UNIVERSITAT DE BARCELONA

An All-in-One mHealth Application

#Beats – Your health mate

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Abstract

By exploring the current situation of the mHealth market in Spain, and the feasibility of the open-source framework, this article looks forward to developing an all-in-one mHealth application with the concept of Mini Programs/ Instant App. It can integrate the healthcare resources and provide users with more experience of instant services without a complicated installation process. It also strengthens the protection of personal information and privacy. In the meanwhile, by applying the methodology of Rapid Prototyping, a user interface of this app, Beats, will be presented to visualize the above concepts. It may be a revolution for medical providers, doctor-patient relationships, public health care systems, and even the entire healthcare system.

Key Words

Digital healthcare, mHealth, all-in-one, Instant Game, Mini Programs, open-source framework

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1. Executive Summary

With the flourish of digitalization in our life, the topic of mHealth is now getting more and more attention. This paper is intending to developing a mHealth application to let everyone feel the efficiency and convenience of digital technologies, and at the same time, to avoid the waste of public healthcare resources and to rationalize the current allocation of Healthcare resources.

After investigating and analyzing the open-source front-end frameworks on the market, it is demonstrated that the ecosystem of instant/mini-programs can realize the all-in-one concept mHealth application - Beats. By using the front-end frameworks of React[1], users can enjoy related application services without installing and uninstalling applications, and all of the personal healthcare data can be integrated into one platform. From the benchmarking of the current Spanish mHealth applications market, there are no mainstream healthcare applications similar to Beats. The market prospects for Beats are very impressive and optimistic.

The development of this project is mainly focusing on the aspect of the UI design. Through utilizing the methodology of the rapid prototyping, the structure and core functions of Beats are arranged by Mind map[2], and its high-fidelity prototype is designed with the tool of Figma[3]. The entire Beats structure is restored through 38 mobile application screens, which including the splash screen, onboarding, privacy, sign up and sign in, homepage, etc. The implement of this project consists of the working plan, human and material resources, and budget. The promoting strategy of App Store Optimization (ASO) and Integrated Marketing Communication (IMC), and an evaluation plan will also be planned for the operation stage.

The pre-research and development are only a part of an application project, and how to operate and promote the application in the later stages is also quite important.

[1] https://reactjs.org/
[2] https://www.mindmapping.com/
[3] https://www.figma.com/

2. Introduction

In the 21st century, we have entered the era of digital life. With Internet technology developing, digitization has influenced and changed our behavior and daily life, accelerating the process of social development and the pace of modern life. Back in 2015, Kim, Eun-Young was mentioned in the book review of Patient Will See You Now: The Future of Medicine is in Your Hands. Future medical data will be obtained from digital resources, such as smartphone and wireless medical devices and big genomics data. Human GIS data covering an individual's whole life from prewomb to tomb (my GIS) will be recorded and processed by digital devices [1]. In other words, people will collect information about their health through the Internet or hardware devices under the influence of technology. Nowadays, the full popularity and use of smartphones will enable stalking and customization of digital medical services. For example, the emergence of mHealth, interacting with medical providers and patients, allowing the users to access their health data, and helping to track and customize medical service. However, it also leads to some social problems such as suboptimal health. CVS (computer vision syndrome), an aging population, mental illness, pandemics, natural disasters, etc. These continuously remind us of how important health is.

On the other hand, from the increasing growth rate of healthcare expenditure, people have realized that information and monitoring is the best way to keep up healthy. And health is also no longer limited to personal problems. The physical and mental health of people is essential to a family and even society. And in the public health system, chronic diseases are a considerable problem and challenge in all countries. Despite accounting for around 60 percent of all deaths worldwide, chronic diseases are surprisingly neglected on the public health agendas of most nations and regions, particularly in low and middle-income countries (LMICs), where more attention has traditionally been paid to infectious diseases [2]. Chronic conditions require long-term health management and tracking. The smartphone devices may become an aid that can help people to conduct self-health management.

In recent years, world-renowned e-commerce giants such as Google, Microsoft, Apple, and Alipay are further going into digital medicine. However, Microsoft's HealthVault Health Services officially turned off in November 2019. The fact that one of Google's suggested services for its users was still a paradox when Google closed Google Health in January 2013 was HealthVault. The downfalls of HealthVault included its focus on traditional health records over dynamic and patient-acquired data, its lack of integration with many popular wearables, and other smart health devices and its limited social and sharing capabilities [3]. From the pioneers' failure and the market research of the digital medical application market noted later, we find that the functions and operations of health and medicine application are still in the

initial stages of monitoring and have much space to upgrade. This article wants to explore how to efficiently digitize the sophisticated medical resources and design a more intelligent all-in-one mHealth to serve the public.

As a new health model, the mobile health (from now on abbreviated to mHealth) industry has emerged different kinds of healthcare apps with distinct features, such as online appointments, telemedicine, personal physical monitoring, etc. While users experience these services, they have to continually register and create different accounts and passwords, fill in personal information and health status, and worry about personal account privacy and security risks. It can be said that the functional duplication problem of the same type of application is pronounced. The purpose for users to download an app may just for using one of the specific features. The low usage frequency and the prolonged usage cycle have become a widespread phenomenon in the mHealth industry. Under this situation, healthcare apps will quickly become 'zombie apps' in the user's phone. And while users enjoy the digital health service experience, they need to switch between some mHealth applications with similar functions. This process also complicates the user's utilization and management of the apps. mHealth should be a user-friendly tool for providing information syndication, advice, and aids to users and offering them efficient and convenient healthcare service experience.

Due to the enormous market potential of mHealth, e-commerce giants such as Google launched Google Fit and Google Suit. And another company called Get real health has divided its health services into four apps based on different classification healthcare functions. Even though these apps are designed for specified target groups and features, there is a perception among experts in the use of information resources, and this is a kind of digital system duplication and excessive waste.

Beats, the tool this project of the proposal, is devoted to solving these problems. If we can develop an all-in-one healthcare service platform that can gather all kinds of healthcare services, health institutions, and health information on the market, users will be able to get a more comprehensive understanding of their physical condition. All kinds of healthcare apps can be presented to users in the form of Instant apps/ Mini Programs (from now on abbreviated to MPs) on this platform. After enjoying the fast and immediate demand service, their health data can also be centrally recorded on one platform. For developers, new app development requires scripting and updating versions based on different application markets, and the up-front capital of developing a new app is relatively high. The concept of instant apps/MPs can effectively relieve the pressure of the investment cost of enterprises. And those companies can take more concentration on improving digital medical services.

Further, they all face medical resource allocation problems for the public healthcare systems and the local governments. How to efficiently integrate existing medical resources and improve the utilization of medical resources become the essential contents of management decisions. The MPs we propose, Beats, can act as a public healthcare sharing platform. Multi-

regional health information sharing now is challenging to be implemented due to district policies and privacy issues. Beats can ensure data security and privacy through two-way authorization. On this basis, the government will be able to provide more digital healthcare services to the public.

2.1 mHealth (Mobile Health)

According to the WHO definition, mHealth (mobile health) is medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices [4]. The healthcare industry is continuously being innovated and digitalized under the influence of technological advancements. With the emergence of E-health concepts, such as AI prediction, auxiliary diagnosis, Electronic Health Records, Telemedicine, etc. the optimization of medical resources allocation has been realized. The connection and management of medical services between doctors and patients are also more efficient. Among them, the mHealth market has to expand particularly rapidly. Nowadays, mobile devices are no longer just communication tools. Numerous health & fitness medical apps are assisting us to monitor our primary health conditions better. mHealth is leading the healthcare industry into a new era.

With the development of information and communication technology, the innovation of smart terminals, the healthcare industry has ushered in the event of mobile intelligence. The content of the healthcare service has also evolved from medical treatment to health management. There are over 325,000 apps in the global mHealth market, and mHealth downloads are more than 3.7 billion[5]. And Spain has a very digitalized society comparing with other EU countries. It is one of the Top 5 in Europe which has already employed digital technology in the healthcare system and existed a supportive regulatory framework. Spain offers comparably right market conditions for mHealth. While most of the countries don't have a mHealth roadmap or guidelines, Spain already has the most friendly mHealth regulations, especially in regions of Catalonia and Galicia. Spain is one of the European countries with a high acceptance of the development of digital healthcare and relatively mature market regulations. E-health is widely used in traditional treatment in Spain [6]. It is beneficial to the promotion and development of mHealth applications in the Spanish market.

2.2 All-in-one App

The Treaty on European Union (EU) was signed in Maastricht on February 7th, 1992 by the Foreign Ministers and Finance and Economic Affairs Ministers of the Twelve, which marks the beginning of an era of integration in Europe [7]. The establishment of the European Economic

Area (EEA) and the unification of its currency brought unprecedented economic prosperity to the EU. Such globalization is an organic connection between different items in particular scopes or regions through attributes of commonalities, expanding the dimension of interests to realize a whole or union.

With the emergence of world economic globalization, the direction of social development is transforming from complexities to conciseness. The concept of the all-in-one app comes from this. Some respondents wanted an all-in-one system such that they did not have to use multiple medical-related apps. Participants described a desire for an app that would keep track of all their vital statistics (weight, diet, sleep, etc.) to better communicate with their doctors during appointments (i.e., linking with and inputting these data into their medical record) [8]. It is a national survey for US mobile owners. It can be seen that mHealth applications on the market are focused on highlighting and optimizing their advantages features. Such a market strategy is correct. However, what users face is they need to summarize and collect their health data from different platforms. On this point, the health digital process does not facilitate users and make it more complicated.

Utilizing the all-in-one concept in a mHealth application is to think from the user's point of view and designed to give users a better digital healthcare experience. Beats is committed to being created as an all-in-one app in the healthcare industry. Users can enjoy all possible healthcare feature services from one platform. It is just like a remote control that users can manipulate and manage their health data on the platform according to their demands. At the moment, the all-in-one mHealth application in the Spanish market, even in the world's fair, is blank. The prospects of an effective docking platform that can integrate personal healthcare information are promising.

3. Objectives

3.1 General objective

Beats is defined as an all-in-one healthcare service platform that can integrate the digital health resources in the market to provide a better health service experience for users. Here, a closed ecosystem will be introduced – WeChat Mini Program[4] which is based on the MINA framework[5] and obtain a huge success in the Chinese market. Under this scenario, users can search the healthcare mini-programs in Beats, which covers almost all health and fitness, medical apps in the market. You don't need to download and registered lots of related Apps on your phone that may be only used once or twice.

Beats can be defined as the beating of the heart, the rhythm of the exercise and your life. Beats hopes to become a reliable healthcare service platform for users (including patients, citizens, health professionals, public service, health service providers, and software developers). Each user's interface can be customized according to their own needs. Also, smart voice functions like Siri on iPhone, health QR code, and fingerprint identification will be included to enrich Beats' accessibility.

And for those developers and health service providers, the new function of third-party MPs' open-source framework can also significantly reduce their development costs and shortened development cycles for SMEs.

3.2 Specific objective

The above objectives should be achieved through the study of the following modules:

- Investigating some similar open-source ecosystem like mini-programs and instant apps. Exploring how it works and whether Beats can be operated independently from these open-source ecosystems.
- We are benchmarking of 'Medical' and 'Health Fitness' Apps in the Spanish App market.
- The business model and the critical risks of Beats.

[4] https://developers.weixin.qq.com/miniprogram/en/dev/framework/
[5] https://mina.apache.org/

- Legal challenge: Security and privacy issues.
- Define the main functions and accessibility, users positioning of Beats, and analyze feasibility.
- Design structure: Low and High-Fidelity prototyping
- Develop a proposal and schedule.

4. Methodology

The methodology selected to implement this application is an agile strategy, Rapid Prototyping, which is an iterative process used to visualize what a website or an application will look like in order to get feedback and validation from users, stakeholders, developers, and designers [9]. It also includes the methodologies of the comparison and analysis of the open-source frameworks in the application market, investigation of the current situation of mHealth applications market in Spain.

4.1 Rapid Prototyping

The rapid prototyping is a simple-functional prototype system with three steps, and repeated as many times as needed:

1. Prototype: Create a visual mock-up of your solution or interface.
2. Review: Share the prototype with users and evaluate if it meets their needs and expectations.
3. Refine: Based on this feedback, identify areas that need to be improved or clarified.

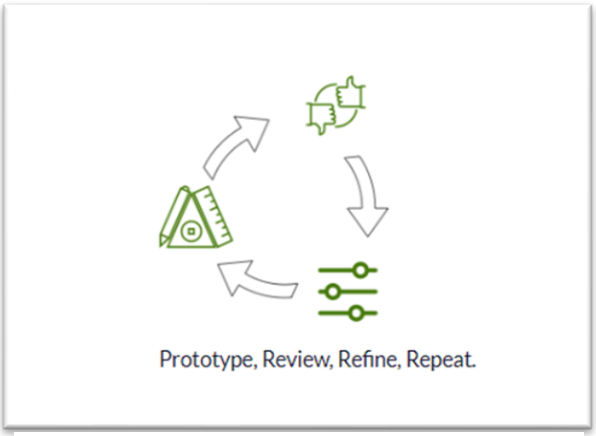

Fig. 4-1 The Rapid Prototyping Process - Anant Jain

It is a process that can be inspected, tested, and modified during the operation until its performance meets user requirements. The main advantage of rapid prototyping is that it is a user-supporting method that lets users engage and play an active role in the design phase of the system life cycle, reducing the risks during the development.

