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# Designing Collaborative Technology-based Interventions for Mental Health Management

MASTER DISSERTATION

**Beatriz Severes Lopes**
INTERNATIONAL MASTER OF INTERACTIVE MEDIA DESIGN

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A Nossa Universidade
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ORIENTATION
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# Designing Collaborative Technology-based Interventions for Mental Health Management

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*Designing Collaborative Technology-based Interventions for Mental Health Management*

# Abstract

In addition to the impact on public health, especially after the emergence of the COVID-19 pandemic, mental health problems have been amplified globally, leading to higher levels of anxiety and depression especially among young adults, who are among the most vulnerable populations.

Due to the specific social context and newfound challenges surrounding university life, psychological distress affects university students at a disproportional higher rate when compared to the general population. With the increase in requests for university therapy services, digital mental health tools developed in conjunction with in-person therapy offer a pioneering solution for expanding the potential and reach of these services while overcoming socioeconomic, geographical, and educational barriers.

This thesis explores the process of collaboratively developing a mobile application named *Toolbox* for mental well-being self-management alongside the psychology counselling services at the University of Madeira. By exploring providers' perspectives and concerns, this study highlights how a digital solution designed by clinicians could address daily challenges and facilitate treatment protocols.

This study presents the potential a mental health app has for improving clinical interventions in the university environment and helping providers of mental health services. The integration of a mental health platform into therapeutic practices can better inform the clients' course of treatment, particularly due to the collection and analysis of user behaviour-tracking information. It also encourages users to learn about mental health and develop a closer connection with their psychologists.

From a methodological standpoint, it proposes the development of mental health app should be conducted in an adaptable process that accommodates the stakeholders' expertise and inputs under a cross-disciplinary approach to developing a digital platform that addresses students' mental health.

**Keywords:** academic achievement, blended care, collaborative work, design methodology, e-mental health interventions, online interventions, university students.

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# Resumo

Além do impacto na saúde pública, especialmente com o surgimento da pandemia COVID-19, os problemas de saúde mental aumentaram globalmente, levando a níveis mais elevados de ansiedade e depressão principalmente entre jovens adultos, uma das populações mais vulneráveis.

Devido ao contexto social e desafios que envolvem a experiência universitária, o sofrimento psicológico atinge os estudantes universitários de um modo desproporcionalmente maior aquando comparado com a população em geral. Com o aumento dos pedidos nos serviços de apoio psicológico, as ferramentas digitais para saúde mental desenvolvidas em conjunto com a terapia presencial oferecem uma solução pioneira para ampliar o alcance destes serviços, superando barreiras socioeconómicas, geográficas e educacionais.

Esta tese explora o processo de desenvolvimento colaborativo de uma aplicação móvel denominada *Toolbox* para a autogestão do bem-estar psicológico em conjunto com o serviço de psicologia da Universidade da Madeira. Ao explorar as perspetivas e preocupações dos psicólogos, este estudo evidencia o modo como uma solução digital projetada por profissionais de saúde pode ajudar a fazer face aos desafios do dia-a-dia e facilitar o processo terapêutico.

Este estudo apresenta o potencial que uma *app* para saúde mental detém para melhorar as intervenções clínicas em ambiente universitário, auxiliando o trabalho dos psicólogos dos serviços de apoio psicológico. A integração de uma plataforma para saúde mental em prática clinicas melhora o processo terapêutico dos clientes, especialmente aquando a recolha e análise de dados de monitorização comportamental. Estas plataformas também incentivam a aprendizagem sobre saúde mental dos utilizadores e o desenvolvimento uma ligação mais próxima com psicólogos.

Do ponto de vista metodológico, este estudo propõe que o desenvolvimento de uma *app* para saúde mental deve ser conduzido num processo adaptativo, que acomode o conhecimento especializado e as contribuições dos parceiros de forma interdisciplinar no desenvolvimento de uma plataforma digital para a saúde mental de estudantes.

**Palavras-chave:** desempenho académico, *blended care*, colaboração em equipa, estudantes universitários, intervenções digitais em saúde mental, intervenções digitais, metodologia de design.

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# Acronyms

| | |
|---|---|
| DALYs | Disability-adjusted life-year. |
| eMHI | e-Mental Health Interventions. |
| EU | European Uninon. |
| GDP | Gross Domestic Product. |
| GDPR | General Data Protection Regulation. |
| mHealth | Mobile Health. |
| PDAs | Personal Digital Assistants. |
| PS-UMa | Psychology Service of the University of Madeira. |
| RtD | Research through Design. |
| SA Representative | Student Association Representative. |
| SUS | System Usability Scale. |
| UCD | user-centered design. |
| UI | User-Interaction. |
| UMa | University of Madeira. |
| UX | User-Experience. |
| VR | Virtual Reality. |

| | |
|---|---|
| WHO | World Health Organization. |

# Chapter 1

# Introduction

## 1.1 Motivation

The impact of mental health disorders has become a significant economic burden for European countries [1]. Despite the European Union's efforts, countries still lack the structural change for more inclusive and accessible health systems focused on prevention and recovering communities' well-being.

With the novel coronavirus (COVID-19) global pandemic declared in 2020 by the World Health Organization (WHO), mental health challenges have increased globally, leading to higher levels of anxiety and depression. Among all the changes the pandemic has brought, it has exacerbated the idea that mental health is not a secondary problem but is as important as physical health and that there is a direct correlation between them [2].

In Portugal, like in most countries, communities had to drastically readjust to different ways of living due to the experiencing of interdiction in face-to-face interactions, the closing of all schools and universities, and a vast set of lifestyle adjustments. While these changes affected everyone, studies have shown that young people have become a critical risk group in terms of mental health challenges [3], specifically among university students due to the already high reported rates of mental illness (Auerbach RP et al. as cited in [4]; [5]), especially in the indicators of anxiety and depression [5].

Mental health disorders are especially prevalent among university students due to the particular context they are inserted in [6]. Combined with the transition between adolescence and adulthood, this period is defined by increased autonomy from parents, newfound challenges in routines and social interactions, and instability

toward the future [7].

While the urgency to address this issue is recognized by governments and institutions, with the understanding that timely and effective treatment is essential, university counselling services still lack the appropriate resources to address this issue expeditiously. The number of students in need of treatment far exceeds the capabilities of the psychology services in the universities, resulting in waiting lists of more than six months in some areas of the country [8] and unattended care for most of the students in need.

With the increase in requests for university therapy services, digital mental health tools that are developed alongside counselling services and integrated with in-person therapy, offer a pioneering solution in expanding the potential of these services while overcoming socio-economic and educational barriers. The investment in mental health literacy – *"the knowledge and beliefs about mental disorders that enable a person to recognise, manage, or prevent a mental health problem"* [2] – has received increased attention from the latest research. When used as a strategy to educate and promote mental well-being, it can become a valuable resource in emotion self-management, identification of disorders and in reducing the stigma surrounding mental health interventions. For these reasons, this work investigates the potential digital tools could have in supporting mental health clinical interventions with university students.

## 1.2 Objectives

The work described in this thesis aims to create an exploratory approach of a digital tool that evaluates how technology can support mental health interventions with university students in in-person clinical care.

Through the development of a tool alongside mental health counselling services, this research aimed at exploring how a platform can improve both the patient's management of emotions and the provider's course of treatment. A secondary goal was to explore a methodology that includes clinicians in the design process as integral stakeholders and part of the product development framework.

