aim […] at expressing or improving physical fitness and mental well-being […]” (Council of

Europe 2001). Among other things, sport is an important factor influencing the social skills, the skills development, the self-esteem as well as the self-confidence of individuals (Hiremath 2019, Brennan 2021). In addition, sports activities contribute significantly to the development of communities. Thus, for example, various initiatives introduced with the aim of promoting sustainable community development through sports activities are indicating the positive effects it has on the empowerment of communities (Schulenkorf 2012, Diehl, et al. 2018, Sejwal 2014, Butt 2016).

Conclusively, this means that sport is an essential tool to minimize the consequences and risks associated with loneliness.

Based on these results, we conducted a quantitative survey at the Nova SBE. In this survey, we first analyzed which platforms (i.e., social network channels) are used by the respondents and examined the motivation of people to socialize and build connections. The excerpt of this quantitative survey can be found in the *Appendix* in *Figure* 16. As a result, we were able to identify that many of the respondents do not connect with new people through social networks. However, they could imagine using digital applications to meet new people in certain situations. This included the scenario of moving to new in a location. In addition, respondents highlighted they would consider meeting new people when sharing common interests.

Based on the findings from the literature and the quantitative survey, we identify that sports activities provide an effective vehicle for addressing the loneliness of people and can positively impact individuals and their social connections. In relation to the results from the survey, a first consideration is that people might have an interest in connecting with others through digital networks based on their interest in doing sports together.

3.2. Validation

In order to ultimately realize the objective of developing a digital product, a validation process based on the results of the ideation is performed. The goal of this validation is to identify

whether the assumption of the ideation that people would be interested in connecting with others for physical activity through digital networks is applicable. In doing so, this general assumption is divided into three hypotheses in order to subsequently evaluate them.

These three hypotheses are as follows:

- People are actively searching for people to do sports within their location.
- People are willing to team up for sports with people they don't know.
- People are interested in engaging on a digital platform to organize and join sports events.

To validate these hypotheses, a WhatsApp group providing a channel for communication to organize sports activities was launched. In doing so, the aim was to identify if people are actively looking for other people to join sports matches and activities. Furthermore, the goal was to understand whether people would connect with others to participate in sports if they did not know these people beforehand. According to the response to the group, more specifically the number of people who join and the number of interactions in the group chat, the hypotheses are evaluated.

After initializing the group, the link to the WhatsApp group chat was shared through various channels among students at Nova SBE. Within a few hours after the group was created, more than 100 people joined and first activities have been organized. Initially, people posted to the group chat looking for players for events, such as paddle, volleyball, and tennis matches. In addition, sports instructors have started to use the group chat as a platform to share event details about workouts they organize to attract participants. To date, since the initiation of the group, the group has 380 members who actively use the network to search for people who want to join sports activities based on the same interest. In addition, the group chat is regularly used for the purpose of organizing weekly workouts. Currently, three workouts are regularly offered, a HIIT workout on Mondays with Tobias, on Tuesdays a CrossFit Bootcamp with Sabbie, and on Thursdays a Full Body Workout with Lili.

In addition to the WhatsApp group, a qualitative survey was conducted. The aim of the survey was to better understand what concrete problems potential users face in using a digital solution to connect people for sports activities. For this purpose, both sports instructors and students from Nova SBE who have joined the WhatsApp group were interviewed. From the interview, the insight was derived that fitness instructors use the platform particularly to share their offer with a broad target group. By using a platform, they can create their own community for people who have similar interests while remaining targeted. Other platforms that do not specialize in fitness do not enable this. During the interview with students, a central aspect mentioned was the interest in using a platform that does not involve high costs in order to be able to participate in sports activities. Moreover, the students expressed their interest to participate in a variety of different activities instead of being limited to a certain type of sports. In addition, they highlighted that they value spontaneity, which is why they actively used the WhatsApp group. Furthermore, a main outcome derived from the interviews was that most digital tools for networking do not satisfy their needs, which is also the reason why they do not use them.

Based on the results, both from the acceptance and use of the WhatsApp group and from the findings of the surveys, the hypotheses posed at the beginning are validated.

3.3. Comparison of Existing Solutions

With the aim of understanding more precisely why the needs are not adequately satisfied, we have carried out a detailed analysis of existing solutions. Digital platforms and tools that can be used to organize and/or participate in sports activities were identified, their functionalities analyzed, and their features compared.

Various digital platforms and services provide the capabilities to connect and organize people to participate in physical activities and events. These include messaging applications, social networks and platforms, and sports-related mobile applications and services. In the following,

we describe the identified solutions, as illustrated in *Figure* 1, in more detail and assess why they are not satisfying the user needs.

Figure 1: Comparison of existing solutions

Messaging applications such as WhatsApp and/or Telegram, according to their functionality, are built for one-on-one and/or group conversations. Furthermore, each user is responsible for adding and managing their own contacts. Social networks, such as Facebook, are typically designed to allow people to network with each other, as well as larger communities. The platform enables users to create and to join groups, which they can initiate and search according to their interests. In addition, there are other platforms that allow organizing and sharing events. One example is the platform Meet Up, which can be used both as a website and as a mobile application, allowing to share and participate in local events for various kinds of activities. Both, messaging applications and social networks carry the risk of noise, low relevance, and member trust for users. Consequently, groups and group chats are not organized in a reliable and relevant way. Although groups make it possible to organize sports activities according to a specific type of sport, even at a local level, they do not provide additional functionalities for communicating and finding partners. In addition, these platforms are not only focused on sports, which makes finding a target audience much more difficult.

In addition to platforms that enable networking, sports-related mobile applications and services, such as Urban Sports Club and/or Class Pass, enable participation in a variety of sporting organizations and activities. They are subscription-based services and are location-based, meaning to the location where they have partners, allowing, for example, users access to gyms and other facilities. These applications are often associated with high prices and do not permit users to connect with other users. In addition to these services, there are also applications that are used for networking and tracking of fitness activities. For example, Nike Running and/or Runstastic from Adidas. By using these applications, users can chat with friends, record, and share their achievements. However, these applications do not enable people to organize activities or participate in sports events.

From the comparison of the different platforms and applications, it emerges that none of the existing platforms combine the aspect of matching and connecting people to organize and participate in physical activities. However, to leverage the positive effects of sports while addressing user needs, an improved digital service has to be determined.

4 Our Development Process

4.1. Our Idea

Based on the findings obtained from the research and by validating the assumptions that people have a need that is not adequately addressed by existing solutions, the idea for *Connactive* emerged.

The concept of *Connactive* and the underlying product idea is to create a location-based digital platform that enables people to organize sports activities, create team events, and facilitate people to join sports activities. This solution addresses the problem of loneliness and the underlying effects on an individual level. By providing an application, the aim is to create network effects and thus to strengthen communities. To achieve this, the targeted outcome is to

encourage individuals to live an active lifestyle and to enhance opportunities to connect with like-minded people, leading to overall improvements in their physical and mental health.