What the rapid prototyping can provide us to test, the new functionalities, the latest technology, and the new interface exactly correspond with the characteristics of Beats.

Combined with the design of High-fidelity prototypes tool - Figma, the conception of Beats can be presented entirely realistically and correctly to the users.

4.2 Related technologies

Besides, the investigation of related open-source frameworks similar to MPs will influence Beats' implementation in the western market. Through a large number of relevant information searches, Google, Facebook, and Alibaba are also applying the open-source frameworks to launching similar mini-programs. The in-deep analysis of their operations will help Beats choose the third-party open-source framework, which will be more appropriate for them. Due to the target market of Beats is in Spain, the research subjects will be selected as follows:

- WeChat – Mini Programs (MPs)
- Facebook – React
- Google – Android Instant Apps

4.3 Benchmarking

From the ranking data of APP ANNIE[6] in the Spanish market, in consideration of the popularity and the user's comprehensive evaluation, four applications classified in 'Medical' and 'Health and Fitness' will be selected for benchmarking. In the way of Mind map to make the comparative analysis of their structures (Mind map[7]) and functions, and the internal investigation of Beats with the SWOT analysis and risk analysis, we can probably predict Beats' acceptance and feasibility in the Spanish market.

Medical App:

- Quirónsalud
- STOP COVID-19 CAT

Health and Fitness:

- Mi Fit
- Home Workout - No Equipment

[6] https://www.appannie.com/en/
[7] https://www.mindmapping.com/

5. Technological Reference Framework

Recently, the emergence of some frontend frameworks such as React[8], Vue.js[9], and Tina.js[10] have laid a solid foundation for developing the ecosystem of instant/mini-programs. Many world's major e-commerce divisions platforms develop instant/mini program ecosystem on their platform. Due to the vast user database of these Apps, developers can leverage more ideas to reflect the value of their products and meet more use scenarios and personalized needs. Also, users no longer need to install a full screen of Apps to enjoy a similar experience as native Apps. Here, some of the most representative open-source frameworks, and their instant/mini-program ecosystems will be introduced and analyzed.

5.1 WeChat

5.1.1 MINA Framework (MPs)

The development framework of WeChat Mini Programs is based on Apache MINA[11] which is an open-source Java network application framework. According to the introduction of the official website, MINA helps users quickly develop high performance and high scalability network applications. It provides an abstract · event-driven · asynchronous API over various transports such as TCP/IP and UDP/IP via Java NIO [10]. The MPs' MINA framework system is

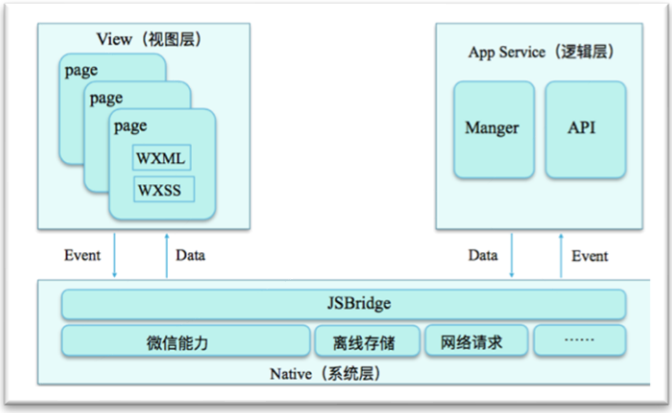

Fig. 5-1 MINA Framework(https://www.jianshu.com/p/3db8484fc521)

[8] https://reactjs.org/
[9] https://vuejs.org/
[10] https://tina.js.org/#/
[11] https://mina.apache.org/mina-project/

divided into two parts: View Layer[12] (View) and Logic Layer[13] (App Service). Reactive Data Binding System[14], which is the core of the framework that can ensure the synchronization of Logic Layer and View Layer. View and App Service run in separate threads execution and communicate via JSBridge.

As can be seen from Fig. 5-1:

- View Layer (View): WXML[15](WeChat Markup language) is an HTML-like tag language and a set of Basic Components[16] provided by MINA. Developers use WXML files to set up the infrastructure view of the page, and WXSS[17] (WeChat Style Sheet) data to control the displays of the page.
- Logic Layer (App Service): It's the service center of MINA. The data required for page rendering and the logic of page interaction are implemented in AppService. App Service in the MINA framework uses JavaScript to write an interactive thesis, network requests, and data processing, but not DOM operations in JavaScript.

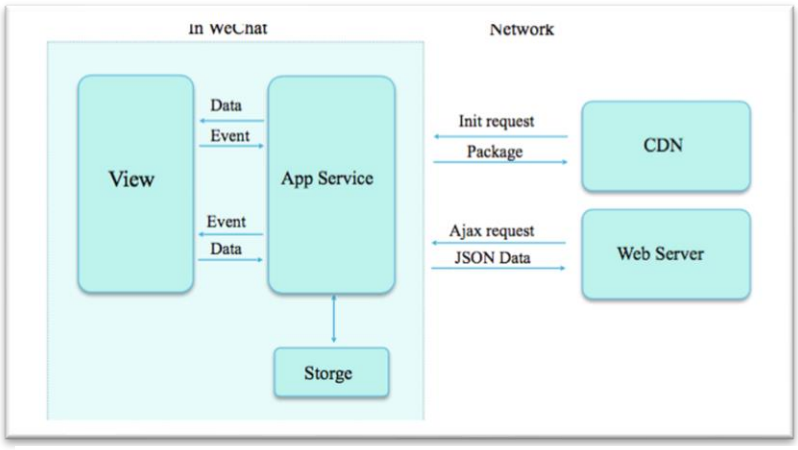

*Fig. 5-2 WeChat Loading Procedure(*https://www.jianshu.com/p/3db8484fc521*)*

5.1.2 Mini Programs (MPs)

WeChat Mini Programs (MPs) was released on January 9th, 2017, by Tencent. They can be easily accessed and disseminated within the WeChat (the Chinese equivalent of WhatsApp) ecosystem. Users can directly open the MPs through scanning QR code or typing keywords in the WeChat search bar. The entire process does not require users to download and install on

[12] https://developers.weixin.qq.com/miniprogram/en/dev/framework/view/
[13] https://developers.weixin.qq.com/miniprogram/en/dev/framework/app-service/
[14] https://developers.weixin.qq.com/miniprogram/en/dev/framework/MINA.html
[15] https://developers.weixin.qq.com/miniprogram/en/dev/framework/view/
[16] https://developers.weixin.qq.com/miniprogram/en/dev/framework/view/component.html
[17] https://developers.weixin.qq.com/miniprogram/en/dev/framework/view/

this platform. MPs are creating a new model to connect users and services. Based on the development of MPs in the Chinese market and the feedback support of the relevant data, MPs are also suitable for the Western market. According to authoritative report analysis, most oversea mini-program users are located in Europe and Russia (56.98%) in 2018 [10]. It shows that the high acceptance of MPs in Spain and the European market is a solid ground for the development and promotion of Beats.

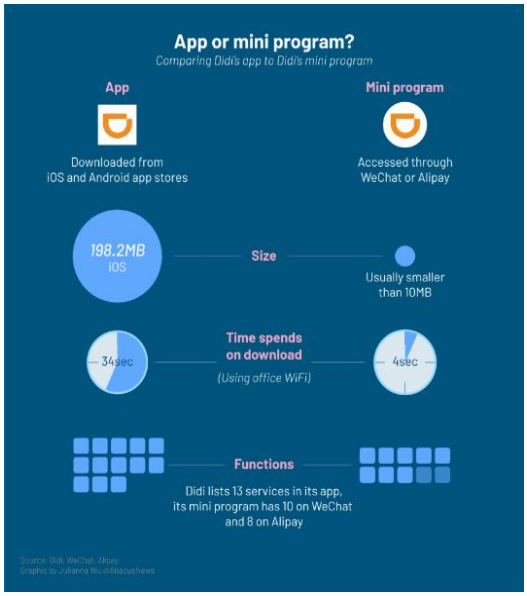

Fig. 5-3 Capacities of WeChat Mini Programs VS native apps. Source: Abacus

Comparing with the native Apps, we can see in Fig. 5-3 that the size and time spend on downloads of MPs are far less than in native Apps, which have a better functional structure. Those features in MPs may not be as comprehensive as native Apps, but functions in MPs can meet the primary user's basic operational requirements. Mini programs are necessarily implemented as Web apps with some customizable features that are thus accessed via hyperlinks from the app. They may suffer from worse user experience than native apps [11]. However, functional flaws do not substantially affect the user's acceptance of the MPs. According to QuestMobile Mini-program Report H1 2019, WalktheChat Analysis, WeChat Mini Program's monthly active users base grown 51.9% in just six months. (Fig. 5-4) By June 2019, WeChat Mini Program has 746 million monthly active

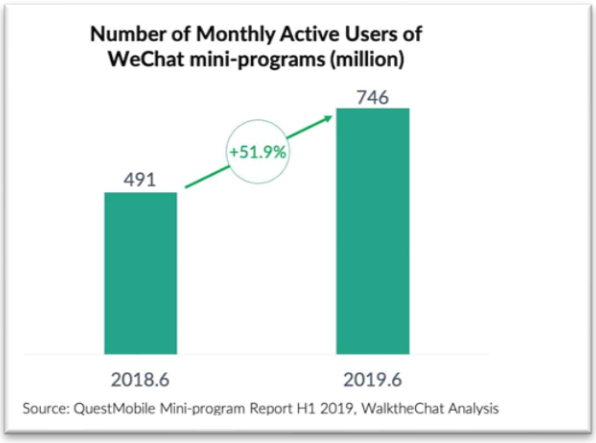

Fig. 5-4 Number of monthly active users of WeChat mini-programs(million)

users. Users are also spending more time using Mini Program. (Fig. 5-5) In just six months, the average time the user spends on Mini Program grows by 23.3%, from 52 min to 64 min [10].

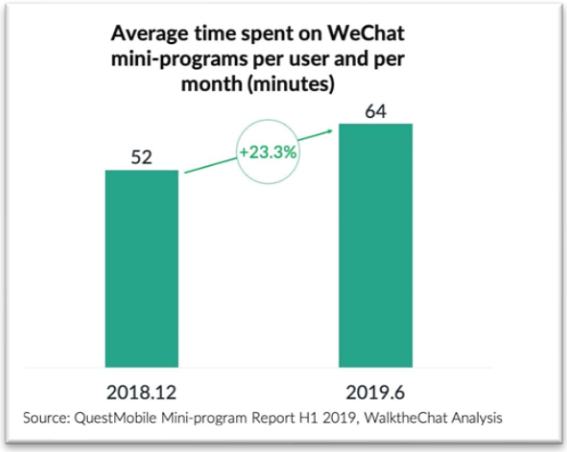

Fig. 5-5 *Average time spent on WeChat mini-programs per user and per month (minutes)*

The emergence and success of MPs in the Chinese market changes the users' and developers' perceptions about the landscape of the mobile Apps market: With the introduction of MPs in 2017, an ecosystem was created for third-party developers to offer lightweight apps to WeChat's sizeable existing user base. This event marked a new chapter of platform innovation on WeChat, further extending its proposition as an all-in-one-app to a super-app [12]. After seeing the great success of Tencent's app, Alibaba, Baidu, Bytedance, and other Chinese e-commerce giants have also launched their MPs to seize market share and improve users' experience. Earlier, in 2013, Facebook released React, which is a JavaScript library for building user interfaces. And on Google I/O 2016, Google released Instant Apps, which lets people enjoy the app's offerings without installing it. Arguably, Facebook and Google introduced a similar concept like MPs earlier than Tencent. In the next chapters, some ideas will be presented to help you comprehend more about the Instant Apps/Mini programs.

5.2 Facebook

5.2.1 React (RN)

As early as April 2015, Facebook launched an open-source mobile JavaScript framework – React Native (RN). React Native is a JavaScript framework for writing real, natively rendering mobile applications for iOS and Android. It's based on React, Facebook's JavaScript library for building user interfaces, but instead of targeting the browser, it targets mobile platforms [13]. Native React is focused on improving the development efficiency of multi-platform – 'learn once, write anywhere.' After years of development and improvement, React Native has become the mainstream framework for cross-platform development around the world. Its

implementation ideas and technical approaches have greatly influenced the light application solutions of significant companies, such as Tencent's WeChat MPs. From the State of JavaScript 2019, Front End Frameworks Report shows that: Whether in terms of comfort, satisfaction, or user feedback, React performs very well.