By analyzing providers' perspectives and specific concerns, the project builds on previous work by another study in the community – *Toolbox* from 2018 [9] – in testing how a digital tool could address the challenges psychologists at the University of Madeira University of Madeira (UMa) face daily, and facilitate the patients' treatment

protocols.

Additionally, by gathering perspectives from other areas of expertise and doing so in a user-centred way, the project will be in permanent iteration and development. Integrating other stakeholders with different points of view will improve the chances of successfully designing a tool to be implemented alongside face-to-face treatment.

## 1.3 Proposal

In order to achieve this goal, this thesis describes the development of an inclusive process to inform the design of an app called *Toolbox*, a self-management mental health tool designed for students. In addition this applications will be used alongside therapeutic in-person practices by the PS-UMa. It is proposed that a mobile digital platform – such as an app – with the characteristics of the *Toolbox* can help improve students' mental health, guiding them through self-management programs and educational content in different areas that impact their mental well-being.

## 1.4 Research Questions

Through the research on the specialized literature and the analysis of case studies as a foundation for further exploration, this work has the objective of investigating the following research questions:

- In which capacity digital mental health platforms can be a helpful resource in aiding the management of mental health conditions within courses of treatment?
- Understand how a Research through Design (RtD) methodology supports the development of a technology-based approach to assist mental health clinical interventions in the context of University care. By exploring how mental health platforms can be designed in a collaborative environment, the cross-disciplinary project component of the research will be the sandbox where these premises are tested, an exploratory site to assess if a comprehensive design method can help the team overcome, both conceptual and organizational barriers to collaborative research.

## 1.5 Structure of the Dissertation

The research starts by reviewing the existing literature about the state of mental health and its importance in society globally, from an economic to an educational perspective. In **chapter two**, it is introduced the current state of mental health in Portugal, focusing on Madeira and the community challenges. It is explored the notion that mental distress disproportionately affects young people, why university students are especially prone to mental health distress and how it directly influences their academic achievement. Is is examined the potential of digital mental health tools, which ubiquitous qualities allow the user to overcome some of the main obstacles in seeking help for this population. The literature review concludes with the definition of the methodology to be followed through the project's development.

**Chapter three** introduces a detailed description of the methodology created for the *Toolbox* project and the main steps necessary for the development of the study. The steps that constitute this methodology are then explained in detail in **chapters four to ten**, where all the process activity is described thoroughly.

A summary of this thesis's methodological section has been submitted as a pictorial in the ACM International Conference on Tangible, Embedded and Embodied Interaction (TEI) 2023 as *"Designing Collaborative Technology-based Interventions for Mental Well-being Management"* by the Beatriz Severes and Mary Barreto. This study was conceived by all of the authors and the submission is currently under review process.

In **chapter four**, *Discovery, Planning and Definition*, the problem space definition and team establishement are described in more detail. **Chapter five**, *Research*, details the different methods for understanding the needs of the student community at Madeira and the insights that emerged from the overall study.

A synopsis of the work presented in chapter five *"Research"* has been submitted as oral communication and presented in the 14$^{\text{th}}$ National Congress on Health Psychology – Psychology and Health in Times of Crisis as *"Toolbox – a collaborative technology approach to support clinical interventions in a university setting"* by Beatriz Severes, Mary Barreto, Maria Luísa Pereira Soares, Luciana Maria Jardim Ferreira, Marta Diana Santos Fernandes, and Carla Silva. The authors of the present thesis played a significant role in the preparation and execution of the study, the data analysis, interpretation, and presentation of the work. The collaborative contributions have

been indicated clearly and acknowledged and the chapter has benefitted from their generous editorial suggestions.

The work presented in chapter five *"Research"* has been submitted as a paper in the 21st International Conference on Mobile and Ubiquitous Multimedia as *"Mental Well-being Management through a Technology-based Intervention in the University context: A qualitative analysis of user needs"* by Beatriz Severes and Mary Barreto. This study was conceived by all of the authors and the submission is currently under review process.

Following this characterization, the systematization of the user profiles during the *Exploration* stage is presented in **chapter six** as the insights from the team on the three types of users. **Chapter seven** – *Information Architecture* – is devoted to assessing content and technical features to be taken into account in the construction of the app. In **chapter eight** – *Design and Prototype* – the process of design of the Toolbox app is presented, from low-fidelity wireframes to the finished design. *Usability Testing and Iteration* (**chapter nine**) contains a summary of the results from the usability tests and the discussion resulting from that iterative process. Finally, in **chapter ten** – *Final Prototype, Recommendations and Documentation* – the final considerations discussed with the stakeholders are presented.

**Chapter eleven** encompasses the discussion of the work, the reflections on what was learned from this study, what was successful and the limitations encountered during the process. Based on the findings from the research, the possibilities for improvement are introduced for future iterations of the *Toolbox* project.

# Chapter 2

# State-of-the-Art

Mental health is defined by the World Health Organization (WHO) as *"a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community"* [9]. Just like physical health, it represents a fundamental component of well-being. While that link has been addressed as unrelated, several studies advocate for the relationship between these two universes, as some mental disorders impact the development of physical illnesses [10].

The need to prioritize mental health and see it as an urgent global issue has grown significantly in recent years, mainly due to the upward trend of suicide, which represents the leading cause of death among young people (15- to 29-year-olds). Pre-pandemic data shows that depression and anxiety disorders are among the top causes of Disability-adjusted life-year (DALYs) worldwide [11]. The impact of this burden was transversal for both genders and across different countries, with no significant reduction in prevalence being detected since 1990, despite many governments' interventions and efforts to reduce it [12].

With the COVID-19 global pandemic, declared in March 2020 by the WHO, mental health challenges have increased even further, leading to higher levels of anxiety and depression [3], especially among young people, women and lower-income workers. Data from a range of studies also suggest that mental health has worsened with the introduction of restrictive societal measures – like lockdowns and curfews – leading to higher than usual levels of anxiety and depression [3].

The urgency to prioritize mental health and well-being is indisputable. Just in the European Uninon (EU), the annual cost of mental health disorders has reached the

staggering €50 billion mark [1]. Across the EU27 post-pandemic studies have found a significant decrease in mental well-being (from 53% to 45% on average) through all age groups since the summer of 2020. The data is especially concerting once it is segmented into age groups, as two-thirds of people (64%) in the youngest age group (18–34 years) are at risk of depression [13].

Despite efforts from the European Union and the Member States to create conditions to change this pattern positively, countries still lack the structural change for more inclusive and accessible national social and health systems focused on preventing and recovering communities' well-being [14].

A 2021 global survey from UNICEF and Gallup has found that the younger generations (15- to 24-year-olds) are more prone to identify and report feelings of anxiety and depression when compared with older adults. The same study concludes that amongst young people across the EU, almost 1 in 5 reported suffering from mental health problems or symptoms such as depression or anxiety. This study also found that economic conditions, age, gender and educational level are significant factors in explaining the prevalence of anxiety among young people [1].

This paradigm is also present in the Portuguese reality. Under UNICEF's *State of the World's Children 2021 report*, which analyzed 33 EU countries with pre-pandemic data, the organization estimates that 19,8% of adolescents (ages 10-19) in the country suffer from mental disorders such as depression and anxiety, bipolar disorder, eating disorders, among others [United Nations Children's Fund 2021]. While this statistic is conservative – as most people admit resistance in asking for help about their mental health due to discrimination and stigma [10], [15] – this data puts the country as the second region in the EU with the most considerable prevalence of mental health disorders in the age group.