4.2. UX/UI Design

In addition to mapping the functionalities of the *Connactive* app, a positive user experience during usage is crucial to satisfy users. Therefore, it is important to develop an interactive, intuitive, and user-friendly interface in the product (Bártolo 2021). Based on the goal of aligning the app design to provide a "seamless and effortless user experience" (Roto, Rantavuo and Väänänen-Vainio-Mattila 2009, Invonto 2021), different methods to build the UI/UX design are applied. In this context, UI design is related to the appearance and style of the application and its user screens, whereas UX design refers to the holistic experience a user has when navigating through the app (Adipat and Zhang 2005, UX Design Institute 2022). Collectively both design methods create the overall app impression a user has when navigating and using the app. To implement a design in the *Connactive* app development process, various wireframes and screen interactions are tested to obtain a vision of the appearance. This is implemented in the online design tool Figma, creating and testing different screens and the interaction between them (Lytvyn 2021).

In the first step, research in terms of analyzing how different apps are built was conducted. During this process, apps like Runtastic, Urban Sports Club, as well as social connecting apps like Instagram and Meet Up were studied in depth. Various blogs and platforms about the subject of app design were researched, such as Dribble, Designlab, and Pinterest.

In the second step, screen frames have been created in Figma, exploring a variety of options for the *Connactive* app design. A representation of the frames created in Figma can be found in the *Appendix* in *Figure* 17.

After creating an initial idea for the appearance of the app, the design concept is integrated into the development process in OutSystems. For this purpose, the custom CSS function is used, creating the screens and adapting them according to the feedback from users.

4.3. User Journey

After outlining the development process of the *Connactive* app, the user journey is described from the perspective of a user navigating through the app.

Once the user accesses the *Connactive* app, the first screen displayed is the login page (*Figure* 2), where the user can either log in or create an account.

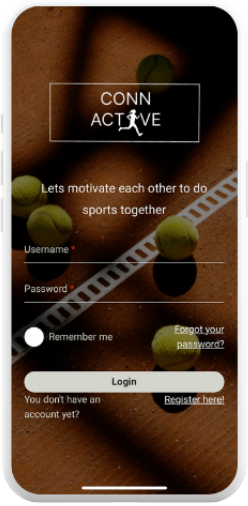


Figure 2: Login screen

In the case that the user has not yet created an account, the registration is initiated (*Figure* 3). To be able to register, personal information about the user is required, such as name, preferred username, email, and password. Furthermore, the location is specified, which is currently limited to Lisbon. To use the *Connactive* app, it is necessary that the user agrees to the terms and conditions and the personal data usage. After the user clicks the button, a redirection to the next screen is performed. On this screen, the user can add activities according to personal sport interests and the experience level. Once the user finishes entering the information and clicks the done button, the home screen of the app is opened.

Figure 3: Sign up screens

The home screen in the app (*Figure* 4) is where a list of the upcoming and signed up events is displayed. Moreover, the user can create a new event from this screen by clicking on the "+ Create your own sports event" button, which redirects the user to the create event screen.

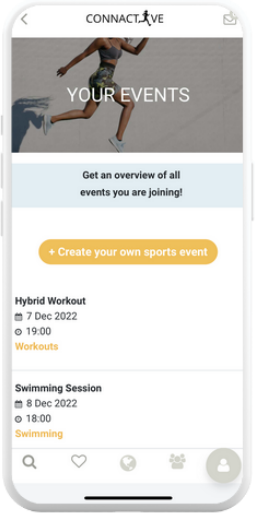


Figure 4: Home screen

On the bottom bar of the screen, icons are displayed to navigate to further screens, namely to the discovery screen, the home screen, the event map, the *Connactive* users screen, and the user profile screen.

The discovery screen (*Figure* 5) displays all events in an area. Using a drop-down filter, the events can be filtered according to their sports activity. After clicking the join button, the details

screen of the respective event is opened. Furthermore, by using the "+ Create an event" link, new events can be uploaded.

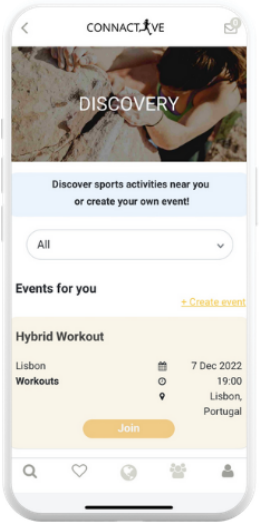


Figure 5: Discovery screen

In the event detail view, more detailed information about the sports event is provided (*Figure* 6). This includes, for example, the date, the time, the organizer, the location, the event description, and the total number of spots available. Furthermore, a list of all users who are joining the event is displayed.

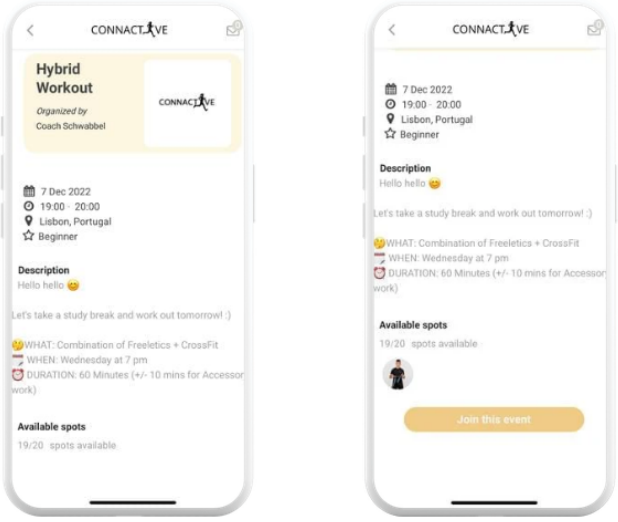


Figure 6: Event detail screen

By joining an event, the user gets access to the event chat. In the chat overview (*Figure* 7) an overview of all event chats is provided. Unread messages from the user are displayed as unread

messages in the event chat overview and on the message icon in the top right of the screen layout.

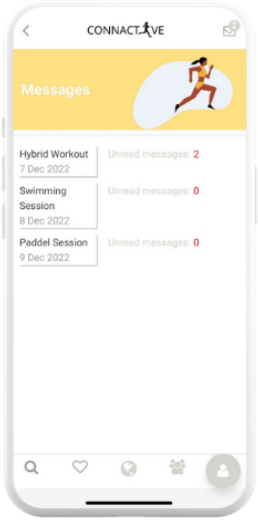


Figure 7: Event chat overview screen

Next to joining existing events, the user can create own sports event (*Figure* 8). After successfully adding the event information, given that the entries are valid, the event is created, and other users are able to see and to sign up to the event. Event creators can edit the event details and delete the event (*Figure* 9).