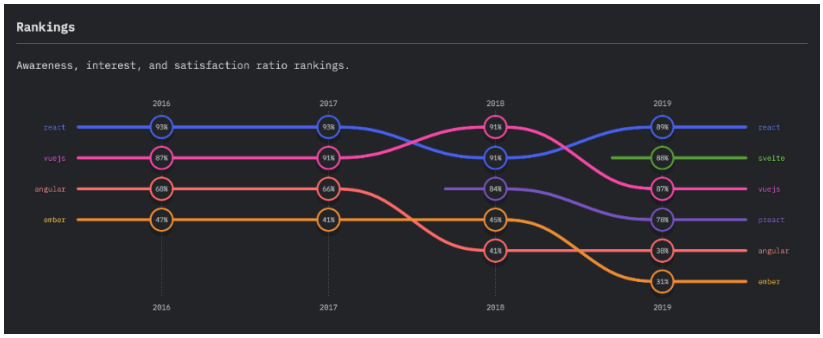

Fig. 5-6 *Awareness, interest, and satisfaction ratio rankings of Front-End Frameworks* ***2019****. Source: stateofjs*

Fig. 5-7 *Feedbacks of Front-End Frameworks 2019. Source: stateofjs*

5.2.2 Instant Games

Facebook then launched Instant Games in November 2016, allowing users to play a series of HTML5-based games without downloading Apps. On March 14th, 2018, Facebook official announcement of its full opening platform of Instant Games mini-gaming to the world, which means all developers can upload their mini-games to Facebook. And this is the biggest social network worldwide, with over 2.6 billion monthly active users as of the first quarter of 2020 [14]. WeChat has a similar mini-game to Instant Game, Still, Facebook is more potent that its 'FB Messenger' has multiple mini-game entrances that can not only start the game in a window chat but also find the entry of the game list in the 'FB Messenger' menu. And now the platform is not just limited to mature markets: it is now available on Facebook Lite, an app that allows mobile users across the world to access Facebook on low-spec devices, and quality of Internet connection is not an issue [15]. In such a vast user base, it can be said that this instant concept

of the programs or games has been accepted and recognized by the global market, and its growth trend is favored.

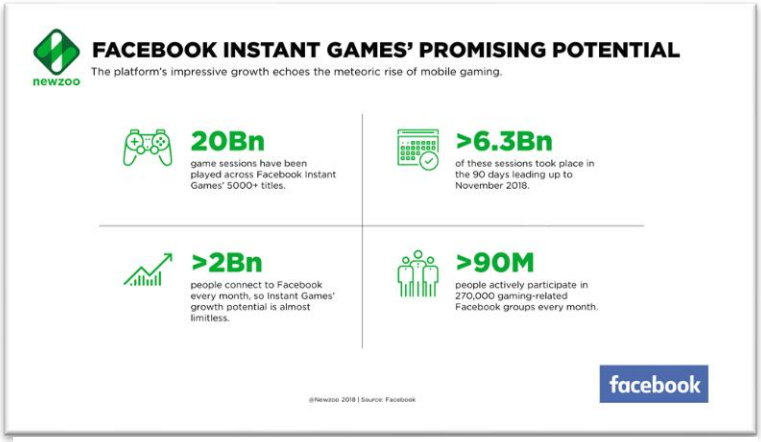

Fig. 5-8 *Facebook Instant Games' **Promising** Potential. Source: Facebook*

5.3 Google

5.3.1 Google PWA (Progressive Web App)

The concept of Google PWA came up in 2016, and the technology was launched in 2017. PWA's core is to leverage the standardized framework provided by mobile sites to implement the Progressive Web Apps and improve the user experience of Web Apps. Google Developers to sum up the advantages of PWA as FIRE – Fast, Integrated, Reliable, and Engaging[18]. There are already many enterprises, such as Twitter, Uber, Instagram, and Financial Times, using PWA.

5.3.2 Android Instant Apps

PWA is a kind of Web APP, and Android Instant Apps is Google's light app, a lit-up version of the App, and morphologically closer to the WeChat MPs. It is worth noting that Android Instant Apps are not the same as WeChat MPs. Android Instant Apps offer a kind of quick trial service for users through social networks, app stores, and other channels. And users can decide to install the full version when the user experience is satisfactory. On the other hand, WeChat MPs don't have the step with trial experience.

[18] https://developers.google.com/web/fundamentals/glossary

6. Market Analysis

6.1 Background

6.1.1 Overview

The emergence of mHealth is an innovative model based on the continuous development of the network. With the help of mobile devices, the scope of health resource interaction in the O2O model has been gradually expanded. According to the report ‘mHealth Apps Market Size, Share & Trends Analysis Report By Type (Fitness, Lifestyle Management, Nutrition & Diet, Women's Health, Medication Adherence, Healthcare Providers/Payers), And Segment Forecasts, 2019 – 2026’, The global mHealth apps market size is expected to reach USD 236.0 billion by 2026, It is projected to expand at a CAGR of 44.7% during the forecast period [16]. From which we can foresee that the future of the mHealth market is quite promising.

For the moment, the mHealth in the application market is divided into two major sections: health & fitness and medical. In the following market analysis, benchmarking will be used to investigate and study four popular mHealth apps in the Spanish application market. Through contrastive analysis of their structures and functions, it can be inferred that Beats’ prospects and viabilities and the positioning of its essential features in the Spanish market.

6.1.2 Demand analysis

User demand is the basis of all products. For mHealth application, user habits are still in the cultivation stage. With the maturity of the app's services and features, user habits will be improved. There is also a growing user demand for managing personal healthcare information. Further, the use of the product scene will become fragmented and diversified. In addition to the primary acquisition of health information, the user's demand for fitness, psychological counseling, healthy recipes are also growing. In essence, users are meeting the need to improve their health and quality of life.

In recent years of medical development, digital medicine has been applied in areas such as AI prediction, screening, auxiliary diagnosis, drug development, and tracking of suspected areas in areas such as patients. Digital medicine has also become the focus of research in many countries. However, the digital health services enjoyed by the general public are still stuck in the essential function of tracking steps, heartbeats, and calories, etc. With the development

and the popularity of mobile devices (smartphones), user demand gradually increased, the scenario for product use will be more fragmented and diversified.

6.2 External Analysis (Benchmarking)

6.2.1 Competitors Determination

Currently, iOS and Android are now the two largest mobile operating system market in the world. And until May 2020, the iOS users have a market share of 21.31%, while Android users accounted for 78.44% market share in Spain[19]. So the testing environment will be performed in Android.

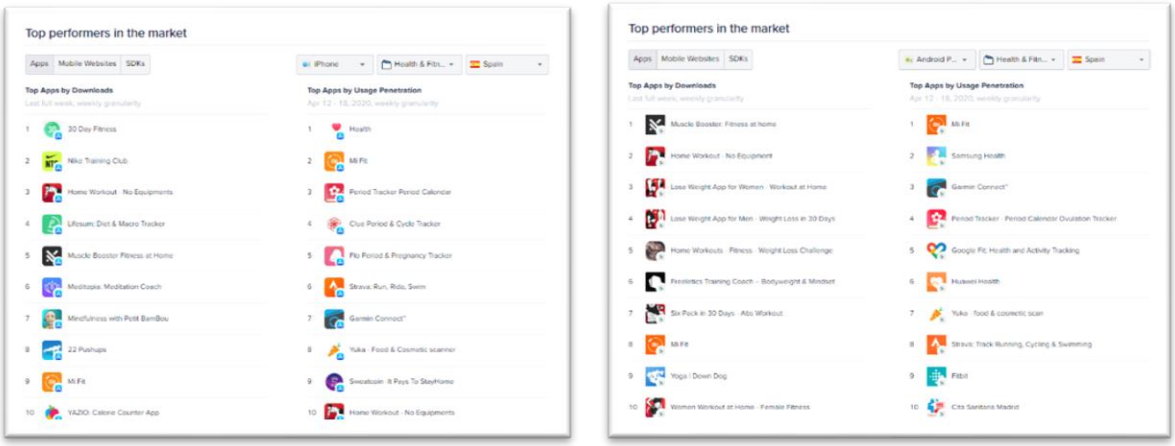

Fig. 6-1 Health and fitness section in iOS and Android

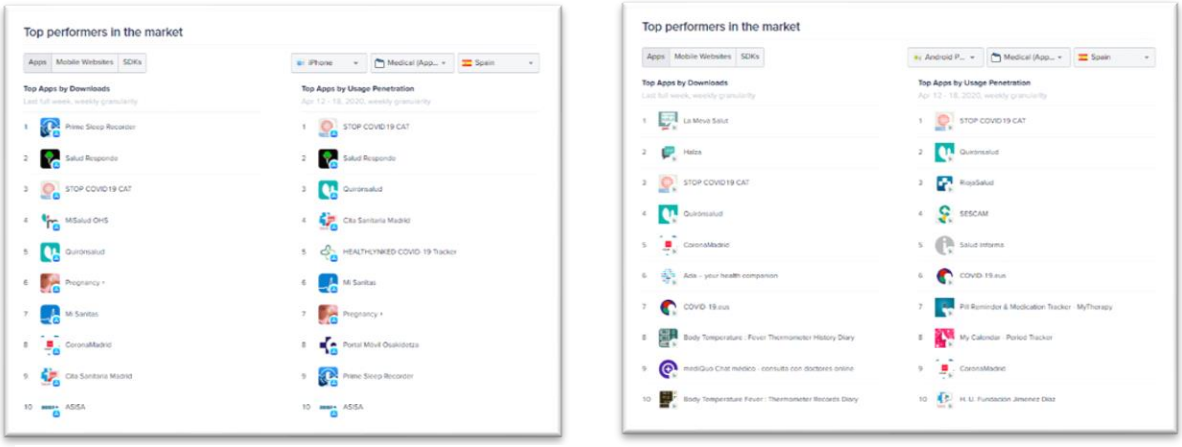

Fig. 6-2 Medical section in iOS and Android

[19] https://gs.statcounter.com/os-market-share/mobile/spain

After a comparative analysis of competitors' performances, structures, and market positioning, we can intuitively understand user demands and market conditions in Spain. Beats can also determine its market positioning more accurately. As shown in Fig. 6-1 & Fig. 6-2, to gain insights into the functional modules of current mHealth Apps market, the characteristics of content operation and interface and market acceptance, synthesis the data from APP ANNIE[20] of Top weekly performers in the market in the field of 'Health and fitness' and 'Medical' section, in iOS and Android, in Spain. Combining with iOS and Google Play user downloads, application utilization, and rankings, the below four applications were selected as the competitors for Beats.

APP Version	
Medical	**Health & Fitness**
Quirónsalud V 2.70	Mi Fit v 4.0.17
STOP COVID-19 CAT V 1.0.2	Home Workout - No Equipment V 1.0.31
Device Model	
Android 10, Huawei P30pro, EMUI 10.0.0	

Table 1 Testing environment

6.2.2 Current Situation

From the rating and the scoring survey of two sections, it can be seen that the downloads of health & fitness are higher than in medical, and the rating is also more positive than in medical. It is substantially related to the functionality of the application.

App	Release on	Rating	Slogan	Product positioning
Quirónsalud	May 21, 2015	4.5/3,587	La salud persona a persona	Cooperating with national and international insurance companies and providing users the best medical services by integrating Spain's best hospital resources.
STOP COVID-19 CAT	Mar 18, 2020	2.9/1,575	-	Providing citizens in Catalonia with relevant knowledge, real-time information, and preventive measures about COVID-19. Assisting the government in collecting personal information about home isolated and suspected patients.
Mi Fit	Aug 19, 2014	4.5/949,160	-	Accurately recording users training statistics, sleep quality, weight, and various individuals health indicates. Helping users learn more about their bodies. It can be suitable for a wide range of devices, including Mi Band, Amazfit Bip, etc.
Home Workout	Nov 8, 2017	4.8/997,288	ENERGY & PERSISTENCE Conquer all things	Providing daily exercise routines for users major muscle groups and ensuring the exercise scientifically and professionally. Many sorts of built-in Apps are included, such as bodybuilding, strength training, boxing, etc. To become a professional home fitness coach.

Table 2 Product positioning and rating comparison

[20] https://www.appannie.com/en/

- **Quirónsalud**[21]
  It is a company founded in 2015 and headquartered in Madrid. It has a scientifically rigorous attitude, with the best professionals, state-of-the-art technology, research, and management to ensure the quality of services provided to all citizens. Its medical services cover all medical professions, particularly in the diagnosis and treatment of cardiovascular disease and oncology pathology. Its brand influence and reputation are well-ranked in the Spanish market. With strategic cooperation with many local hospitals and insurance companies, the number of users in Quirónsalud is stable and plentiful.

- **STOP COVID-19 CAT**[22]
  Salut Generalitat de Catalunya launched this application. Due to the recent influence of the COVID-19 pandemic, its downloads have seen a surge in April. The primary purpose of developing this app is to relieve the pressure of public medical resources and provide citizens with a unified open platform for self-screening of COVID-19. In the meanwhile, it is collecting population data to create real-time dynamic heat maps. However, STOP COVID-19 CAT was released for only one month, its features and user experience were less than satisfactory, with ratings of only 2.9 on Google Play.

- **Mi Fit**[23]
  Originally this was an app developed to match Xiaomi bracelets. Xiaomi and its related electronic products are very popular, and its mobile phone sales are in Top3 in the Spanish market. It lays the basis for a high viscosity user base for Mi fit. Its target group is health-focused sports enthusiasts, gradually moving towards the personal ID direction. And its positioning of a healthy life, additional features of being associated with a variety of brand devices, makes the downloads, usage, and rating are ranked at the top of the app ranking.