A recent national study on the state of citizens' mental health focused their analysis on the most prevalent well-being indicators in the context of the first months of living with the COVID-19 pandemic in Portugal – particularly anxiety, depression, post-traumatic stress disorder and burnout. The results of this study are in line with other international assessments on this context [14] – the Portuguese population showcase higher levels of psychological distress (33.7%), specifically regarding anxiety (27%) and depression (26.4%)– and corroborate the increase in mental health disorders in comparison with data reported in the first national study on mental health [16].

In terms of the different gender and age groups, the data shows that in Portugal,

it is mainly women (45.8%) and young 18 to 29-year-old adults (49.6%) who most frequently display symptoms of psychological distress. These conclusions are remarkably consistent in analyzing scores on the psychological well-being/suffering, anxiety, depression, and post-traumatic stress disorder scales [16]. Another insight from this report is uncertainty about the access to mental health support: responders mention that they do not know about the options for either hot lines (55.4%) or in-person psychological assistance (53%). This implies that there is still a lot of education to be made in demystifying the stigma and increasing mental health literacy [17].

Looking closer at the data breakdown in the different regions of Portugal, Madeira ranks as the region with the highest rate of mental distress, moderate to severe anxiety and moderate to severe depression [10]. This precarious situation in terms of mental well-being in the region can easily be explained when considering the conditions for mental health, and the economic and social disparities of this specific context.

Madeira's economic activities are highly centred around tourism, representing 37% of Madeira's Gross Domestic Product (GDP) and a third of the region's job market [18]. The inequality in the distribution of wealth in Madeira is the country's second-highest (20.8%). According to the most recent data, the region has the highest poverty and social exclusion rate among citizens (32.9%). One in every four people in the region is at risk of poverty (24,2%) [19].

Parallel to the COVID-19-specific impact in the economic sphere, the region already had precarious access to state-funded mental health care in the region – with long waiting lists, low-income households and a deep stigma concerning mental health. With the eruption of the pandemic, regional government entities were forced to take action and put in place measures of lockdowns and curfews. Although these measures had an impact on everybody, in a region where tourism impacts economic activities, and is a significant source of income, these restrictions caused an additional level of uncertainty and anxiety [10] which reflects on the mental well-being of citizens.

With this contextual environment, it is easy to understand why in Madeira, 47% of the analyzed population shows signs of mental distress, with almost half of the sample expressing moderate to severe anxiety (46.7%) and a third of the inquired showing signs of moderate to severe depression (34,4%)– the highest rate in the country for both pathologies.

## 2.1 Mental Health and its impact on the academic success of university students

The preventive restrictions to limit physical contact that had to be put in place with the COVID-19 pandemic forced governments worldwide to take drastic approaches following a common goal of reducing the spread of coronavirus, which has led to closing non-essential establishments, schools and universities.

In schools, traditional in-person classes were suspended. National television educational broadcasting became the baseline for many children and adolescents [20] education. Social media platforms have become indispensable for students, teachers, and parents sharing educational materials.

As for universities, suspending in-person classroom teaching and social interactions and moving the entire college experience to the online environment had a tremendous impact on the lives of students [7], leading to social isolation on a large record scale, which relates to psychological distress, high levels of anxiety, and acute stress [7].

In the pre-pandemic period, research studies have recognized that young adults are a vulnerable population in terms of mental well-being, suffering from higher levels of anxiety, depression, substance abuse, and eating disorders than the general population [16]. This is especially prevalent among university students, who at this point in their lives are dealing with added obligations, a new sense of independence, the stress of the responsibilities of being an adult, and the pressure of academic success and the preconceived notion of its correlation with future career and financial success [7]. When the context of the educational environment had to be radically adjusted, the impact on students' mental health was consequently amplified [10].

The impact of mental health disorders on academic success has become an important issue to understand among the global scientific community. These efforts focus on identifying the context and reasons why university students suffer from mental health disorders, and on which strategies, and tools can be developed to mitigate this burden in the future [21], [22]. In a pre-pandemic context, the expansion and accessibility of online and mobile technologies in society have allowed for the exploration and development of digital tools to monitor health patterns, to seek peer support or to raise awareness around self-help strategies.

## 2.2 Technology Use in Mental Health Research

Mobile Health (mHealth) is defined by the World Health Organization as "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, Personal Digital Assistants (PDAs), and other wireless devices" [22].

Digital mental health tools can create a virtual safe space with the user and are often low-cost, self-paced and anonymous [23]. These ubiquitous qualities allow the user to overcome the stigma [24] surrounding professional in-person help, and the high cost of traditional therapy [24], [25] and are more likely to be accepted by younger generations [24]. According to this definition, online-based mental health tools can be considered e-Mental Health Interventions (eMHI). These include, among others, voice, video or text messaging interventions, real-time tracking devices, web-based interventions and mobile apps [25].

These tools have become an essential medium for digital mental health interventions when delivered through mobile apps due to their worldwide mobility and connectivity. Due to the singular characteristics of mobile apps, these can convey an extensive range of technologies and functionalities – Virtual Reality (VR), augmented reality, telehealth, games, social networks, and real-time interactivity, among others [26]. These apps usually incorporate the option of additional personal guidance from a therapist – via phone calls, email, text messages, and video chat, among others – which may complement in-person psychotherapy interventions [27]. Although eMHIs promise new approaches that effectively improve mental health management, these are often designed as self-help intervention tools whose impact is shown to be more suitable in minor to moderate interventions [23], [25].

In individuals with mental health problems like depression and anxiety, especially when considering the socio-economic conditions of the subjects, digital mental health tools have been perceived as suitable alternatives to in-person treatments [28], [25], [29], [15], especially among young adults who are more prone to the inclusion of technology in their daily lives [21]. Individuals with depression and anxiety can already find numerous self-management digital tools – mental health-specific or not – to help them cope with their daily struggles. Remarkably, most mental health apps in the

market do not have a medical or scientific foundation [15], [26], which can be a problem when choosing a digital tool and continuing to engage with it before the therapeutic goals are reached, or the skills are learned.

Digital mental tools can take different approaches and present themselves differently, depending on the medium. Some have a therapeutic basis [28], [26] – like psychoeducation and skill-building tools, behaviour and mood tracking, cognitive control and problem-solving therapy, therapeutic evaluative conditioning, positive psychotherapy or breathing training exercises –, others engage in online therapy – either synchronously or asynchronously – with healthcare specialists, while other use digital strategies like gamification, VR, interfaces connected to sensors or social networks [25], [21] to involve the users' social abilities and motivate them to maintain the engagement and usage of the mobile tool [30], [31].

With a focus on digital mental health in treating psychological conditions among university students, recent studies have found that while patients are receptive to the integration of mobile apps in this context [32], most patients believe that a combined in-person therapy approach is necessary for a successful mental health treatment [24], [27], [33].

The literature also pointed out the inadequacy of mobile applications in treating more complex psychological issues [25] – despite the predisposition and commitment of patients with these severe conditions in using these [23] – and the need for medical professionals to be involved in the design process of these applications in order to apply psychological frameworks – like cognitive behavioural therapy, positive psychotherapy, acceptance-based therapy, mindfulness, among others [26].

### 2.2.1 Best practices

Following the recent research studies on mental health apps [34], [21], [35] it was fundamental to retrieve from the literature a series of considerations and best practices that could inform the design and development of an eMHI in a collaborative process. The methods below have been specifically designed for health technologies [36], considering the patient's needs and especially the mental health professionals' attitudes towards blended psychiatric care.