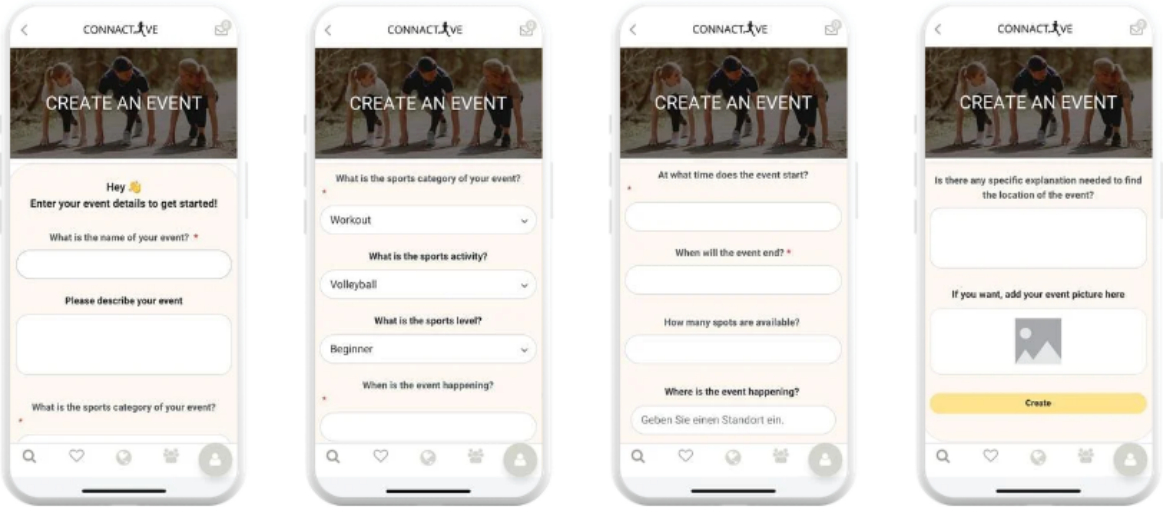


Figure 8: Create event screen

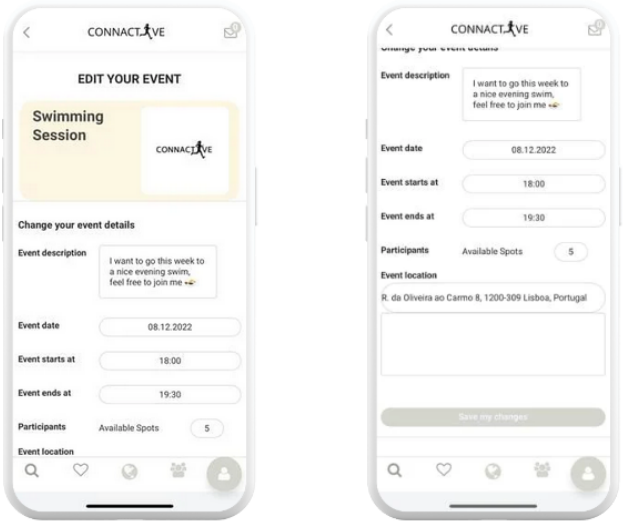


Figure 9: Edit event screen

For an overview of all events related to the location where they take place, a user can select the map icon in the bottom bar. This displays a screen where all events are sorted by date (*Figure* 10). By navigating through the events, the location is displayed on a map and the searching for events according to a specific area enabled. By clicking on an event, the user can view the event details and/or sign up to the event.

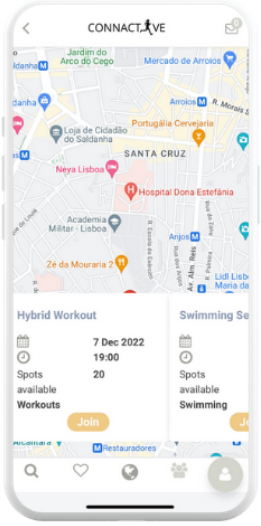


Figure 10: Map screen

Using the community icon on the bottom bar directs the user to an overview of all registered *Connactive* users, displaying their username and their location (*Figure* 11). Furthermore, the

details of each user can be viewed, displaying the location, age, user picture, and personal description. Moreover, the list of all sports activities the user added is displayed.

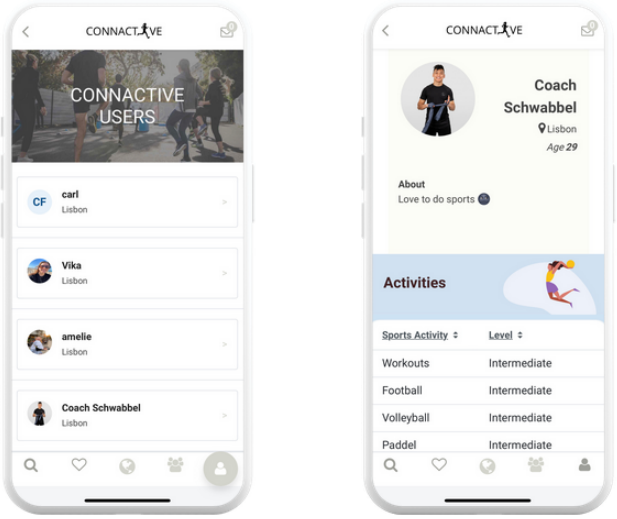


Figure 11: Community overview and user detail screen

The personal profile of the user is accessed by clicking on the right icon in the bottom bar. This opens a popup menu where three profile areas are available, namely the profile, the achievements of the user, and the settings of the user profile (*Figure* 12).

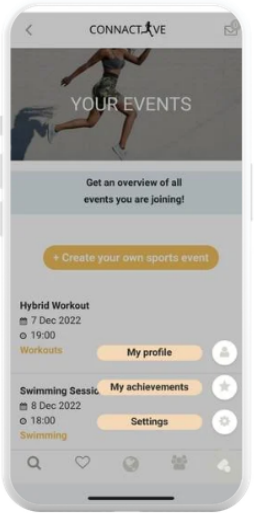


Figure 12: Profile pop-up menu

On the profile screen (*Figure* 13), the user can view the profile details. In addition, this screen also allows the user to access the edit screen to adjust the profile details or edit the sports activities.