- **Home Workout - No Equipment**[24]
  It is an exercise and health app developed by Leap Fitness Group. Until July 1st, 2020, all premium workouts in this app are free. It makes Home Workout trending hot

[21] https://play.google.com/store/apps/details?id=com.divisait.quironsalud
[22] https://play.google.com/store/apps/details?id=cat.gencat.mobi.StopCovid19Cat
[23] https://play.google.com/store/apps/details?id=com.xiaomi.hm.health
[24] https://play.google.com/store/apps/details?id=homeworkout.homeworkouts.noequipment

recently. Unlike other workout fitness apps, it focuses on developing specific muscle groups or dedicates your time for a full-body workout. For different degrees of users have the corresponding classification plan. Through animated GIF or demo videos, it is clear that users can figure out how to do the right exercises. Users can also watch a YouTube video for more clarity. It can be said that the user experience of this app is remarkable.

6.2.3 Structure Diagrams Analysis

Structural diagrams can provide a full display of product information, and functional logic, which helps us quickly understand the functionality and information structure of products. In this section, the Mind map will be used to present the basic structure of these four apps for a more intuitive and intensive presentation of the positioning, functionality, and user interface of the entire product.

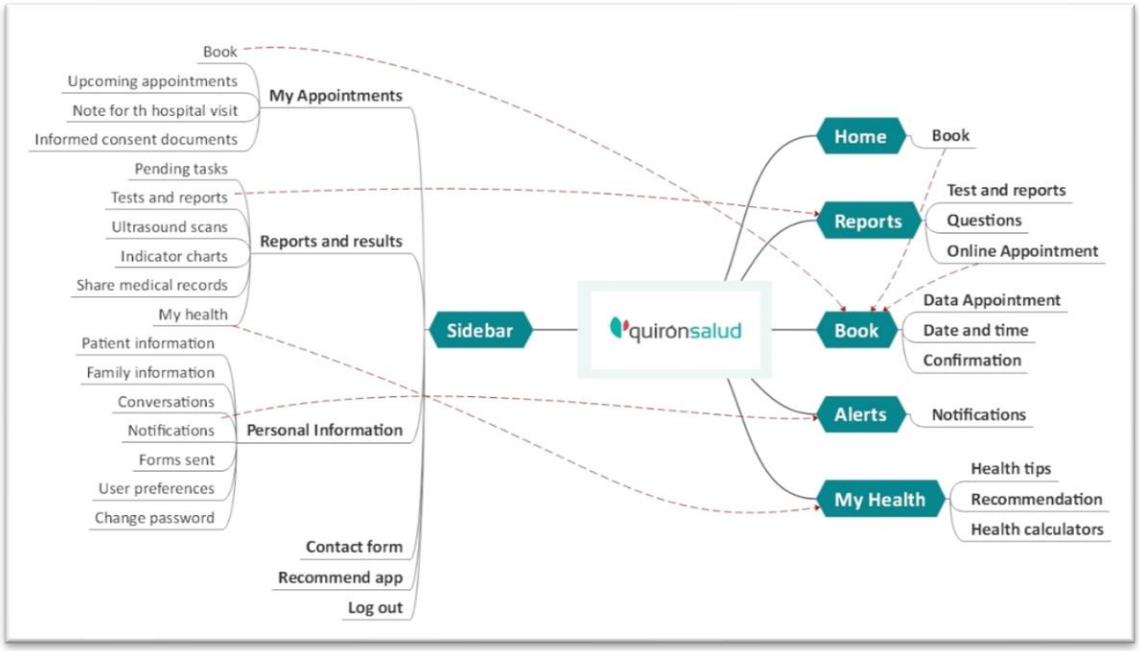

Fig. 6-3 *Structure Diagram of Quirónsalud*

Quirónsalud: The structure of Quirónsalud is generally straightforward. However, the bottom navigation bar and the sidebar navigation are repetitive in some functions, such as a book, my health, and notification. It complicates user operation and decreases the overall experience. As can be seen from Fig. 6-3, the characteristic feature of Quirónsalud is the online appointment and the reports, which is worth Beats learning.

STOP COVID-19 CAT: In this application, the structure is a single-function of registering the personal information if you have the COVID-19 symptoms. The choice of five languages increases the accessibility of this application.

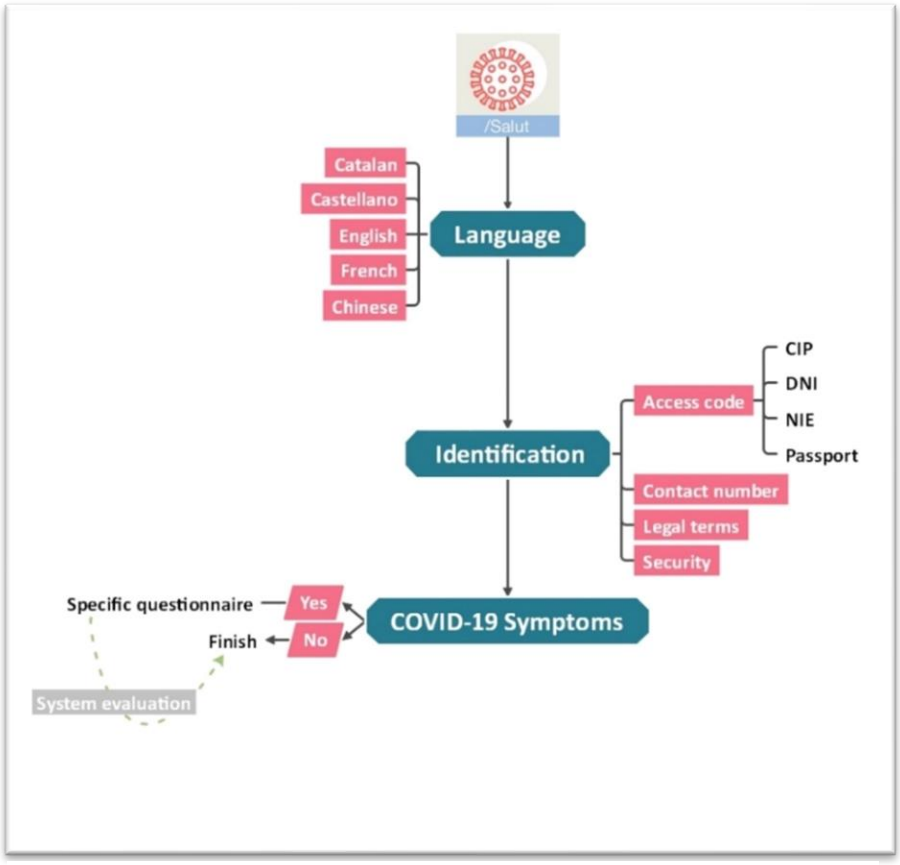

***Fig. 6-4 Structure** Diagram of STOP COVID-19 CAT*

Mi Fit: It connects with external portable devices and provides users with body statistics in different sports states. Its structure clear and detailed. The functions of QR code scanning, smart analysis, and friends can be used in Beats.

Home Workout - No Equipment: As shown in Fig. 6-6, in addition to the current training plans, users can discover more projects, and it also provides the reminder and the report function as Quirónsalud. It has 16 different kinds of language for choice. Beats will draw on the structure of its discover section.