- **Appropriate Functionality** [36] – A platform that "isn't time-consuming or complicated to learn how to use" [21]. This is also related to the input of in-

formation, as users prefer apps that are "easy to understand and made entering information a quick and efficient process". The possibility of using the platform in different devices was also noted in two studies [21], [34], solving the technological exclusion problem with apps/versions/updates [36]. From the health professional perspective, one of the concerns could be unnecessary additional work, and frustration that could arise from incorporating technology into their practice.

- **Encouraging feedback** – Young users surveyed appreciated positive feedback and reinforcement to keep the engagement up. Receiving encouraging messages from apps was mentioned in some studies as a valuable tool in helping users "cope with stressors outside of therapy sessions" [21].

- **Solid platform**s – Users mention an immense frustration is platforms that break down [34], ] – i.e., freezing, bugs, glitches, connectivity issues – take too long to load or make them take too many steps to get 'somewhere'. These issues can be responsible for the disengagement of the users or prevent them from using the platforms as frequently as they can.

- **Poorly organized information** – Following Nielsen's guidelines, poorly organized information [21] frustrates the user from a navigational point of view and an optimization perspective. Due to their generational and social characteristics, college students do not want to spend much time looking for content, as they want a "consistent user interface that allows information to be made readily accessible" [21].

- **Time Constraints** – Due to their academic and social lives, college students are rarely alone during the day [32]. Some studies mention that many students reported they would feel unease and uncomfortable using the psychological tracking exercises/activities in social situations (i.e., at work, school, studying, with friends). A recommendation from the literature is the possibility of customization for setting time aside during the day to record everything at their own pace. This was preferred over monitoring activities throughout the day [21].

- **Motivation** – Acknowledging and understanding the consequence of the exercises is an important step to keep the patient engaged with the platforms. If the student understands why it is important, they will more easily continue to use

the app [21]. If the user experiences positive outcomes from behaviour tracking – especially if it connects with the healthcare professionals they engage in the therapy sessions – that could also help patients' long-term engagement [36]. A study alongside providers has also mentioned the importance of motivating the users to keep using the platforms to improve accurate tracking information. Providers mentioned that "apps could provide examples to improve understanding of tasks, pair assigned activities to more enjoyable activities to increase motivation, make assigned activities seem more relevant to the client, make the tracked activities seem less rigid, and reinforce completion" [21].

- **Usable and Aesthetically Appealing Design** – Platforms should be easy to use and aesthetically appealing to the end-user [36], especially in the health domain. A simple layout, coherent and thoughtful visual hierarchy were remarked from patients on different studies and are aligned with Nielsen's heuristics. Gamification strategies are also an aspect that was highly valued on these apps. Using different ways to communicate information, and a reward system to reinforce completion resonates with users and motivates them to keep using the platforms.

- **Customization** – Young adults in the studies reviewed mentioned that these platforms need to have the flexibility of adjusting the preferences of the users' daily lives and needs to facilitate the engagement process. It should allow the information tailoring to occur from the data input – when, where and how – notifications, goals [36] and personalization of exercises and activities to fit the patient's symptoms.

- **Educational content presented in engaging ways** – In concordance with Nielsen's heuristics, the way the content is presented directly connects with how the users will engage with the platform. Young users prefer educational information to have a balance between visual and text-based contents – a dense wall of text is frowned upon in this demographic.

- **Age-appropriate language** – Some study participants complained that some apps use "juvenile and patronizing" [34] languages and contents, which acts as a deterrent for platform usage. Especially in terms of mental health, the contents have to be constructed appropriately to engage the readers to feel safe and grow,

instead of making users feel inadequate.

- ***Not Irritating or Embarrassing*** [36] – Even with continuous use, a health-focused platform should not irritate or embarrass the user and be too intrusive in his daily life. The manner in which the app requires the user to engage with it, and how it is used should be controlled by the user.

- ***Accuracy of Information*** [36] – The information the platforms gathers on the user's behaviour should not be misrepresented or inaccurately recorded. When due to technological constraints, it is challenging to keep the record straight, and the platform should allow users to enter their data manually or edit it.

- **Privacy** – Privacy, anonymity and data management are recurrent worries about digital mental health platforms [34], [35]. Due to the high level of sensitivity of user data in these interventions, if online platforms want users to engage with the system, there needs to be a clear privacy and security protocol in place. This protocol needs to be explained to the user to consent or adjust the privacy preferences – which data is collected, who can access it, and how the user controls their data and progress.

- **Behavioural tracking** – This approach is one of the most exciting approaches to managing mental health, especially with in-person therapy protocols. It helps users set goals, monitor their data and progress and understand how the tracking assists the regulation of their emotions and behaviours. Young adults are more prone to accept behaviour tracking, and engage with daily records of their well-being, if done in a non-disruptive and personalized way [36].

  It can provide important information about users' behaviours – to both patients and professionals – as it increases awareness of mental states, helps identify patterns and triggers, and could help make therapy sessions more productive.

  The design, contents, customization of platform and notifications, rewards and privacy are the most cited relevant aspects to consider when developing platforms. Tracking has some problems if the platform is not designed considering the target users specificities' – highlighted in the heuristics above. It needs to be an enjoyable experience that does not cause frustration and anxiety for users not to feel discouraged.

A key aspect was evaluating what needs to be tracked for clinical utility. According to one practitioner from the Armstrong et al. study, *"if the data are just going to a data bank, it's kind of static, just like paper... then maybe it's not necessary for tracking to be tech-based"*. Furthermore, the authors from this study suggested a list of behaviours that could be therapeutically useful to track:

| | |
|---|---|
| Physical activity | Fatigue |
| Emotional intensity | Therapy homework |
| Conflict | Relationships |
| Device use | Relaxation activities |
| Community and citizenship | Concentration |
| Sleep and appetite | Work/school |
| Attendance | Achievement |
| Irritability | Creativity |
| Problem behaviours | Driving |
| Social activities | Money use |
| Thoughts | Sexual risk-taking |
| Urges | Substance use |
| Extracurricular activities | |

## 2.3 Collaborative Design Frameworks

In line with the research from the psychology literature regarding the development of eMHIs, and with the commitment to integrating mental health professionals and experts into the design process, it became relevant to understand which methods and frameworks could be appropriate in the creation of a product using a cross-disciplinary team.

Design methodologies are at the centre of a product development process. In design research, the focus has moved from the functional theory for object-centred design activities to integrated product–services to complex systems [37], questioning the purpose of a product as a whole and the understanding of whom these systems are built for [38], [39]. Studying the users – their motivations, needs, concerns and future goals – has become a fundamental component of design as a practice [38]. Only by

placing the user at the centre of the design process, and having a trans-disciplinary approach [37] towards a problem can a methodology address complex issues [37], [38].

The development process of a product can be seen as a transformation process. It starts from the users' needs that inform the understanding of the problem in the first place, leading to the definition of the requirements and how these should be done before the design of the solution [40]. To better define a methodology to be adopted in the project component of this thesis, the research led to an analysis of design and engineer methodologies focused on the involvement of users and stakeholders in the design process.

The methodologies analyzed were narrowed down using the following criteria:

- user-centered design (UCD) practices, which mandates the involvement of users in specific stages of the design process of systems. Understanding the user's needs and different contexts can help define appropriate design requirements.

- cooperation between areas of expertise in specific moments of the project, actively involving these stakeholders in the design process. This approach aims to ensure the results meet the needs of the users, that is usable and done in the most informed way possible.

- a flexible framework that allows the evaluation tools and processes to be adjusted accordingly. Despite exploring design methodologies, which tend to be more rigid in terms of methods/processes to be carried out in a particular way, the flexibility of a framework should be considered, especially since the process sets itself to be inclusive and iterative.