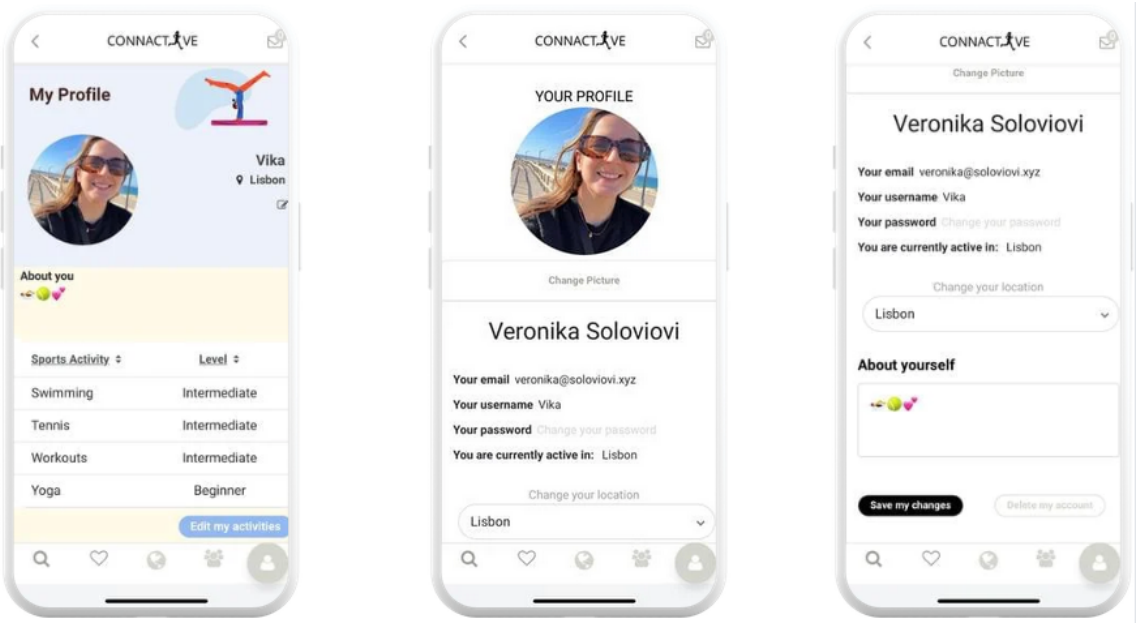


Figure 13: Personal profile and edit profile screen

The achievements screen displays how many matches or workouts the user attended and how many events the user created (*Figure* 14). In addition, the user can see the total number of people connected since joining the *Connactive* app. In addition, this screen enables the user to access a feedback screen, where feedback about the app and the experience during sports events can be provided (*Figure* 15).

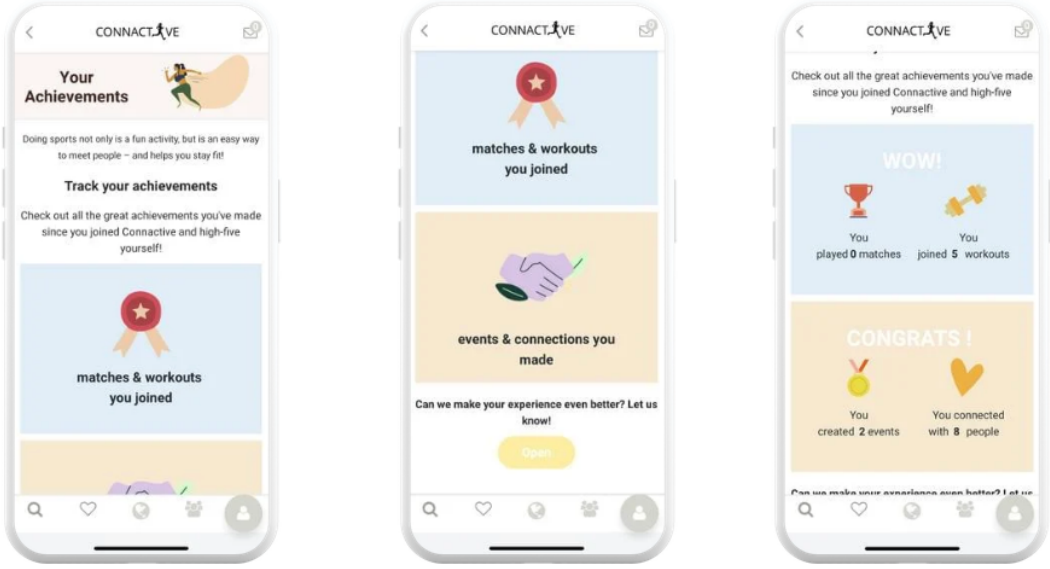


Figure 14: Achievements screen

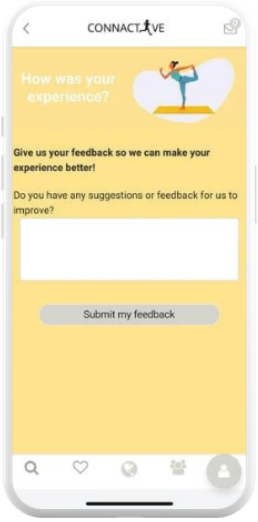


Figure 15: Feedback screen

Under the settings screen, all details of the user related to the account and to the *Connactive* app can be found. This includes information about *Connactive* and the creators, the terms and conditions as well as the privacy policy in separate screens.

5 Measures and Metrics of Impact

5.1. Sustainable Development Goals

For addressing the problem of rising loneliness and to quantify the effects of the developed application, it is necessary to devise a method to measure the impact. For this reason, in a first step, it is necessary to identify the impact targeted.

In this regard, the Sustainable Development Goals (SDGs), developed by the United Nations (UN), can provide a framework for action that can be used as a benchmark for impact. As global goals, they serve as a call to action to address pressing issues to support economic, social, and ecological progress (United Nations 2015).

By supporting people “in making well-informed choices” (United Nations 2018), *Connactive* aims to actively address the SDG 3. This SDG focuses on the importance of promoting healthy lifestyles and well-being for all people of all ages (Acharya, Lin and Dhingra 2018). By

efficiently pursuing this objective, advantages are created for individuals and society that outweigh the costs of addressing the negative effects of non-preventive activities. As "healthy people are the foundation for healthy economies" (The Global Goals 2022), *Connactive* intends to promote and protect the individual's health, which is an essential condition for a good quality of life. Maintaining a healthy lifestyle prevents diseases, injuries, and other direct negative consequences affecting the ability to enjoy life (Ortiz-Ospina 2022). In this context, a key metric used is the life expectancy resulting from a healthier lifestyle. Even though life expectancy has generally increased in the last decades and the gap worldwide is decreasing, the importance of considering and addressing this outcome is still of great concern. One factor that influences this outcome is, besides social and environmental conditions, access to medical care, and government regulations and policies, the individual behavior and health habits of people (Blue, et al. 2016, Roser, Ortiz-Ospina and Ritchie 2019). This includes avoiding unhealthy habits such as smoking and not being physically active. To overcome these habits and consequently improve the health, a behavior change is required, which *Connactive* intends to support.

Connactive influences actively the health behavior of individuals and communities by offering activities to become physically engaged. In this way, the aim is to make physical activity more accessible and thus promote health practices as a basis for behavioral change (Cohn 2014). Therefore, accessibility is achieved by minimizing the barrier by providing a technical solution, as the *Connactive* application, for all common operating systems of mobile devices. Additionally, *Connactive* reduces the barrier to physical activity by creating a community that expands the variety and number of activities available. Thus, opportunities for participation are increased. However, in order to assess the activities and the outcome, it is necessary to establish a framework for impact measurement. For this purpose, the theory of change framework is developed.