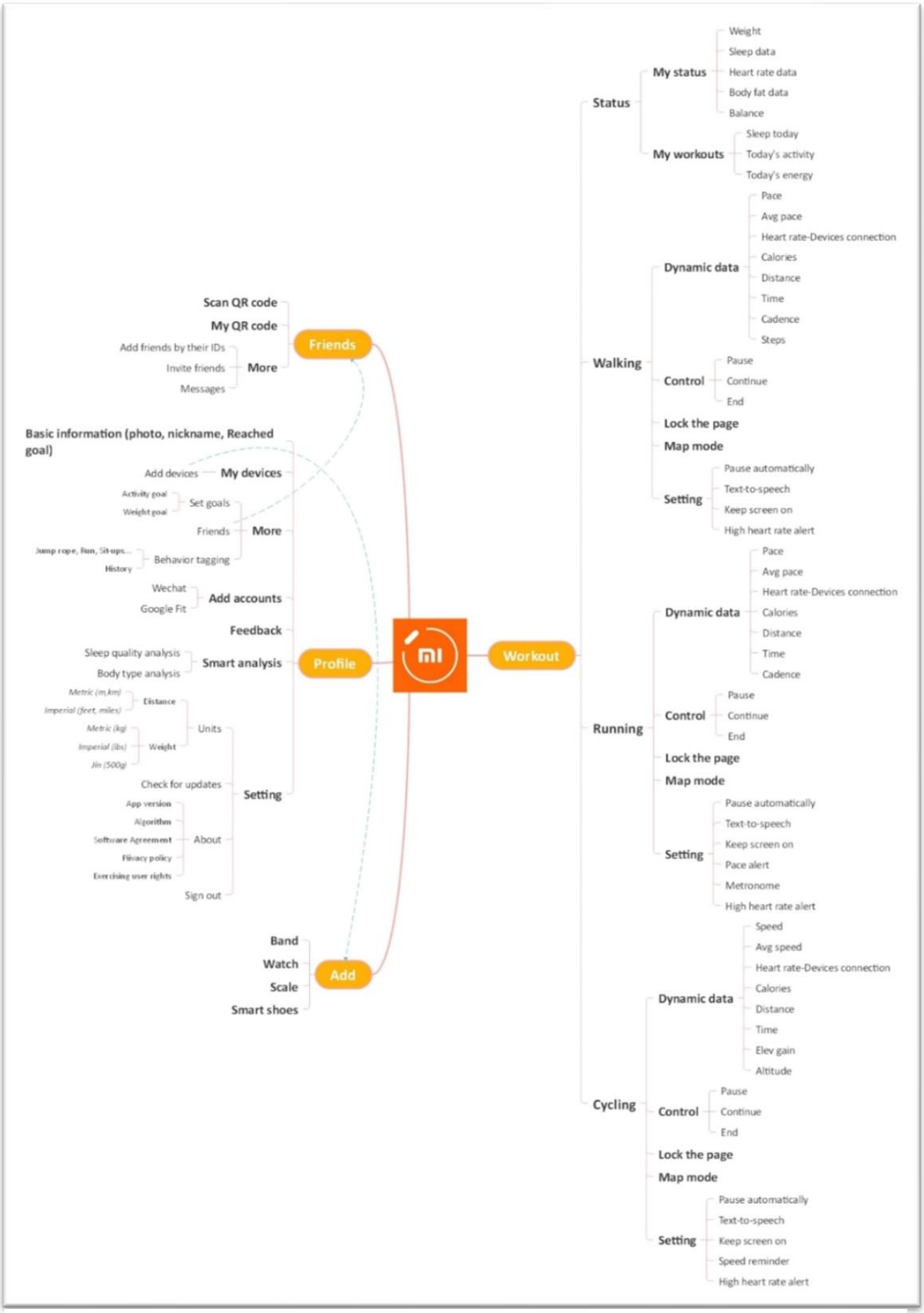

Fig. 6-5 Structure Diagram of Mi Fit

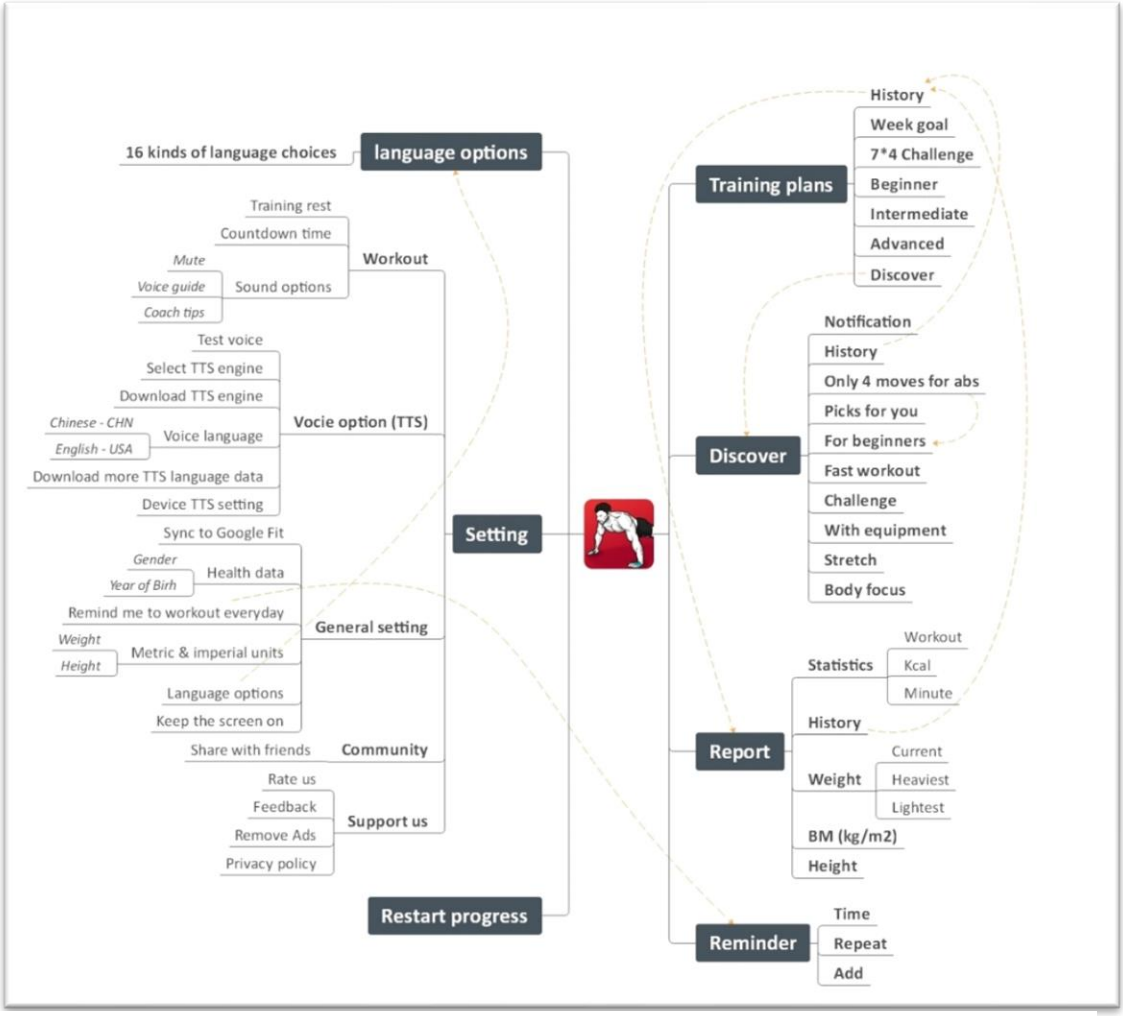

Fig. 6-6 Structure Diagram of Home Workout - No Equipment

In the structures of two medical apps, although their positionings are different, it can be evident that Quirónsalud's overall interface layout is more relatively intact and bright. In terms of user experience of the STOP COVID-19, users cannot obtain some substantial feedback from this app. It was developed to cater to the current market demand, while the single functionality and structure cause for low usage. That's why it has a pretty hefty download and lower user ratings. Since the development from 2015, Quirónsalud has accumulated abundant experience and a high reputation in the Spanish market. The business model and the market scale of Quirónsalud make its user group quite large, stable, and sticky. Its specific positioning and favorable user interactions have a direct return in increasing user engagement.

The framework structure of Mi fit, and Home Workout is excellent. And due to diverse target groups and positioning, their emphasis is different. Mi fit mainly focuses on the induction and collection of motion and health data. And with the collocation of mobile wearable devices to provide users a new healthy experience. Home Workout is more like a fitness assistant coach.

The reasonable classification of its fitness program and multiple audio-visual video tutorials fortify its accessibility and user experience.

In conclusion, compared to the medical apps, the structure of the health & fitness apps is complex and detailed. Medical apps should strengthen the development and experience of interaction. Regional regulations may limit some of the Feature development. In this case, the availability of the medical apps will be significantly reduced, which is detrimental to the development and update of the functionality.

6.2.4 Function Analysis

The function is closely related to customer demand, which is the core of market competition. The diversity and fragmentation of customer demand are becoming increasingly prominent. Thus, the functional comparison will be analyzed from the following aspects.

- Target group
- UI (User Interface)
- Functions
- Privacy & Permission
- Social Media

The target group is one of the definitions of product positioning. The success of Facebook tells us that when the product satisfies the needs of a specific group, and it becomes the best choice to meet the needs of those people. The target group of products will be expanded, and the product will also gradually become the user's best choice.

The user interface, referred to as UI, is a layer in the process of human-machine interaction. It includes the layout of the menu, dialog box, and windows, the validity of the text, interface appearance, the combination of pictures and icons, operability, etc. Just as the first impression of someone is from his/her apparel matching, a remarkable user interface, from the pairing of color graphics, interaction design, and voice control features, will have a positive impact on users.

To be desirable for customers, the multisided e-health market as a whole should be ethically acceptable and trusted, with conformance with regulations and laws, it must be secure, and it must offer the customer protection of his or her information privacy [17]. The protection of personal privacy and information data security issues directly affect the trustworthiness of the product. Users can determine the security of the app from its permissions. Therefore, the application should request user permissions within a reasonable range of features it provides.

Social media are interactive, and everyone is free to write, share, comment, forward, and communicate online. As a low-cost and cost-effective online tool, it delivers a product brand

image and fosters brand loyalty. It also provides a broader communication platform between users and brands. Enterprises can offer users with timely feedback and technical support. It enhances the user experience of the product.

Below is the comparison of four applications. The number of followers captured from social media is before April 30th, 2020.

	Medical		Health & Fitness	
	Quirónsalud	**STOP COVID-19**	**Mi Fit**	**Home Workout**
Target Group	Clients who require a better medical experience and users of related cooperative hospitals	Users in need of prevention and self-check of COVID-19.	Users who can bind related devices and with health data record requirements.	Users with fitness needs and muscle exercise enthusiasts.
UI (User Interface)				
Interface layout	Clear, concise	Simple design	Clear, modern design	Modern design, consistent
Color tone	Turquoise	White	Orange	Blue
Navigation	☑	☑	☑	☑
Search function	☒	☒	☒	☒
Language	Spanish, English, Catalan	Catalan, Spanish, English, French, Chinese	Follow the mobile language system	16 languages
Registration	☑	☒	☑	☒
Third-party Login	☒	☒	Mi Account, WeChat, Facebook, Google	☒
Functions				

Similarity	Authentication with E-mail and phone.		Personal basic status and dynamic data record; Set goals;	
Difference	1) Making and managing appointment; 2) Report data analysis; 3) Alert and notification; 4) Personal health data management; 5) Health tips and recommendation; 6) Family information connection.	Registration of personal contact information and provide related knowledge and response measures about COVID-19.	1) Personal QR code and social interaction; 2) Connections to various smart devices; 3) Smart analysis for sleep quality and body type;	1) Reminder function of alarm; 2) Voice and sound accessibility; 3) Discovery of more workout;
Privacy & Permission				
Scope of authorization	Storage, Location, Camera, Microphone, Contact, Calendar, Body sensors;	Storage, Location, Telephone;	Storage, Location, Camera, Telephone, Microphone, Contact, Call logs, In-app installations;	Storage, Control vibration, Google play billing service, have a full network access, Play install referrer API, Prevent phone from sleeping, Receive data from Internet, View network connections;
Social Media				
Facebook	73,754	33,124	517,524	☒
Twitter	37,379	96,195	105,996	☒
Instagram	17,479	41,721	288,780	☒
YouTube	11.1K	4.08K	1.04M	4.37K
Engagement	Low	Regular-Low	Regular	Low

Table 3 Feature Comparison of four competitors

6.2.5 Conclusion

From the analysis comparison above, these apps have their specific target group and functionality. Mi Fit and Home Workout are superior to the other two in the user interface that the layout is more modern, the overall usage is more fluid, and the user experience is better. COVID-19 and Mi Fit are relatively reasonable in privacy and permission settings. All four apps don't pay much attention to social media and user engagement. Only Mi Fit has created a user interaction feature for connecting friends. Lacking a benign interaction will be a significant limitation and influence in the development of the features.

6.3 Internal Analysis

6.3.1 Ecosystem

The ecosystem designed for Beats is centered on the concept of mini-programs. It creates a dedicated platform for the market to provide users with personal health data collection and management services. Users do not need to register different accounts for apps with various features, and through the functionality of friends and BTL (below-the-line) activities to create a healthy interaction community. In Chapter 5, four close ecosystems of the mini-programs concept have been described in detail. Nowadays, the most popular applications in western markets are Facebook and its chat app, WhatsApp. In terms of market operational maturity, the front end frameworks of React will be more appropriate to Beats.

6.3.2 SWOT Analysis

SWOT analysis is a method to make a comprehensive, systematic, and definitive study of Beats from the internal strengths, internal weaknesses, external opportunities. and external threats. Then the corresponding development strategy and planning can be formulated according to the research results.

Strengths:

- So far, in mainstream mHealth applications, there are no similar competitors to Beats in the Spanish market. This is a brand-new defined healthcare app which has a great market development potential.
- There exist user demands for smarter healthcare apps.
- The scope of the target user is extensive. Any health enthusiast or a health-focused person will be a target user for Beats.

Weaknesses

- Beats, as a very new brand, need to be developing under the protective cloak of the massive tech companies. As a startup project, it's hard to test and release the application by its own power.
- Currently, healthcare apps in the market are weakly regulated. It is hard to find a credible organization to standardize the evaluation and management of those apps that want to join Beats.

Opportunities:

- The competitors like Quirónsalud and Home Workout, does not offer functions with more accessibility like voice-assisted search, and QR code.
- Quirónsalud, STOP COVID-19, and Home workout don’t have an interactive section of family and friends. It is possible to strengthen the creation of social features, and more "third-party access" constitutes the health interactive communities that will enhance user loyalty and the utilization of the app.
- Generally, there is no design of the health-relevant content. It can be a section related to real-time news, such as a blog, or health tips that allows users to acquire more health information and knowledge.

Threats:

- Due to the early start and long development, Quirónsalud and Home Workout are very professional in their field and have a large user base. Some brands of application already have a great market impact and position. Its brand influence has earned it a high level of user trust and favorability for its products.
- The language accessibility of Mi Fit and Home Workout is favorable. There are at least three languages available for users to select. With the appropriate color tone and icons, the text is concisely and directly for users to understand. Meanwhile, Quirónsalud, Mi Fit, and Home Workout use a navigation bar with disambiguation tags.

6.3.3 Market Promotion

- The objectives of promoting a brand-new app to the local market are to raise brand mindfulness and to feature its particular characteristics. Combined with the analysis of SWOT, the attributes of Beats which are not quite the same as other competitors available are recorded as underneath:
- The target group can be covered for all ages in Spain.
- Users can manage their healthcare data and information with just one account. Avoiding the process of re-registering personal information.

- The concept of Instant apps use in the mHealth app is novel, convenient, and low cost. Each user can personalize their health world.
- New health functionality experiences such as health QR code, voice assistant, and health interaction ecosystem.

6.3.4 Strategy

After a series of analyses of competitors, Beats will be running under the environment of Instant apps, which is a more mainstream closed ecosystem in the Spanish market. And the prototype of Beats will principally demonstrate its characteristic functions. To effectively expand the user base, in addition to the fundamental registration way of email and phone number, Beats will add the third-party account registrations of WhatsApp, Facebook, and Google, which have an enormous number of users. It is worth noting that Instagram and WhatsApp are subsidiaries of Facebook. And Beats is an app defined as a service platform and relies on the entrance of mHealth merchants. In a sense, Facebook is possibly to be the most potential host for the project.

- Support Platform: Beats will choose the mainstream mobile application platform, Android and iOS, and currently without considering Microsoft's WP and other platforms.
- Development Mode: The agile strategy of the Rapid prototyping model will be adopted to design the user interface and underlying functionality of Beats in the tool of Figma, then continue to develop following service features though user demands and feedback. Therefore, the functionality and the user experience of Beats will be significantly improved.
- Basic Framework: Beats main functionality is that users can access mHealth apps through a small program without downloading and re-registrations. And the open-source mobile framework utilized for Instant concept application in Beats is React Native.
- Auxiliary Support: Beats requires real-name authentication to protect the user's personal information in accessing personal health data. Fingerprint identification, QR code, and the voice assistant will also be adopted to increase the application's accessibility.

6.4 Risks Analysis

6.4.1 Technical Risks

The innovative functionality requires research and development under realistic and feasible technology. The main technical risks of launching an application come from aspects below:

- Compatibility - Due to the contradiction between the rapid replacement of the hardware system and the length of the development cycle, the app needs to be continuously updated its versions to compatible with different devices and systems. It leads to an increase in the human and material costs of maintaining and upgrading.
- Accessibility - It is one of the critical factors of user experience. Some of the architecture designs will make the user operation more complicated in pursuit of powerful and perfect functionality. Indirectly leading to a shorter lifecycle of the app.
- Variability - The origin of application development is the identification of the application requirements and exploring potential demands. However, in the whole development process, the change in application requirements is uncontrollable, which may be a waste of time and functional defects.
- Dependence - The development of Beats relies on third-party services support such as iOS, Android, and Facebook. The project interruption would happen without the appropriate support.

6.4.2 Management Risks

The management risk refers to the budget and schedule problems encountered in the application development process. It can affect the implementation of the work plan, increase the cost of the project, and even make the project impossible.

- The development is not completed within the required schedule. The development period for Beats is six months. A variety of force majeure factors during the development will be happened to affect the original time management progress. Such as unable to achieve the functionality in the prototype of Beats, some features cannot be achieved due to compatibility issues. These will lead to insufficient development time in the late period or incremental cost expenditure problem which will directly influence the quality of the application.
- In the application development process, those problems of human resources and material resources management, and quality management may occur at every stage of development. Such as the sick leave of the technical staff, the over-expected system

maintenance costs, the temporary requirements requested by clients. And if the quality supervision is ignored, it will also pose a great risk to the application development.