- an iterative process that includes touchpoints with stakeholders and users at different stages of the process. The importance of an iterative process is directly associated with testing the platforms and collecting feedback from users. However, it also extends to the research and discovery stages of the methodology. This should not deter progress from being made, but it allows some flexibility for adjustments that could benefit the project in the long run.

Using these criteria to analyze specific design methodologies allows the speculation of why certain methods could have a higher impact on the project in progress than others, especially when exploring these through the perspective of design theory and engineering practices. Considering the selection made in the specific literature,

the following is the list of methodologies and frameworks that revealed to be more influential in this particular setting:

- Design Thinking
- Participatory Design
- Co-Design
- Research through Design

### 2.3.1 Design Thinking

Design Thinking, especially when combined with human-centered design, focuses on the user at the end of the production process, developing empathy and understanding their needs and working through solutions to their problems through ongoing experimentation.

According to Koppenhagen F. et al., it must structure and integrate an iterative cycle to solve partial problems according to the stage of the project they emerge. It also allows convergence between the different stages and includes users' direct involvement in the product development process, who are placed in a position to make their contribution.

The Design Thinking process has a set of steps clearly defined:

1. Empathize
2. Define
3. Ideate
4. Prototype
5. Test

These phases do not need to be followed one after the other, as one is encouraged to repeat and alternate between steps to best address the situation the team is working with. Due to being an iterative approach to the development process, the design phase is extended, allowing the testing and modification of the solution proposals.

### 2.3.2 Participatory Design

Participatory Design is an approach to design that invites all stakeholders (e.g. customers, employees, partners, citizens, consumers) into the design process to understand better, meet, and sometimes anticipate their needs – from a *passive audience* into becoming *co-creators of value* [37]. It encompasses techniques practical to both initial discovery and subsequent ideation phases of a project. The users of a product, service, or experience are included and have an active role in designing the solutions that will fit them.

This methodology adds a social component to the design process, incentivizing the interaction and negotiations between stakeholders, who add their specific knowledge to the design process and their singular perspectives informed by experience [37].

Understanding how users/stakeholders would solve a challenge they face directly often surfaces new insights about their experiences. This information better informs how designers focus their efforts, and the ideas users propose are used as actionable inspiration for the solutions being developed.

### 2.3.3 Co-Design

Co-design allows users to participate in the creative development of a product by interacting directly with design and research teams [41]. This methodology is based on the belief that all people can contribute to the creative process and that users, as experts of their own experiences. That allows the analysis of different points of view that can inform design and innovation direction.

Co-design is a method that can be used in all stages of the design process, but especially in the ideation or conceptual phases, for the design process to move forward. Partnering with users ensures their inclusion in knowledge development, idea generation, and concept development on products to serve these same users best.

### 2.3.4 Research through Design

Research through Design focuses on the capabilities of design as a reflexive practice that challenges the understating of the problem spaces through the development of artefacts and solutions that are continuously questioned and iterated [42]. When compared to other frameworks of the Design field, RtD can be distinguished by the

intention *"design researchers bring to bear on a problematic situation"* as the focus shifts from the product to the production of new and valuable knowledge.

According to Zimmerman et. al [42], the Research through Design process has a set of steps that a set of five steps that guide the project:

- Select: selecting a research problem worthy of investigation, *"a new material to play with, a context and target population to understand and empathize with, a societal issue or insight, and/or a theoretical framing they wish to apply to interaction"*. [42]

- Design: by conducting a literature review to understand the state-of-the-art and the insights from other researchers on the field, researchers conduct fieldwork through experimentation with materials and concepts. *"In these early stages of the project, the team is searching to understand what the state of the world is and how they might offer a new perspective, a new problem framing, which provides a path to a preferred future"* [42]. With an initial framing, the design process and iterations proceed until a refined solution is developed.

- Evaluate: simultaneously with the Design process, the evaluation of the initial framing is necessary to generate new perspectives of the problem space, as *"part of the critique is to explicate the proposal that is embedded in the designer and in their solution"*. [42]

- Reflect and disseminate: by reflecting on the knowledge acquired from the study of a subject and disseminating the work for the community, new perspectives can be fostered to create new solutions for either the same problem or applicable to different contexts, *"provoking designers to think about the next problematic situation and solution"*. [42] The documentation process in a RtD practice is highly valuable as it allows for other researched to learn from the process of a project, reproduce it or repurpose its findings for other situations.

- Repeat: as the final step, *"by repeatedly investigating the same situation"* [42], new perceptions of the problem space can emerge, potentiating the development of better solutions and results.

## 2.4 The study's regional context

The context of mental health interventions in Madeira is still expanding, especially in schools, with a ratio of one therapist/psychologist per 700 students [43]. While the region representatives recognize the significant role of the psychologist in the school environment, the existing proportion of professionals per student makes it impossible for an actual intervention in cases where the psychological distress is not severe and evident [44]. This is where mental health digital interventions stand as a real asset for improving young people's access to evidence-based mental health interventions [24].

According to portrayed findings from an unpublished study by the PS-UMa, since the COVID-19 pandemic started, the number of consultation requests from university students has doubled, in which anxiety is labelled as the most prevalent condition among these new patients, followed by problems with studying, depression and management of social relations and emotions.

The project component of this research aims to further improve a digital tool developed by the PS-UMa – *Toolbox* [45] (in detail under Appendix A). Developed in 2018 in the scope of a Masters in Informatics Engineering, this digital tool was tested by a control group of users. Its focus was on helping students cope with anxiety through self-management exercises.

With the intent of developing this platform in a user-centred way and strengthening the connection with the PS-UMa – following the recommendations of the literature and the contextual user study that is lacking –, the hope for this project is that it effectively supports the Psychology Service with the patients in treatment and the school community at large. To this end, the platform needs to be evaluated from many perspectives – from a scientific basis that will inform the content, but especially from a design, user experience, privacy and engineering standpoints, and ultimately from the user itself. These areas of expertise will contribute to the design process at different stages and be valued in a Participatory Design manner.

As a proto-conceptual proposal, the product to be developed alongside the PS-UMa will fall into a behaviour-tracking 'app' for clinical practice, with the intent of being used as the first touchpoint with stress and anxiety management. It will not work as an online diagnosis tool or online therapy forum, but as a non-invasive tool to help the students/patients keep track of their feelings and give appropriate tips to manage their stress/anxiety.

Informed by the literature and case studies mentioned in the research, the product will require the users to daily record their feelings and assessments of the day through simple questions, and pick which feelings they recognize, among other exercises. From a usability point of view, and to keep the user engaged during the treatment, these exercises must be intuitive and easy to complete to avoid frustration. Following the feedback from the PS-UMa, the platform will send motivational and educational recommendations tailored to the user's data, always with the consent and customization that the user would deem appropriate. All the content and approach to the users will be designed and informed by the PS-UMa according to their expertise and the population that will use the app.

Another feature mentioned in the early conversations with the PS-UMa was the exploration of a feature that could recognize patterns in the users' inputs – i.e., user replied in a non-positive manner, stopped engaging with the app, or a combination of other factors. These patterns will be defined by the Psychology Service, developed according to the appropriate psychology standards, following a scale of severity and would promptly inform the Psychology Service if any action should take place. This approach would be another tool in to help assess patient care and urgency level – especially if the Psychology Service is overwhelmed with requests.

There is also the need to explore the different levels of permissions that the platform allows – from patients in treatment to general users that could use the platform in a non-committed way – to the different levels of engagement defined by the patient's journey.