5.2. Theory of Change

The theory of change (ToC) as a conceptual framework and planning tool serves the purpose of short- and long-term social impact measurement (Taplin, et al. 2013). Based on the SDGs, which define the desired long-term objectives in general, the ToC enables both the definition of activities and the evaluation of success. As a result, activities of change are aligned, ensuring the allocation and prioritization of resources. Furthermore, by implementing a ToC, partnerships are strengthened to support the further development and validation of the developed initiatives (Collins and Clark 2013). The ToC is results-oriented and thus provides a better reflection and communication of impact intentions, capturing the problem, the desired goals, the outcomes, the activities, and the requirements (IPA 2016, Dembek, et al. 2017). In doing so, a plan is created that reflects the mission and vision by first defining the desired outcome and subsequently the activities and inputs necessary to achieve it. An illustration of the ToC of *Connactive* can be found in *Figure* 18 in the *Appendix*.

Based on the identified problem, *Connactive* is primarily addressing the issue of increasing loneliness and the subsequent consequences. Therefore, the purpose of the application is to address the issue by connecting people together to participate in sports activities. In this way, the negative effects associated with increased loneliness are addressed to accomplish beneficial effects for individuals and communities. The systemic change expected to be achieved, meaning the impact, is therefore addressing this problem on three levels. These are in concrete the mental and physical health of individuals as well as the social interaction in communities. To achieve this, it is necessary to first define the outcomes that result from using the application.

In the context of the ToC, the *Connactive* application is considered as an intervention that helps people to engage in sports activities. The outcomes are differentiated on three levels, the short-term, the medium-term, and the long-term outcomes. These outcomes are based on the theory of changing behavior towards a healthier lifestyle (Linke, Robinson and Pekmezi 2014). On the

basis of this concept, there are three levels at which health behavior is changed, notably the individual, interpersonal, and ecological level. Regarding the short-term outcomes resulting from the intervention, the focus is primarily on the individual level, making individuals aware of the favorable effects of physical activity. Through low-threshold access to the app, the intention is to encourage and support individuals to become more active. However, a requirement for this is that people have the intention themselves to become more active, for example when becoming aware of the negative consequences of not doing physical activity (Linke, Robinson and Pekmezi 2014, Gholami, et al. 2019). In the mid-term, the outcome generated is of a social cognitive nature, where behavior is changed because individuals do more sports (Bothmer 2005, Linke, Robinson and Pekmezi 2014). This outcome is achieved through connecting and socializing with different people and thus realizing the positive effects physical activity creates (Ghildiyal 2015). In addition, a further outcome is the promotion of self-regulation, which means to give individuals the opportunity to monitor and observe their achievements and behavior change (Linke, Robinson and Pekmezi 2014, Hanawi, et al. 2020). This includes highlighting the benefits they have from using the application, for example feeling less stressed (Ghildiyal 2015). The long-term outcomes are focused on a socio-ecological level, intended to target the preventive behavior of people (Linke, Robinson and Pekmezi 2014). In doing so, unhealthy habits are more likely to be avoided and thus, problems such as obesity or depression, resolved. Furthermore, by integrating healthier lifestyles into organizations and communities, the objective of *Connactive* is to transform community environments. This is achieved by improving the physical and emotional dimensions of people in the long-term.

On the basis of the outcomes, it is essential to determine the output, meaning the immediate effect that results from various activities. The output of *Connactive* is primarily the utilization of the app to sign up for physical activities or create events to connect people. This includes the

installation of the application, its active use, and the participation in activities. Furthermore, an output is that users have a positive time using the application and attending the events.

In the next step, the activities in the ToC are described which need to be pursued to achieve the outputs. Primarily, this includes developing an application that meets the needs of users in order to have a positive and valuable experience. Furthermore, it consists of developing mechanisms and strategies within the app that encourage users to use the app on a regular basis. Thus, providing the means to engage in a healthy habit. Similarly, to enable value creation for the users, it is necessary that security and safety measures are in place to create a community space in which users feel comfortable. In addition, this includes activities that provide information to users. To enable educational aspects, it is therefore necessary to provide information and collect data to track user achievements.

Based on the identification of the activities to be carried out, it is necessary to determine the inputs that are necessary to implement these. These inputs are primarily associated with the application itself, the user experience, and the distribution of the application. Hence, the inputs required are financial and human resources to continuously improve the application. This includes among other things the continuous development and iteration on the app, as well as the efforts to reach targeted users through advertisement. Furthermore, inputs are needed that facilitate the collection of data to support the *Connactive* concept and the created impact. In addition, partnerships are necessary as inputs to monetize the application and thus leverage the impact.

In summary, *Connactive* as an idea targets a social impact, intended to contribute to long-term improvements to the health of individuals and to the communities. In this respect, the ToC serves as a strategic planning tool and thus sets the guidelines for the further development of the created app.

6 Conclusions

6.1. Work Experience

The rise of people experiencing loneliness, despite the digital opportunities to connect, is a growing problem that needs to be addressed effectively. This is important not only to improve the health of people, both mental and physical, and to strengthen community development. For this reason, the challenge was to determine how digital opportunities can be leveraged to effectively develop a viable and innovative solution, which current solutions are not achieving. Therefore, we aimed to primarily answer the following questions:

- Can a digital platform leverage the positive effects of physical activity and encourage users to actively organize and/or participate in sports activities?
- How should such a digital product have to be designed to meet user needs and to enable physical engagement?

After implementing methods for ideation and validation and subsequently developing a low-code application in OutSystems, these questions were addressed effectively. In doing so, advantage was taken of interacting with users throughout the entire process of development to obtain and implement feedback. The technical approach involved integrating user needs throughout the entire development process to ensure that the app satisfies their demands. Thus, the software development focused on the application of user research, which, through low-code development, was incorporated directly into the product. As a result, the aim was to address the inadequateness of existing solutions and to develop an app satisfying user needs. Furthermore, to translate the desired impact of the app into a strategic guideline, measures and metrics for social change were established.

6.2. Limitations

In the course of development, several insights were gained. These mainly refer to the findings obtained during the research and validation, as well as limitations experienced in the technical implementation.

Through the approach of validating hypotheses and creating a WhatsApp group, it was identified that people have the desire to organize and participate in sports activities. However, during the implementation of the app, we discovered that people are more likely to participate in events than to organize sports activities themselves. This might be due to the discomfort of taking initiative or the personal responsibility and organization efforts it entails. Nevertheless, it is evident that interest and participation are significant when events are offered. This leads to the conclusion that although the burden to organize events is high, the effort to find participants is little. In addition, this means that the barrier to create events needs to be made as simple as possible in the technical realization, i.e. within the app. Thus, people can be encouraged to create events with greater success.

Despite the successful development of the app, three limitations were faced during the development and deployment of the *Connactive* app. First, the own limited experience in the area of programming. Consequently, we were partly limited in implementing certain functions and could not fully realize the identified user functionalities during the development. Second, the implementation of the design in OutSystems. Even though customization is enabled, there are still boundaries that we were unable to overcome. Third, the distribution of the application itself to reach users and increase user engagement. The *Connactive* app was not made available on app stores like Google Play and/or Apple app store. As a result, potential user had to be guided through the setup of the app, creating a complex process which discourages users. Furthermore, trust showed to be lower when not installing applications from app stores directly. As a result, these limitations restricted the user growth.