6.4.3 Financial Risks

Beats is a service-oriented application. In the initial one or two years is the promotion stage, Beats will provide free healthcare services to the entirety of the users to accumulate user base, cultivate user habits propensities and infiltrate in the local market run-in. Beats can charge a service expense from the merchants during its operation. Therefore, there would exist a specific measure of financing hazards in the early advancement stage, and there are additionally some risks in income balance.

7. App Design

7.1 Methodology

The High-fidelity prototype will be set up to show the users and clients the user interface (UI) of Beats in the wake of characterizing the objectives and critical functions of Beats. In this project, Figma will be utilized to convey the final prototype conceived by the author.

Figma is a browser-based collaborative UI design tool. Many powerful features are built specifically for UI design in addition to the same basic operations and functionality as Sketch. It has three distinct functions: real-time collaboration, vector grid, and version history. The cloud-based synchronization capabilities allow teams and users to comment or modify the design in real-time. These enable faster and more efficient implementation of iterations.

7.2 Visual Design

7.2.1 Color

In design style performance, color plays a vital role in visual experience. The color palette and distribution of the interface directly affect the user experience. Besides, different colors will give users different impressions and feelings. As Fig. 7-1 showed that blue and green are the two colors both women and men love the most, and orange and brown are the two colors both women and men hate the most. Purple that women loved is what men hated, and men like black, women hate gray. It can be said that the color preferences of different target groups are not the same. Therefore, the app's visual design needs to consider different user preferences and experiences to the user's visual feelings.

Fig. 7-1 How color affect conversions Source: KISSmetrics

According to the Beats' target group, the color Picton Blue (#3D9EEB) is selected as the leading color tone. As a popular color for most groups, blue also has a connotation of health, which coincides with the market positioning of Beats.

7.2.2 Design Specification

In designing the app interface, if there are no design specification guidelines, subtle differences will be more frequent in the design process, resulting in subtle differences in each control. For a team design, it's even less possible to collaborate efficiently with multiple people. The design specification can also keep the product features, enhance user awareness, and effectively improve the user experience in the app iteration process.

The interface of Beats was designed within the iPhone 11 Pro/X framework. According to the official website of iOS human interface guidelines[25], its interface design specifications will be based on the following key data:

- Resolution ratio: 375*812pt;
  Status bars: 132px;
  Navigation bars: 132px;
  Tab bars: 147px;
- Primary color: #3D9EEB;
  Secondary color: #7CACD2, #529DF4;
  Essential color: #FFFFFF, #979797;
- Font: San Francisco;
- App icon: 120*120px;
  Custom icons: 60*60px;
  Home screen quick action icon: 54*54px;
  Navigation Bar and Toolbar icons: 48*48px;
  Tab bar icons: 46*46px;

And reference will be made to some components such as Cards[26], Bottom Navigation[27], Tabs[28] in Material Design Guidelines[29] for application in layout design

7.2.3 Logo

As Fig, 7-2 shown, the use of the initial B as the main element of the app's logo, the color blue as the primary color, and with the fluctuations of the ECG (electrocardiograph) which can express one of the meanings of beats in the

Fig. 7-2 Logo of Beats

[25] https://developer.apple.com/design/human-interface-guidelines/ios/overview/themes/
[26] https://material.io/components/cards
[27] https://material.io/components/bottom-navigation
[28] https://material.io/components/tabs
[29] https://material.io/design/guidelines-overview

heartbeats, but also to reveal product positioning of a healthy life. However, it is worth noting that before the design of the logo, we need to communicate with the customer to determine the logo's overall style.

7.3 Interaction Design

Interaction design refers to the process that is arranged within existing resource constraints to create, shape, and decide all user-oriented qualities (structural, functional, ethical, and aesthetic) of a digital artifact for one or many clients [18]. The interaction design for Beats is mainly realized from three aspects: the architecture diagram, the interface layout, and the graphics mode.

7.3.1 Structure Diagrams

Combined with the previous structural analysis of those four competitors, as well as the core characteristics of Beats, the structure of Beats will be divided into five parts, as Fig. 7-3 shown:

- Home: The home page will show Beats' characteristic features, including search functions, personal panels, appointment management, link device management, etc.
- Report: In this section, users can personalize their own data reports after authorization. Beats will provide users intelligent analytics services based on the information collected.
- Discovery: Similar to the App Store, all small programs can be found in discovery. Topics and Health Channel will provide users with real-time health news and information.
- My: You can administer personal schedules, communicate with family and friends, and participate in community activities.

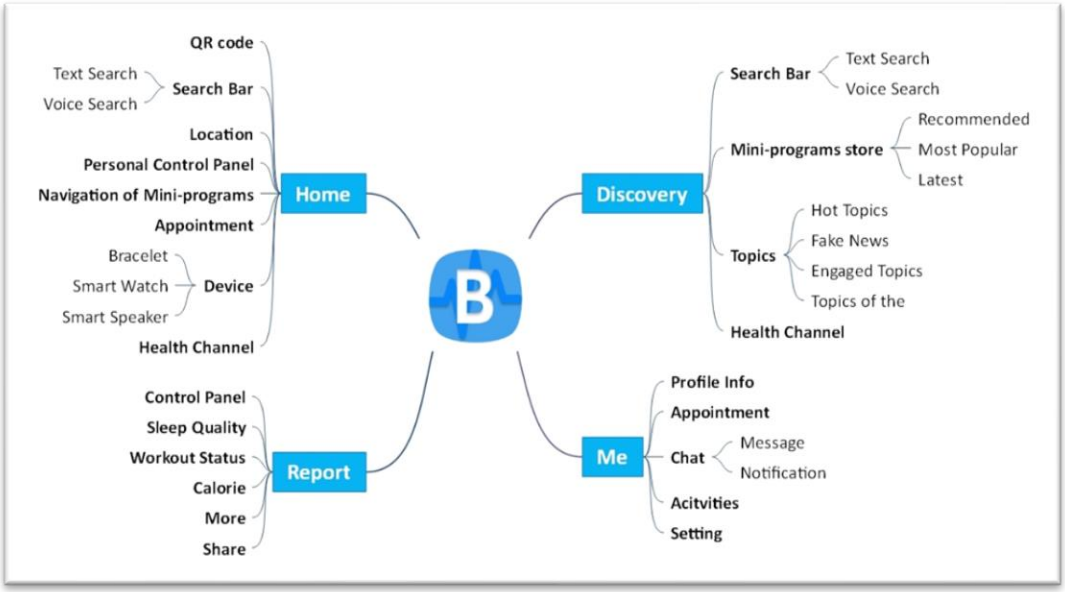

Fig 7-3 The structure of Beats

7.3.2 High-Fidelity Prototype

Here is the access link of the latest high-fidelity prototype of Beats:

https://www.figma.com/proto/UVeba6mtJlr8oNzNXPJ1lA/Beats?node-id=1%3A2&viewport=553%2C612%2C0.1732771396636963&scaling=scale-down

Below are some main lays of Beats presented via the tool Figma.

- **Launch Screen (Splash Screen)**

  About the iOS human interface guideline, the launch screen isn't an opportunity for artistic expression. It's solely intended to enhance the perception of your app as quick to launch and immediately ready for use. Every app must supply a launch screen[30]. The information, color, and content combination on the app's launch screen can reflect the brand's tone. It allows users to integrate more quickly into the app, and enhance the experience, which is conducive to the delivery of brand information.

  Beats' launch screen contains three elements: the brand name - BEATS, the slogan – 'Your health mate,' and the icon – ECG. This kind of display model can better convey the application of the style, connotation, practical use scene, etc., strengthen the user's intuitive impression of Beats, and close the distance between the application and users. It is a relatively safe form of a launch screen.

Fig. 7-4 Launch screen(splash screen) lay

- **Onboarding**

  The onboarding usually appears when a user opens an app for the first time. It can quickly capture the user's attention to view the value and function of the application and play a proper lubrication and guidance role. Generally, the onboarding will not exceed five lays.

  Beats apply a functional introduction type of the onboarding, which displays users the new features of the app give the user a comprehensive understanding of the main characteristics of the Beats. After summarizing and refining the features, combined

[30] https://developer.apple.com/design/human-interface-guidelines/ios/visual-design/launch-screen/

with text descriptions and graphics, five lies are designed to present the user's five main features:

i. Customize your health control panel: Say goodbye to the process of downloading, installing, and uninstalling applications. All the functionality can be found in Beats.
ii. Manage your health data: You can quickly summarize and master your health status and personalize the health service features you need.
iii. Protect personal privacy: We ensure the security of your personal information and privacy.
iv. Interact with family and friends: We provide a healthy interactive space for people who care about each other.
v. Experience a new health model: You will have an exclusive personal digital health identification.

Fig. 7-5 Onboarding lays

As shown in Fig. 7-5, the onboarding is equipped with a skip button which can direct skip to the sign in step, small dots to switch left and right to increase the user experience, and on the final lay, there is a button of 'Start your Beats' to guide you into the initial screen.

- **Sign In and Sign Up**

The 'Sign In' screen also equipped with a skip button that can direct skip to the home screen. In addition to the sign-in way of email or mobile number, Beats also supports third-party accounts signed-in with Facebook, WhatsApp, and Google's to make it easy for users to sign in quickly. The lay also contains the function of retrieving the password, which the user can retrieve by sending a verification code to the registered email or mobile phone. The buttons of Back and Skip are also equipped during the verification process to enhance user accessibility.

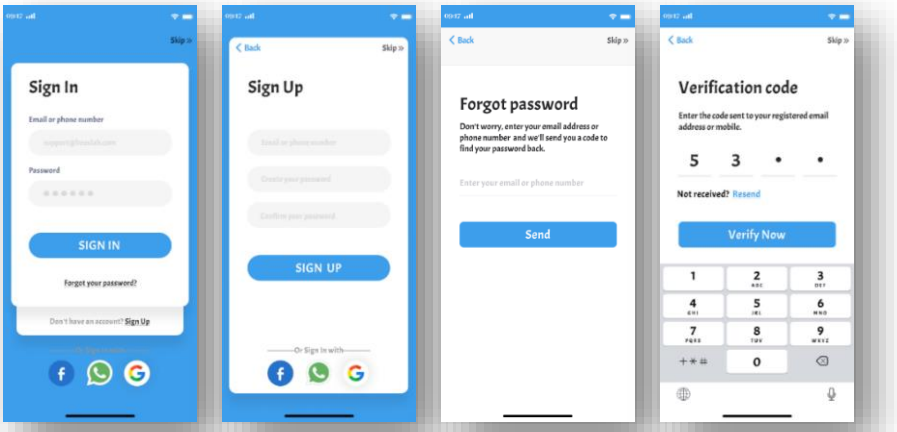

Fig. 7-6 Sign In and Sign Up lays

The layout of the 'Sign Up' screen is similar to the 'Sign In.' Beats simplifies its registration process, and the third-party registration will indirectly increase enrollment conversion rates.

- **Homepage**

  Cards are one of the components in Material Design[31]. Each card is a rectangular module with pictures and text, which is the entrance for users to learn more details.

  The homepage layout of Beats is split by Cards for five parts:

  i. Personal Control Panel: This card shows the dates, the weather, and personal health situation, which will be present in an overall score. The auxiliary icons for notifications, calendars, data Auxiliary icons, chats, and sharing can help users quickly access relevant information. In this card, the user is allowed to modify and display specific body parameters.

  ii. Mini-programs: This card shows the small programs that the user has recently used. Notifications in the app will also appear in the upper right of the app icon to prompt the user.

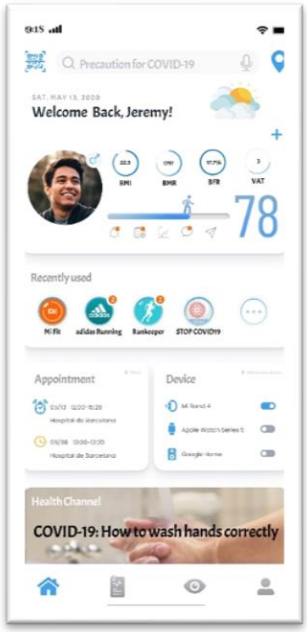

Fig. 7-7 Homepage lay

[31] https://material.io/design

iii. Appointment: The upcoming appointments are displayed in this card to remind users.

iv. Device: This card shows the devices that are commonly connected by users. The quick switch button is shown here for smooth user operation. Users can also modify the tools they need.

v. Health Channel: This card will update in real-time based on the latest health information. The healthcare news can be rendered as a picture carousel or as a drop-down.

And at the bottom of the homepage, a Bottom Navigation is designed to split the Beats into four sections: Homepage, Report, Discovery, and Me.

Below the status bar is a search bar with the functions of scanning QR code and positioning. Each user has his health QR code that can quickly read your health data and add friends. On the underlying text search, the search bar is equipped with the function of voice search to enhance user accessibility. The layout of the search page shows the historical search traces, some recommended mini-programs, and the top trending searches. In the location layout, users can search for their current city with a search bar or authorize Beats to use the current location.