# Chapter 3

# Methodology

Due to the nature of the project, the definition of the design proposal followed a participatory design approach alongside the PS-UMa and other stakeholders in the community. This process enabled the gathering of insights from mental healthcare providers and included them in the development process as core stakeholders.

The feedback from the various stakeholders was analyzed, as the data from parallel national studies and the specialized literature on the subject defined the different user profiles of the target population. The consequent analysis allowed the definition of the primary mental well-being struggles the approach had to tackle – from a conceptual to content, and design perspectives.

The exercises, components and approach to the product were developed alongside the psychologists of the University, serving as the basis for the creation of the requirements of a low-fidelity prototype that was tested with both clients of the PS-UMa and the general student population. From the results of these tests, it was possible to design the high-fidelity prototype, test it again and iterate the final solution that was to be validated with a sample of the client population and psychologists. The methodology that guided this project is described in the following sections.

## 3.1 The role of the stakeholder

When considering the scope of our initial proposal and the different areas of expertise that it touched – from technology, design, healthcare and education – it became relevant to work in partnership with experts from these areas, not only to make the proposal scientifically relevant but especially to guide us in understanding the reality of

UMa's community and what were the urgent needs for the population we were working for. To this end, working with the PS-UMa and the student council Académica da Madeira would be extremely valuable, as these services have been actively working with students and clients to mitigate some of the issues they have identified over an extended period.

By exploring providers' perspectives, it was possible to explore how a mental well-being platform could address the challenges providers face with university students and how technology could be of service.

From a technological standpoint, we consulted with privacy and user experience experts to understand the limits of our proposal and ways in which we could protect users' private information to ensure the confidentiality and security of our approach.

## 3.2 Methodology

After a kickoff meeting where it was explained the core intentions for the project, the team at the PS-UMa introduced the *Toolbox* platform, and expanded on what would be of use to them from a clinical standpoint. From this moment on, a partnership was formed, and regular meetings were scheduled to ensure the progress of the project and the validation from the psychologists on the best course of action.

Informed by collaborative design methodologies and adjusted to the unique aspects of the project component of this study, a methodology was set up to guide the beginning of the process. Despite being a structured methodology, it should be understood as a work in progress, as it will guide the project and be informed by its process.

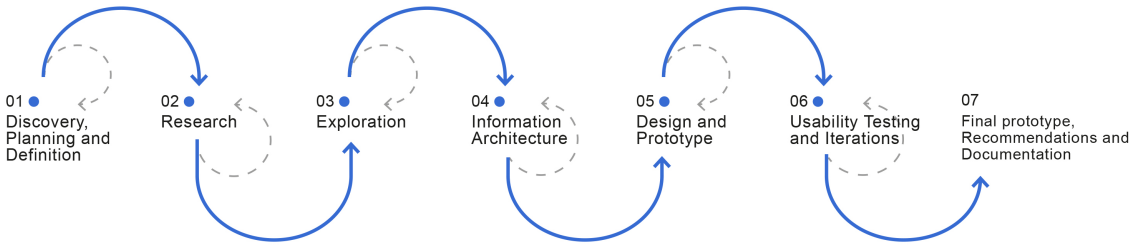



Figure 3.1: Summary of the methodology defined for the *Toolbox* process. In detail under Appendix B.

This methodology is composed of seven stages:

- **Discovery, Planning and Definition**– the initial stage of the process, where the team defines the problem with concept stakeholders to assess the project's objectives and the. The team identifies the proto-users, their needs and wants and how the project can impact them.

  This phase involves researching the problem space, framing the problem to be solved, and gathering evidence and initial direction on what to do next.

- **Research** – in this stage, the team will also apply user experience methods to define the user, the goals they are trying to meet and the appropriateness of the methods chosen. The definition of the end-user archetypes and their idiosyncrasies will result in a detailed understanding of the problem, what outcomes should be expected and where to focus its efforts. The resulting artefacts require validation through observation in the field, which will inform the following steps and tests.

  To this end, the study focused on three target users:

  1. Student: by analyzing the paradigms of the students of the UMa and the specific challenges they face considering their regionally isolated socioeconomic context. Through various qualitative research methods – from interviews, surveys, and participant observation, among others – this group's study intended to create an in-depth characterization of the demographic to understand better this population's particular experiences and how those impact the way they navigate through mental distress;
  2. Client: a variation on the "Students" user, these are the students of the University who are in therapeutic processes with the PS-UMa. Due to privacy and access constraints, the methods for researching the wants and needs of these users are always intermediated by the psychologists or through the questionnaires during the usability testing. These materials allow for the understanding of this user's level of comfort with technology and its usage within therapeutic practices;
  3. Psychologist: by understanding the role of the clinicians in a psychology counselling service – i.e., what their day-to-day is and which processes are

in place in an in-person therapy program – the team can then recognize in which areas technology can be used in an integrative way to improve therapy protocol.

Through the systematization of the student, client and psychologist, the team can accurately define the core problems that need to be addressed, and the extent to which a digital platform can intervene.

- **Exploration** – in this phase, the team understands the problem space design scope and addresses explicitly user needs. In this stage, User-Experience (UX) methods will be used to define the user and the goals they are trying to meet. The appropriateness of the methods chosen will be informed by the *Research* stage, and in this process there may emerge some high-level ideas for potential product solutions.

- **Information Architecture** – this stage of the process, with the users' wants and needs and the product defined, represents the product's infrastructure, features, and hierarchy – i.e., navigation, application functions and behaviours, content, and flows. It is the product's blueprint and will include all the project stakeholders – designers, developers, and content strategists (psychologists and therapists) – working together. The introduction of the development team at this stage is essential because their expertise will inform the design team on the best practices for the project – from a technological standpoint – and will prevent any misunderstandings and unmet expectations further on. Considering the level of information defined, this stage of the process requires validation with the users in a laboratory environment at various moments to corroborate/iterate pivotal aspects like content delivery and engagement, tone and voice, core interactions and connection with the user.

- **Design and Prototype** – in this stage the project goes from the concept to the materialization of the premises and functions developed in the earlier stages. It is a way of getting valuable feedback from team members and test groups of users. The design team can then iterate the project through the feedback phases informed by user and stakeholder insights and push it to the final stages of the development process.

- **Usability Testing and Iteration** – at this stage, the product is presented to the users for testing to identify problems in the design and interaction, uncover opportunities to improve and learn about the target user's behaviour and preferences with the product. Ultimately, the goal is to put users in front of the platform and understand what works, what needs to be improved and whether the product successfully answers the main concerns developed by the team. It should not be considered the last stage of the process, as with each analysis comes a new iteration to improve the product.

- **Final Prototype, Recommendations and Documentation** – as the last stage of the product development, all the issues will have been addressed and accounted for, and the product will be ready to launch. This is when the team produces documentation on the development process – research, requirements, user experience, design and development process, iterations – and a report on the methodology, future directions, and how it can be adaptable to other contexts.

One of the structural variations from the analyzed methodologies was the expansion of the main phases of product development. While most of the studied processes apply equivalent processes previously mentioned, the proposed plan distributes the methods in minor stages of development to make the process less complex from a management standpoint. This redistribution aspires to prevent complexity and allows only the necessary and specialized partners to participate in a determined stage. At the same time, the validation rounds should include all the stakeholders.