6.3. Outlook

The conceptual idea and validation of *Connactive* has made substantial progress by developing the low-code application. Looking forward, the next steps will focus on leveraging the insights gained as a result of the development.

First, we aim to further develop the low-code app to address the limitations identified in *Chapter* 6.2. This includes developing further functionalities, for example notifications and email communication. Additionally, the aim is to publish the *Connactive* app to app stores to facilitate the installation and distribution. Second, we aim to realize innovative marketing strategies and brand building. Thus, the objective is to grow the *Connactive* community to ultimately encourage people to become physical active and to pursue a healthier lifestyle. Finally, greater attention on developing ways to monetize the app will be placed. This includes the development of partnerships with various organizations to benefit from advertising as a revenue stream. The underlying aim is to give organizations, such as sports brands, sports clubs and sports facilities, as well as impact-driven brands, a platform for advertisement. A further revenue stream considered is the provision of a B2B solution of the *Connactive* app. Unlike B2C, the B2B model enables organizations to use the app as a closed community. Hence, employees for example can organize activities to do sports together, fostering organizational development.

The next goal is therefore to explore these options in more detail to build a sustainable revenue stream. For the future, this process is essential to obtain the resources needed to increase the number of users and thus to make a significant impact on the society.

Appendix

Appendix 1: List of Figures

Appendix 2: List of Abbreviations

CRUD	Create, Retrieve, Update, Delete
IDE	Integrated Development Environment
PWA	Progressive Web Application
RAD	Rapid Application Development
SDG	Sustainable Development Goal
SQL	Structured Query Language
ToC	Theory of Change
UN	United Nations
UI	User Interface
UX	User Experience

Appendix 3: Quantitative Research Results

- Quantitative Survey (n = 105)

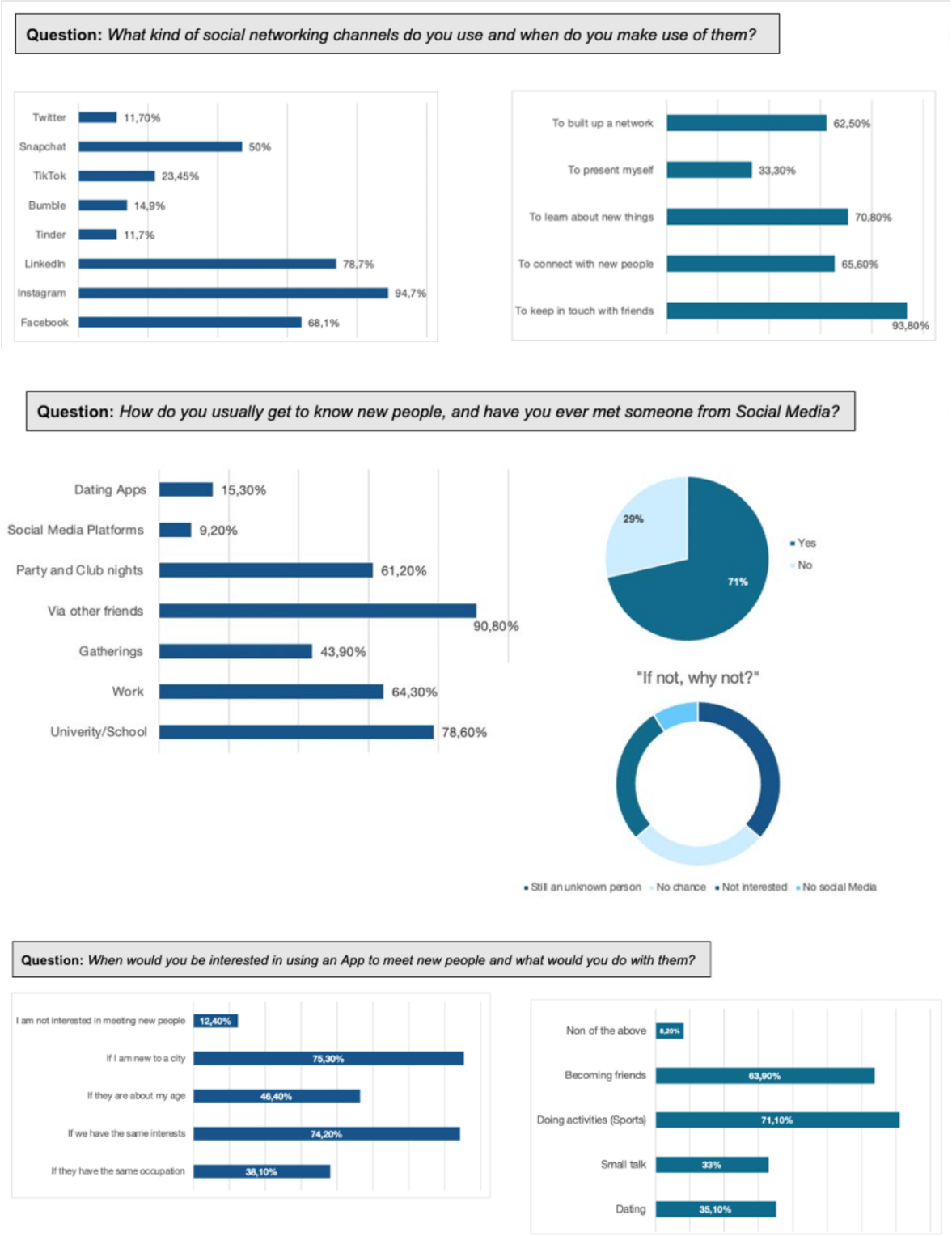
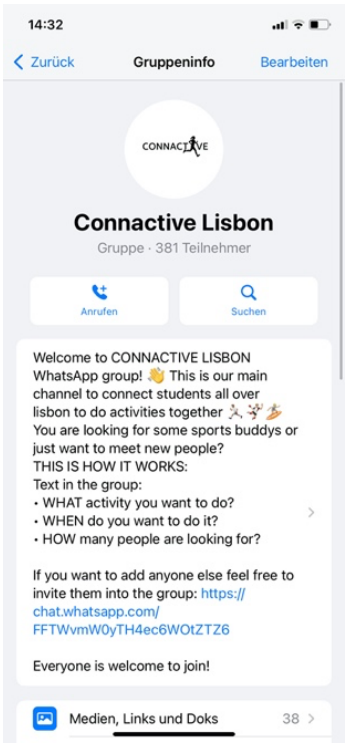


Figure 16: Quantitative research results

Appendix 4: Validation Results

- WhatsApp group (Status: 16/11/2022)