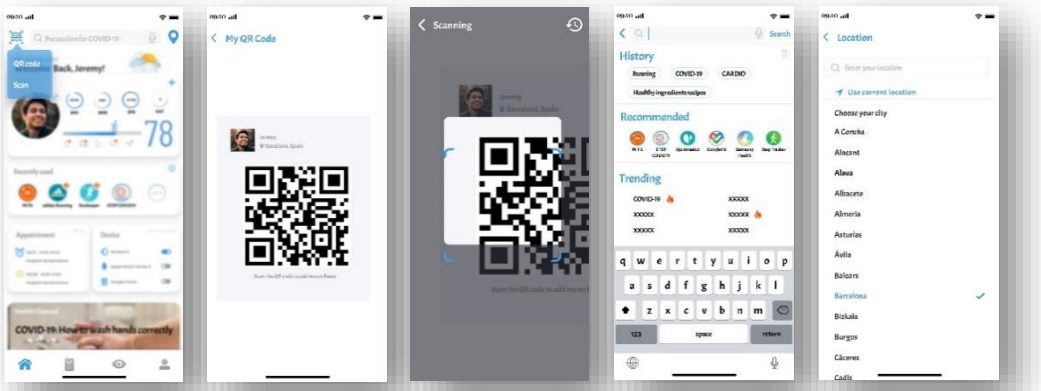

Fig. 7-8 QR code, search, and location lays

- **Report**

The card's components are also used in the report interface, allowing users to link a mini-program to each card. It is important to note that although it is customized, the data presentation of each linked application is fixed. For example, the card connected with Mi Fit will only display the sleep data, shown as 'Sleep Quality.' Users can customize the personal presentation of the report. As the lay ‘More’ shown in Figure 7-9, users can select different interface layouts, set the export address, and manage the application connection.

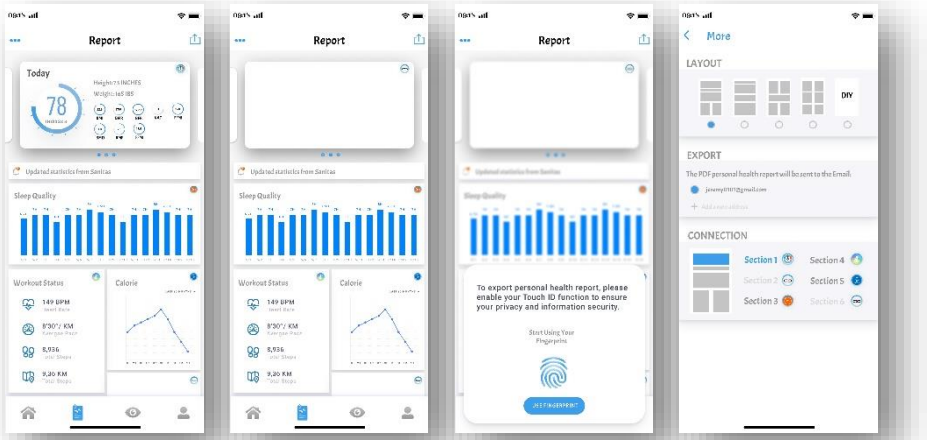

Fig. 7-9 Report lays

When users need to export their reports, fingerprint verification is triggered to ensure maximum protection of the user's privacy and information security. Users need to enable the Touch ID function to export personal health report. The report will be sent to the specified email address as a PDF document.

- **Discovery**

  As shown in Fig, 7-10, the discovery layout is mainly divided into three sections, Mini-programs, topics, and health channels. The Mini-programs use Tabs to classify three categories of 'Recommended', 'Most popular', and 'Latest'. The topics section falls into ‘Hot Topics’, ‘Fake News’ and ‘Engaged Topics’ combine with related icons. This part also shows the topics of the day. In the Health Channel, users can browse the latest healthcare information and news.

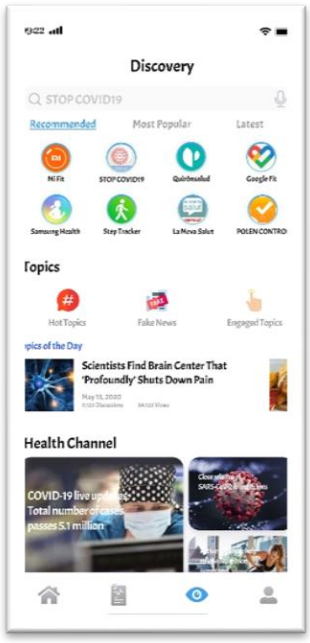

Fig. 7-10 Discovery lay

- **Me**

  In addition to the personal information management and system settings, Beats incorporates appointment, chat, and activities into Me layout. As can be seen from Fig. 7-11, the appointment is highlighted in the calendar, and the upcoming appointment will also be displayed behind the calendar. Users will receive a reminder as a notification after authorization. In the chat section, users can communicate and share information with friends. This section can effectively enhance the usage rate of Beats. The activities offer users some health-related outdoor information and lectures to create a healthy community ecosystem through offline interactions. In the layout of settings, besides the options of ‘Account

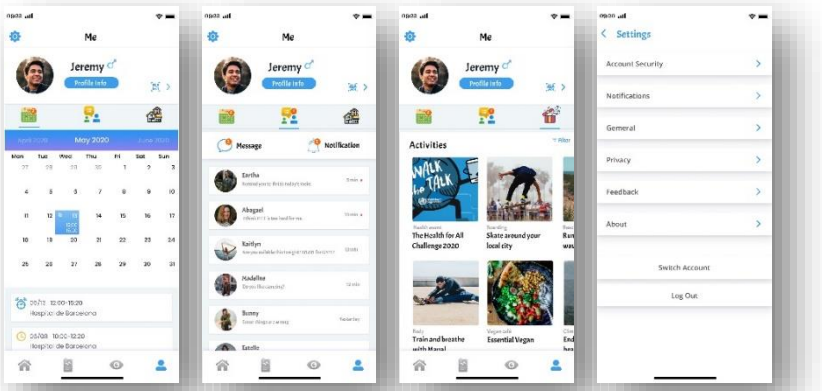

Fig. 7-11 Me lays

Security,' 'Notifications,' 'General,' 'Privacy,' and other options, Beats adds the options of 'Mini-program Management' and 'Device Management'.

- **Mini-program**

  The layout of the mini-program is not specified. It can be the same as the original application, or developers can design the mini-program according to the functional demands. Fig. 7-12 shows two examples of the mini-program layout. At the first time of landing the mini-program, Beats will prompt users that the third-party service is trying to link your Beats account information. Users can either select email or phone number to link with the third-party service to complete the step of sign-in or to sign up to the third-party service. The navigation bar[32] of Mi Fit mini-program consists of the icons of back, refresh, more, and close. When users click the more icon, four custom icons[33] of Share, Favorite, Copy URL, and Report is available for users to select.

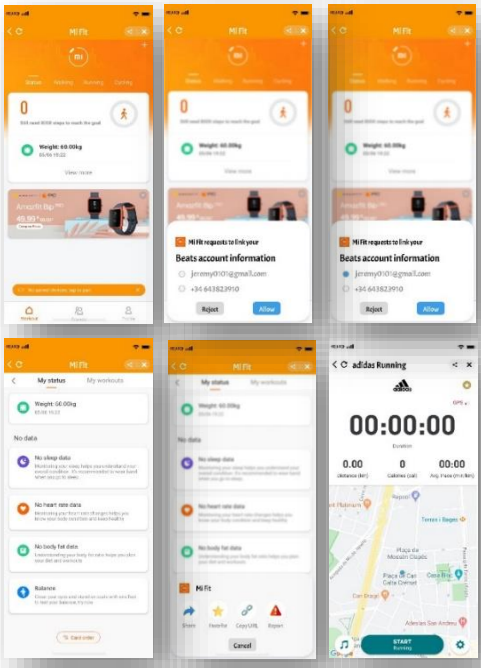

Fig. 7-12 Mini-programs lays

[32] https://developer.apple.com/design/human-interface-guidelines/ios/bars/navigation-bars/
[33] https://developer.apple.com/design/human-interface-guidelines/ios/icons-and-images/custom-icons/

7.4 Privacy and Security

Despite the fingerprint recognition for the Beats data security, Beats must follow up the law of GDPR (General Data Protection Regulation) (EU) 2016/679[34] on data protection and privacy in the European Union (EU) and the European Economic Area (EEA).

7.4.1 Privacy Policy

While first time installing Beats, before the sign in or sign up, the user should be informed of the following privacy policy:

- Beats attaches great importance to the user's privacy and security. We will collect and use user information strictly according to the legal requirements and regulations, and the manners agreed in the Platform's Privacy Policy.
- When you browsing the platform as a tourist (not signed in), we will collect device and log information to guarantee the necessary push information services.
- If you sign in and use Beats' services, you will default to agreeing to our Privacy Policy, otherwise we may not be able to provide you with a complete service.

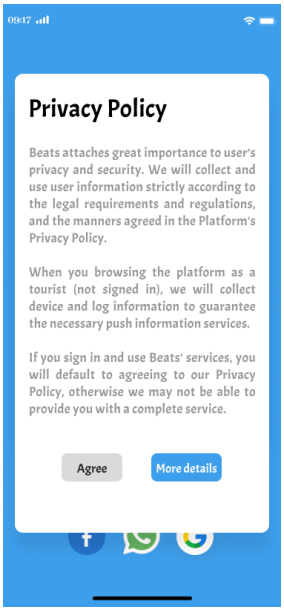

Fig. 7-13 Privacy policy lay

[34] https://eur-lex.europa.eu/eli/reg/2016/679/oj

7.4.2 Permission

While data collection is useful for analyzing user behaviors and demands, the permission needs to be on a normalized premise. Users should be explicitly informed and choose whether to authorize the application to access the related data.

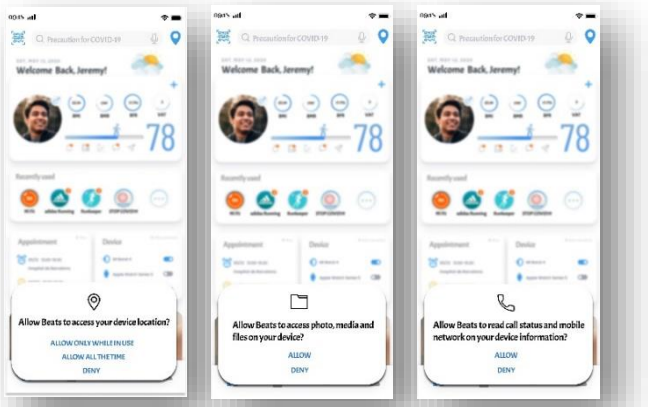

Fig. 7-14 Permission lays

7.4.3 Third-party services

Before to access the third-party services in Beats, the users should be informed and agreed on the following authorization:

By using Beats to log in to this third-party service, you acknowledge that service is permitted access to the following information:

- User alias
- Profile photo
- Gender
- Region
- Location
- Info
- And a list of other contacts using this service,

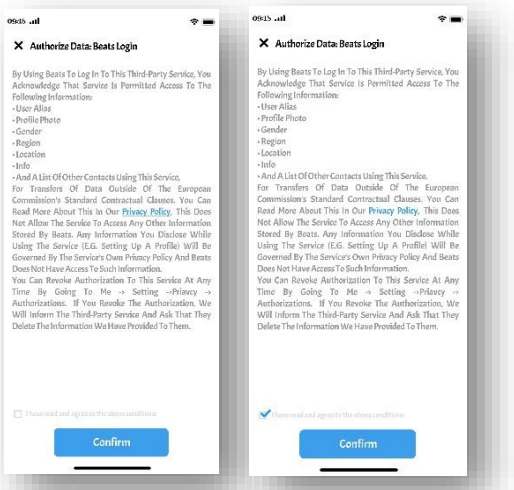

Fig. 7-15 Authorization lays

For transfers of data outside of the European Commission's Standard Contractual Clauses. You can read more about this in our Privacy Policy,

This does not allow the service to access any other information stored by Beats. Any information you disclose while using the service (e.g. setting up a profile) will be governed by the service's own privacy policy and Beats does not have access to such information.

You can revoke authorization to this service at any time by going to Me -> Setting ->Priavcy -> Authorizations. If you revoke the authorization, we will inform the third-party service and ask that they delete the information we have provided to them.

8. Implementation

To better implement this project, a working plan, some related resources, and a budget will be carried out for Beats.