One of the most relevant processes added to the proposed plan is the various stakeholder touchpoints and resulting documentation, which is essential to the process' participatory aspect and the model's RtD basis. The review and validation with the different experts on the project will be vital in ensuring the project is conceptually robust and makes sense for all parties involved. In each validation, the team assesses the progress made in each stage and its impact on the project. These moments of validation also account for the possibility of reassessing assumptions at any stage of the process and redesigning the best path going forward.

In order to address possible low levels of user engagement or a dropout of stakeholders, an early process of advocacy and education for the RtD methodology and the level of commitment to the process will be put in place. The methods for this awareness – i.e., workshops, participation incentives, informative sessions – will be

defined appropriately, according to each target user or stakeholder.

# Chapter 4

# Discovery, Planning and Definition

The *Discovery* stage of the methodology focuses on the problem's definition from a conceptual and a practical standpoint. Considering the scope of the project and the collaborative nature of the framework, it was necessary to understand the PS-UMa current activity before any concepts were brought to the discussion. With the outline of the areas of intervention at the University defined, the Psychology Service shared an engineering dissertation project – *Toolbox* from 2018 [46] – currently being studied by the department, stating that it could be interesting to analyze its current relevancy and results.

*Toolbox* is a website developed in 2018 in the scope of a dissertation project for the master's in engineering from the University of Madeira. It set out to be a complementary resource for the institutional web page of the PS-UMa to promote students' psychological well-being [46].

It consists of an *"interactive web platform"* [46] that provides self-paced exercises and content created specifically for the UMa students' needs, based on cognitive-behavioural principles and positive psychology therapies. It defines itself as a tool for self-help – through the exercises – and mutual help – through the discussion forum and blog [46]. When it was first designed, the platform developed contained the following functionalities:

- programs related to recurrent challenges identified but the students of UMa – such as study methods, anxiety, and time management. These tools are informative and include a plan of self-paced exercises to teach the student the coping mechanisms recommended by the PS-UMa;

- a blog that serves as a direct-to-user publishing platform of new content from the PS-UMa is another type of intervention from the Psychology Service;
- a forum that allows for the debate/discussion of topics from the users;
- a communication area allows the user to book in-person appointments while informing the users of the services the PS-UMa;
- brief and short pieces of advice and tips to keep the user engaged and motivated.

Upon analyzing the *Toolbox* website and its 2017 usability test [46], all the functionalities above were in line with the best practices from the literature at the time, appropriate for the university context and well received by the users. Despite the implementation of the project and its contact with users, the work developed did not seem to continue after this preliminary study. The sections were not developed further, and the platform's usage was discontinued.

To complement the preliminary user data provided by the PS-UMa on the platform, a heuristic evaluation was performed on the *Toolbox* website to understand the current stage of the project and the availability and interest of the PS-UMa team. Due to the lack of qualitative information on the previous user analysis [46], and with the intent of evaluating the platform from an exploratory perspective without the involvement of potential users, this first evaluation functions as an initial proto-usability test and identifies potential issues to be solved from a design and eMHI perspectives. In the stakeholder workshop it was discussed mental health-specific heuristics and best practices to advance the conversation of what the future of the platform could be and developed a set of proto-UX methods – such as personas and user stories – to advance the systematization of our future users.

## 4.1 Heuristic Evaluation

A heuristic evaluation allowed designers to understand the inner works of a digital interface and assess usability problems that need to be addressed and resolved [47]. This review was done as the primary stage of the assessment to evaluate immediate adjustments to get the platform ready for new content, future work for redesigning the platform, and best practices from the literature on technology and mental health.

Aside from a general first impression of the platform, the simple task of a first visit to the website was tested, as the signing up process, booking of an appointment, the initiation of the exercises as a new user, and navigation of the website. These scenarios were evaluated using Jakob Nielsen's Ten Usability Heuristics [47] and other best practices from the eMHI industry [21].

Using the profile of a (proto) typical first-time user, it was found that while the *Toolbox* platform conforms to Nielsen's heuristics in several areas, the platform is challenging to navigate when attempting basic tasks – like showing a dashboard as soon as the user authenticates. This initial evaluation aimed at identifying areas where users may have encountered problems while completing basic tasks on the site. There were also recommendations for improving any issues found. Future evaluations with user testers or more evaluators would help understand the scope of the needed changes.

The *Toolbox* from 2018 [46] worked as a platform for sharing information, but the analysis focused on a more profound approach to mental health management through digital tools. That said, the top positive findings were:

- visibility of system status – When trying to begin an exercise process without logging in, the platform promptly informs the user of the importance of signing up and points to the registration page. The terms of privacy are also highlighted and well explained;

- error prevention – If users are not signed into the site, they are taken to the registration page;

- help user recognize, diagnose, and recover from errors. Error messages (i.e., when the user is not authenticated to access some areas of the website) are written in plain language and are easy to understand.

In terms of negative findings, and while none of these issues were catastrophic, the evaluation found that the site contains some issues that had to be addressed immediately to improve the platform's usage.

- navigation: unexpected locations for content + competing links and categories – The difference between categories is unclear from the content and naming convention. An evaluation of the information architecture is needed to reorganize the content flow and simplify the information given during the process;

- overwhelming information – The sections are sometimes overloaded with content, making it difficult to know where to start. This could be overcome by gradually feeding the information and a better data hierarchy for different users;
- lengthy workflows – The use of repetitive links and paths makes navigation unnecessarily confusing;
- help and documentation – The website is unclear on how to use the mental health tools available – developing a "how to" section could mitigate this issue and improve the user experience.

The *Toolbox* website contains essential, meaningful information and tools for potential users; it offers clients beneficial features that follow Nielsen's usability heuristics. However, a first approach is recommended to address the problem areas highlighted in this report to improve the overall user experience. Once these issues are solved and user feedback is gathered, the team can improve the platform's user experience to address the need for therapeutic intervention.

## 4.2 Proto-User Experience methods

In order to understand whom the Psychology Service perceived as their clients, we created a proto-persona and user story to be validated and improved with the psychologists. From this workshop, two types of users were defined: the clients, students that are engaged and in a therapeutic process with the Psychology Service and that will use the *Toolbox* as an extension of the work done in therapy; the general student population, who has access to an alternative version of the platform that is focused not only on mental health self-management, but that also focuses on the education for more general problems in the student community (i.e., study methods).

## 4.3 Mental Health-specific heuristics

After presenting the heuristic evaluation results, and to evolve the discussion into what would be valuable to pursue in the new approach to the *Toolbox* platform, some of the insights from the case studies studied in the literature were presented to the psychologists.

From this discussion, a list of potential approaches was collected that are in sync with the purposes of the PS-UMa and the needs of the students at the University. These heuristics can be summarized as follows:

- appropriate functionality;
- encouraging feedback;
- time constraints (students daily life);
- motivation;
- customization;
- educational content in engaging ways;
- age-appropriate language;
- not irritating or embarrassing;
- accuracy of information;
- privacy;
- behavioural tracking.

Overall, by designing a platform that is suited to the users' needs without being intrusive, curating the content to be informative, appropriate and non-overwhelming, allowing the user to be in charge of their data and privacy details and by rethinking the way users can interact with the platform are the key insights gathered from the psychologists for this population, and the new version of the *Toolbox* should, therefore, be a reflection of such values.

## 4.4 The impact of study methods in students

Introduced by the PS-UMa as a problem that affects the student community at the University of Madeira, it became relevant to briefly study how the act of learning, and its impact on academic success, is a predominant aspect in impacting students' mental health. This literature review was limited to the subject of study methods in a University environment.