- Impressions from workouts and matches organized through *Connactive*





Appendix 5: Connactive UI/UX Design

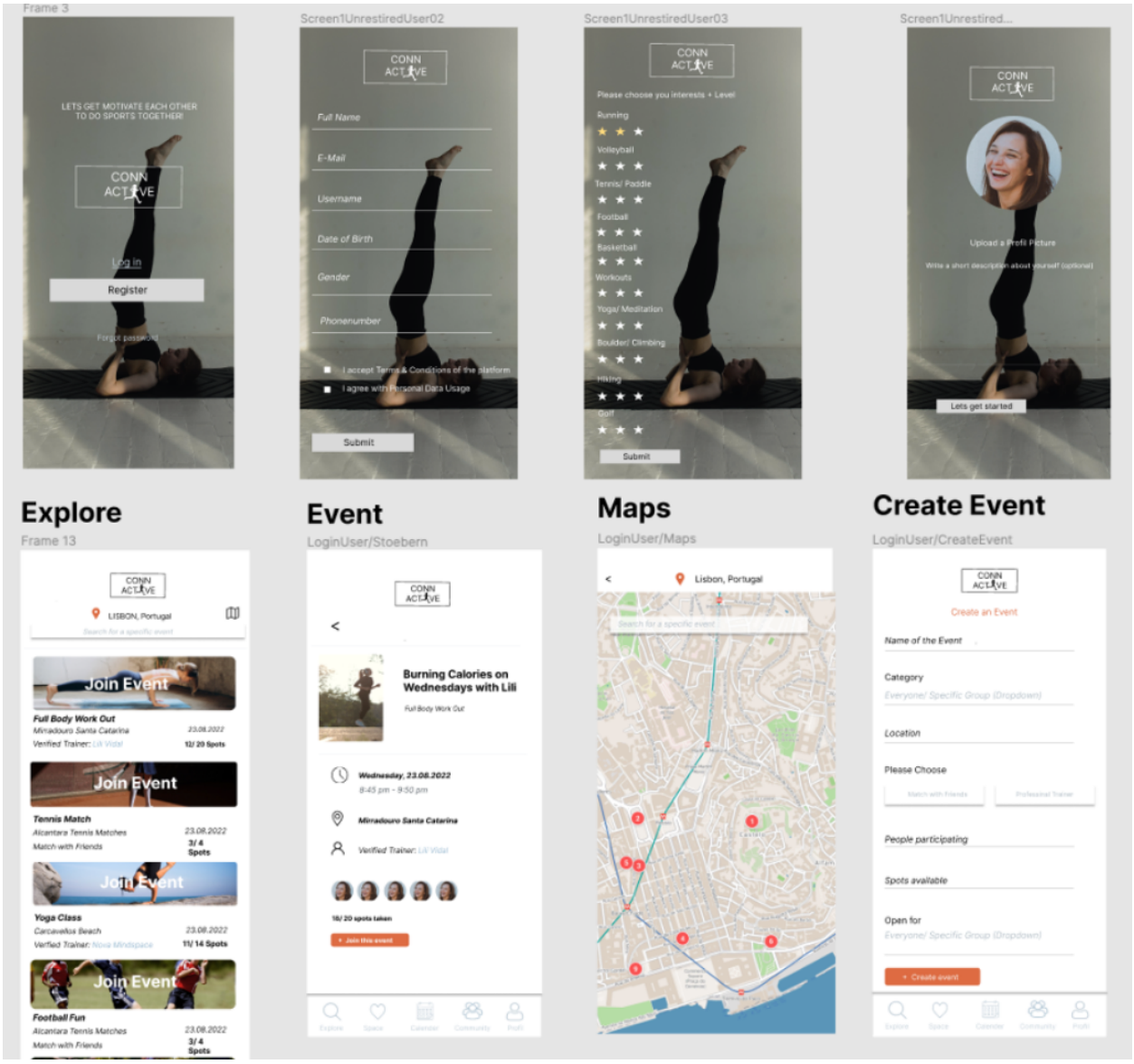


Figure 17: Figma screens

Appendix 6: Connactive Theory of Change

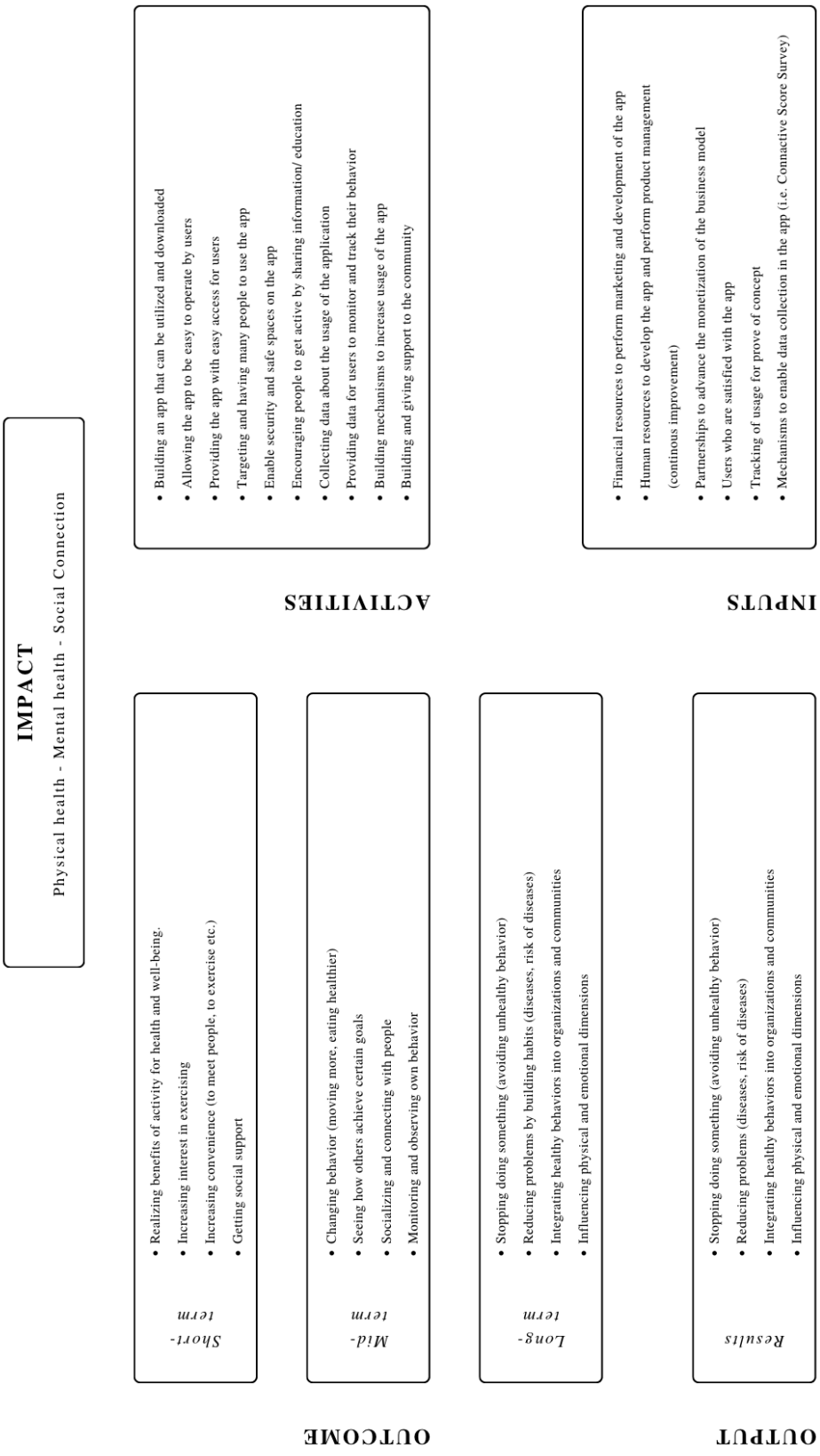
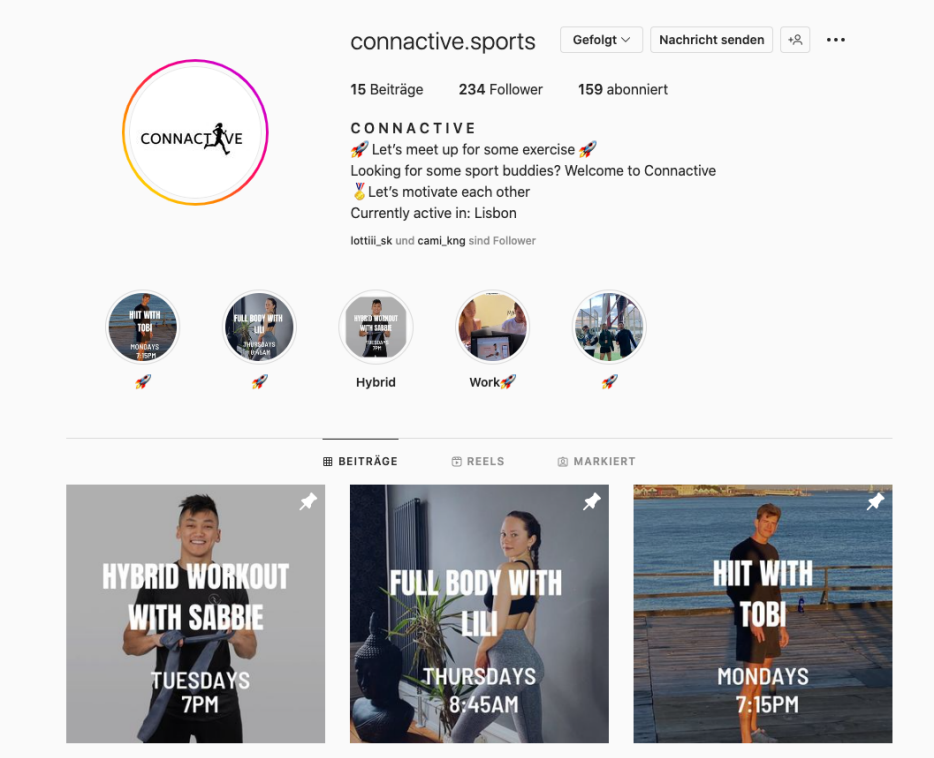