8.1 Working Plan

The project is carried out under the agile strategy of rapid prototyping. The following detailed stage steps are proposed based on the relevant content:

- **Define the project**
  - Project feasibility analysis
  - Technological reference framework analysis
  - Define the basic functionality of the app
  - Define the development team
  - Determine the budget
- **Release the plan**
  - Draw up to-do list
  - Determine the Gantt diagram
  - Update the budget
- **App UI Design**
  - Define the design specification
  - Design Structure
  - Meeting with clients and team
  - Low fidelity prototyping
  - Meeting with clients and team
  - High fidelity prototyping
  - Meeting with clients and team
  - App developing and testing (iOS/ Android)
  - Develop the app
  - Internal testing of the app
  - Modify the app
  - External testing of the app
  - Modify the app
  - Meeting with clients and team
  - Final version of the app

- Marketing
    - Determine marketing strategies
    - implement the marketing campaigns
    - Marketing feedback and review
    - Adjusting the marketing strategies

8.2 Related Resources

8.2.1 Human Resources

The general process for developing an app includes requirements identification, prototype/UI production, development and testing, and release of the app. So, it is essential to operate as professional teamwork in the project. The technical positions required for this project are as follows:

- **A project manager**
  From requirements research and analysis, prototyping, UI design, development, testing, and a series of the app development process, the project manager plays a vital and leading role in the whole project. The project manager needs to ensure every stage of the project is on schedule in time management and resource management.
- **A product manager**
  The product manager is responsible for communicating the functional requirements with customers and users and improving all related problems. After creating the prototypes which the customer confirmed, the prototype will be handed over to the UI designer and program developer for the next step. If the team needs, the product manager is also responsible for the app's marketing and promotion plans.
- **A UI Designer**
  The UI designers are mainly responsible for the interface design and interactive design of the app. UI diagrams can directly affect the user's sensory experience and user experience. According to the requirements, and the app prototype defined by the product manager, the UI designer will visualize the app to make it more in line with market demands and the user's aesthetic.
- **2 Frontend programmers (iOS & Android)**
  In this project, two frontend programmers are required to develop the app on iOS and Android platforms. Programmers will develop app screens according to the design of the UI diagram. The working hours of frontend programmers will be evaluated based on the app's complexity, such as the number of app screens and the amount of app interface with the backend.
- **A backend programmer**

The backend programmer is mainly to develop some algorithmic programs to achieve the functional purpose of the app. The backend program is usually developed in Java[35] or PHP[36] language. Once developed, data docking with front-end Android or iOS enables overall APP functional operation.

- **A test specialist**
  A test specialist is equivalent to the quality inspector. Once the frontend and backend development are completed, a test specialist will test the app for functionality, performance, compatibility, etc. Testing repeatedly validates each functional module from multiple angles to ensure that the entire project logic is accurate.

8.2.2 Material Resources

In the application development project, in addition to office resources, the software resources and hardware resources requirements need to be taken into account.

- **Office resources**
  In a development project, all the meeting minutes and proposed contents will be recorded and shared in the cloud in which team members can work together online. The expenditure of rental, business facilities, and utilities should be taken into account when the team needs an office room.
- **Hardware resources**
  Six 17-inch Windows OS laptops;
  Two 15-inch MacBook;
  One 27-inch iMacs;
  Two 24-inch displays with mouse and keyboard.
- **Software resources**
  Google series online sync tools[37] (Drive/Gmail/Docs/Keep/Sheets/Slides);
  Figma[38] (UI high-fidelity prototype design tool);
  Android Studio[39] (Android application integration development environment);
  XCode[40] (iOS application integration development environment);
  React[41] (Mini-programs interface development)
  GitHub[42] (Cloud base storage tool)

[35] https://www.java.com/es/download/
[36] https://www.php.net/
[37] https://about.google/intl/en/products/?tab=rh
[38] https://www.figma.com/
[39] https://developer.android.com/studio
[40] https://developer.apple.com/xcode/ide/
[41] https://es.reactjs.org/
[42] https://desktop.github.com/

Bitrise[43] (Testing tool).

8.3 Budget

The project estimated budget and schedule are as follows:

	Month	Cost/month(€)	Total (€)
Human Resources			
Project Manager	6	3,000.00 €	18,000.00 €
Product Manager	6	2,700.00 €	16,200.00 €
UI Designer	2	2,000.00 €	4,000.00 €
Frontend Programmers (iOS & Android) *2	3	2,500.00 €	15,000.00 €
Backend Programmer	3	2,000.00 €	6,000.00 €
Test Specialist	1	1,500.00 €	1,500.00 €
		Subtotal	60,700.00 €
		**10% Contingencies*	6,070.00 €
		Total human resources	66,770.00 €
Material Resources			
Rental, business facilities, and utilities	6	1,500.00 €	9,000.00 €
Hardware/Software Resources	6	1,000.00 €	6,000.00 €
		Subtotal	15,000.00 €
		**10% Contingencies*	1,500.00 €
		Total material resources	16,500.00 €
Third-party services			
Third-party login			300.00 €
App user testing			1,000.00 €
App Store/Google Play onboard service			500.00 €
		Subtotal	1,800.00 €
		**10% Contingencies*	180.00 €
		Total material resources	1,980.00 €
		Total Cost exclude VAT	85,250.00 €
		Total Cost include 21% VAT	103,152.50 €

Table 4 The Budget of Beats

[43] https://www.bitrise.io/

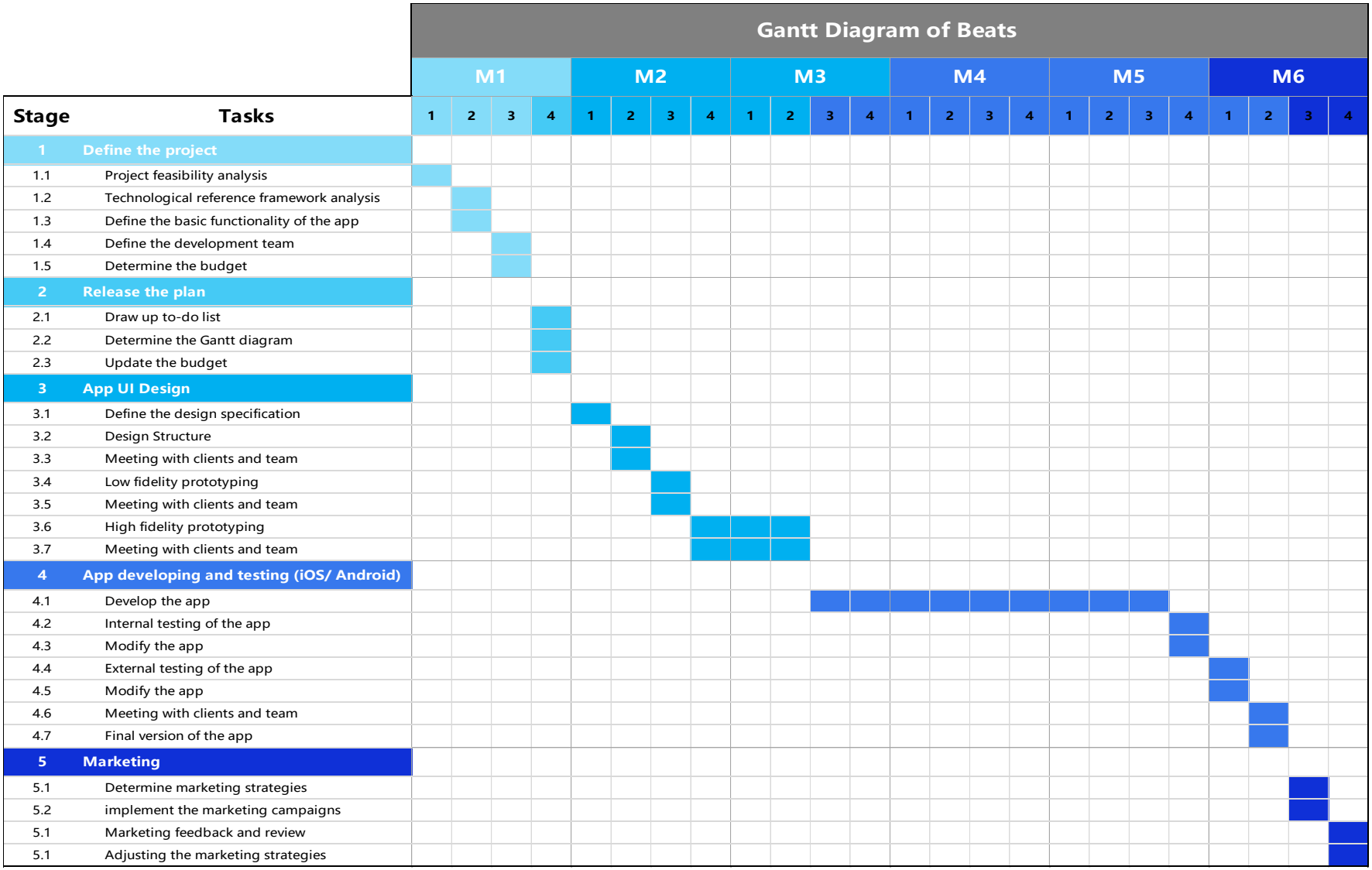

Fig. 8-1 The Schedule of Beats

9. Promotion Strategy

The application promotion is aimed at increasing its brand awareness and encouraging more users and potential users to download and register the application. Beats' promotion strategy is mainly distributed in app store optimization (from now on abbreviated to ASO), and integrated marketing communication (from now on abbreviated to IMC).

9.1 App Store Optimization (ASO)

The App Store Optimization (ASO) is similar to the Search Engine Optimization (SEO), it is the process of optimizing app pages for application platforms such as Android/iOS. The goal is to improve app's exposure, thereby increase its downloads, registrations, user engagements, etc. The optimized content includes title and subtitle, keywords, screenshots, videos, icons, and descriptions.

Beats will be available on both the App Store and Google Play. Although the ASO of the two platforms is slightly different, the promotion strategies of ASO will be implemented in the following parts:

- **Title and subtitle:** In addition to the application name, it is recommended to add some keywords with high search volumes for the title and subtitle to increase the application's impressions.
- **Keywords:** It is recommended to use some ASO keyword research tools to optimize Apple Search Ads[44] and Google AdWords[45]. Such as Sensor Tower[46] and App Annie[47].

9.2 Integrated Marketing Communication (IMC)

Under the influence of social media, the offline marketing communication of ATL (above-the-line) and BTL (Below-the-line) has been replaced by integrated marketing communication (IMC). Integrated Marketing is an approach to creating a unified and seamless experience for consumers to interact with the brand/enterprise; it attempts to meld all aspects of marketing communication such as advertising, sales promotion, public relations, direct marketing, and social media, through their respective mix of tactics, methods, channels, media, and activities,

[44] https://searchads.apple.com/
[45] https://ads.google.com/intl/EN/home/
[46] https://sensortower.com/
[47] https://www.appannie.com/en/

so that all work together as a unified force. It is a process designed to ensure that all messaging and communications strategies are consistent across all channels and are centered on the customer [19]. According to the positioning of healthcare application, IMC of Beats is mainly combined with the following aspects:

- **Public relations (PR):**
  - Cooperate with influential health-related commonweal organizations, medical institutions, or local government departments in Spain.
  - Participation in or sponsorship of sporting events and activities, such as La Liga.
- **Social Media Marketing:**
  - Create some official social media accounts, such as Facebook, Twitter, Instagram, YouTube.
  - Participation in online hostage events.
  - Set up a website or blog.
- **Sponsorship:**
  - Find target sponsors, such as Facebook.

Any of the above marketing communication implementation or integrate promotion can help Beats to enhance brand awareness, build emotional connections with users and potential users, and Increase user trust and loyalty.

10. Evaluation Plan

There are many data metrics for the application evaluation, such as DAU (Daily Active User), DNU (Daily New User), LTV (Life Time Value), CAC (Customer Acquisition Cost), etc. These metrics can be obtained by some payment tools like App Annie. But we shouldn't only focus on shallow data reporting. The evaluation process suggests being detailed analytical planning.

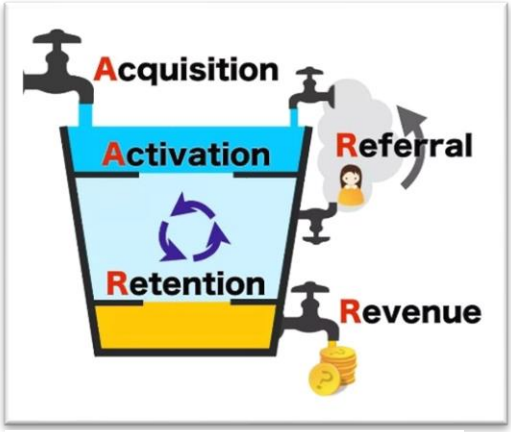

Fig. 10-1 AARRR cycle. Source: Büyümenin

The evaluation plan for Beats follows the AARRR Framework [48], which has the five important indicators for evaluating the product. The operations team can conduct termly evaluations of Beats' market performance. As shown fig. 10-1 shown:

- **Acquisition:** Finding the most valuable channel for Beats;
- **Activation:** The user's first visit and the use experience which can refer to the conversion rate of the Beats' core features;
- **Retention:** How to let users revisit Beats; While paying attention to retention ratio, we should also pay attention to the analysis of churn ratio of Beats;
- **Revenue:** Its mainly approaches include: functional or content payment, advertising revenue, traffic realization, etc. The ARPU (Average Revenue Per User) is one of the core evaluation indicators.
- **Referral:** Monitoring the behavioral curves and retention rates of key communicators of Beats by the sharing conversion ratio.

[48] Sean Ellis, Morgan Brown. Hacking Growth: How Today's Fastest-growing Companies Drive Breakout Success. ISBN: 045149721X, 9780451497215.

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