Figure 18: Theory of change

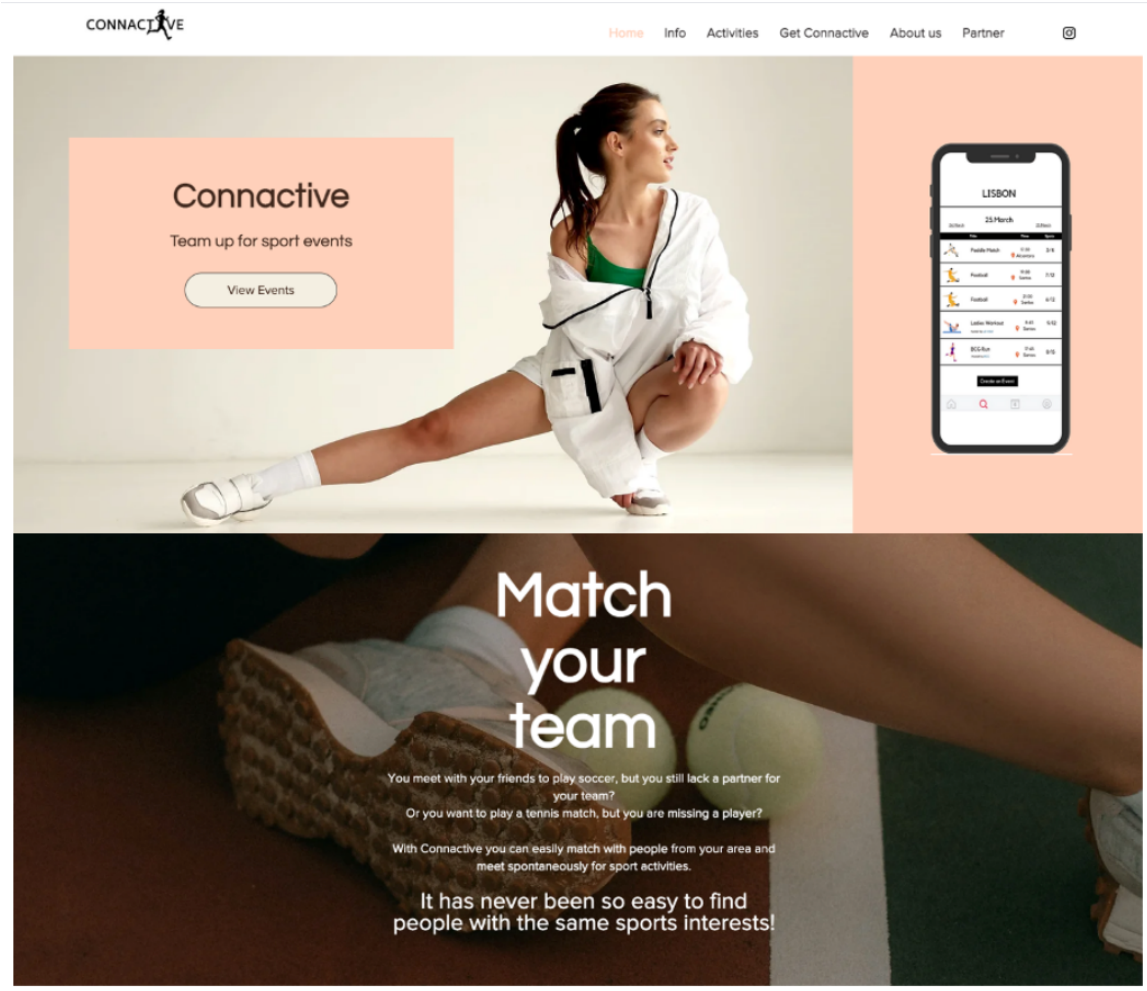
Appendix 7: Connactive Marketing Channels

- Posters on the Nova SBE campus

- Connactive Instagram channel



- *Connactive* website



The *Connactive* website is available at: www.connactive.eu

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