As stated previously, the transition from high school to University is when young people experience growth in several areas of their life, especially at a personal, social and academic level [48]. Aside from it, due to the depth of choice in vocation at such an age, insecurities about the future of the job market and the possibility that the chosen course may not be "ideal" causes increased pressure on students. [48]

Students at University are faced with new ways of teaching – that require much more independence from their part [49] – new assessment methodologies, getting used to new routines and, ultimately, new ways of studying and time management habits that need to be quickly adjusted. The difference students feel also exacerbated by the lack of means that allow the student to adapt to the university environment, as the university environment requires students to have greater levels of autonomy, self-regulation of learning [48] and time management.

Being able to study appropriately is fundamental in a University setting, and it is dependent on two major factors: *"the content that students need to learn and how to learn"* [50]. From the different variables that impact the learning process of students in higher education [51], how students study is one of the critical factors that can be appropriately addressed to improve academic achievement.

Learning strategies are *"behaviours of a learner that are intended to influence how the learner processes information"* (Mayer, 1988, p.11 as cited in [52]). How students approach a subject, the study methods applied, and the self-regulation mechanisms used are not always the most appropriate for the course and subjects (Rosário et al., 2000 as cited in [51]). In conjunction with the higher levels of workload, this dissonance between what students were used to doing increases the frustration levels in students already overwhelmed with the academic workload. This insight was validated in the study with the students at UMa (explored further in chapter 5). Some strategies to improve the commitment and regulation in students' learning processes are described by Rosário et al. as follows:

- the way students plan, execute and evaluate their study activities;
- the management students make of the resources available (i.e., classes, textbooks, time);
- the regulation it makes of its cognitive functions and abilities (knowing how to select, organize, memorize and extrapolate, for example).

By accepting that learning is more influenced by the behaviour of the student than by what the teacher does (Biggs, 2000 as cited in [48]), study methods assume particular relevance in explaining academic success at University, impacting students' stability and mental health and thus making it a fundamental subject to include in the conversations around student well-being.

## 4.5 Summary

The *Discovery* stage resulted in the research objectives, the conceptual background of the project, the alignment with the PS-UMa daily practice, and the definition of the proposed solution. From the key breakthroughs that emerged from the work with the stakeholders in this stage was the inclusion of another group of users – from an in-therapy only tool to a broader intervention to the general population – and the inclusion of another mental well-being condition to be explored, expanding from anxiety and stress management to the inclusion of study methods support. This was a requirement from the team at the PS-UMa, as it is a current problem they are facing in the clinic that we took on to explore and validate in the *Research* phase.

Additionally, and as a result of the stakeholder review meeting, a set of questions were raised for further research to define more accurately the student population in general and the impact of the social-demographic nature of the community. The discussion in this manner can be summarized as follows:

- What drives students to look for ways to learn to study? Lack of study methods or little knowledge about emotional management?
- What is the path taken by a client until they get to the PS-UMa?
- Do students know about the existence of the PS-UMa?
- Does the service know how to help them?
- What role does stigma in mental health have in the decision to ask for help – among students and family.

# Chapter 5

# Research

With the core principles defined, the *Research* stage focused on developing a clear portrait of who the user is and what they want and need. In this stage, we went on to validate and discard assumptions about the product and evaluate the users' needs. In line with the research from the literature regarding the development of eMHIs [36] and with the commitment to integrating mental health professionals and experts into the design process, the *Research* phase began by assessing which methods could be appropriate in the creation of the different user archetypes.

This study focused on the perspective of the UMa students and the specific challenges they face due to their socioeconomic context.

Through a variety of qualitative research methods, the study created a comprehensive characterization of the student of the UMa for reviewing to understand this population's specific experiences, and how they impact the way students navigate through mental distress. The following sections describe the procedures conducted, the main results and its discussion in detail.

The qualitative study consisted of three typologies of interviews, adjusted to the different populations, namely: guerrilla interviews with the student population to gather insights about academic life; individual structured remote interviews with psychologists to gather insights on their day-to-day practice and perspectives on eMHIs usage from clients; and finally, an informal interview with a Student Association Representative (SA Representative) on his vast experience with the student population at the university, and the challenges they face daily.

The interviews were part of a usability study to get insights into the potential user of a mental health application to be used alongside therapeutic practices at the

UMa. This study allowed to validate and discard previous assumptions about the product. Responses from the interviews were organized according to the participant typology and theme framework. An inductive thematic analysis [53] was conducted to identify patterns across the interviews and inform the key aspects to consider when cross-reviewing the insights from each group of participants.

By gathering the perspectives of students and psychologists working in the community, it was possible to circumscribe essential features to be added to the app and validate preconceptions from the literature on what will be better accepted by this academic community. The insights from these interviews were structural to the development of the user profiles for the project, as they informed the following steps in the product development process. Consequently, having a better understanding of the user increases the likelihood of the resulting product being implemented in the UMa community as a complement for in-person therapy services, and a tool for the education of the general student population on strategies to improve their mental well-being.

## 5.1 Participants

### 5.1.1 Students

A sample of 30 students was randomly selected at the university during the finals season. This selection method falls into a guerrilla interview protocol, so that the sample could be as diverse as possible without much intervention in the selection process. There were two inclusion criteria for this participation: the subjects had to be current students at the university, and they could not be involved in a therapy process with the Psychology Service of the University. No identifiable personal information was asked from the participants.

### 5.1.2 Psychologists operating in the Psychology Service

Due to the scope of the project and the stakeholders involved, three psychologists were included in the interview process. These professionals currently work in the Psychology Service and conduct psychotherapy sessions with their clients – a term used to describe students already being followed by the service with weekly sessions or integrated in a therapeutic process.

### 5.1.3 Student Association Representative

After an initial contact with the Academic Student Association, an interview was conducted with the coordinator of the team working on student living initiatives to gather their insights on mental well-being at the university, and which were the perspectives on the most significant challenges for current students.

## 5.2 Materials

### 5.2.1 Students Interview Guide

The guerrilla interviews for the students consisted of five open-ended questions, followed by a structured list of prompts to facilitate further discussion and insights.

The students were asked questions regarding their university experience, the difficulties they face, the management of hardship during finals season and the institutional role of the university towards helping students cope with academic life and the Psychology Service role in their academic experience.

From these questions, and depending on the availability of the students with the subject, there were follow-up prompts regarding mental health – anxiety and stress – and the University initiatives towards students' well-being.

### 5.2.2 Psychologist Interview Guide

The psychologists' individual interviews consisted of 12 open-ended questions, followed by a discussion on possible future directions for the project.

The psychologists' interviews had three main areas of interest – day-to-day activities, the connection between technology and therapy, and reflecting on the possible role of behavioural tracking in their practice. Additionally, the psychologists were asked about which technological features could be helpful for their course of treatment, methods that could potentially be sensitive or uncomfortable for their clients according to their expertise with this specific community, and areas of improvement for the project.

### 5.2.3 Student Association Representative Interview Guide

The SA Representative interview consisted of an explanation of the research to get the interviewee acquainted with the purpose of the project, and five open-ended questions to help with the interview rhythm. Due to the type of work of the interviewee with the Student Association, these questions were thought of as guidelines without giving too much guidance on the interviewee.

## 5.3 Procedure

For the guerrilla interviews with the students, participants were informed about the scope of the research, the department it is associated with, and the themes that would be addressed before the interview. In this process, the interviewer took notes during the interview to assist with the post-interview debrief. The interviews took place on the University campus, and subjects were chosen randomly. No identifiable information was recorded during these interviews, participation was voluntary, and they were approximately 10 minutes long.

In the interviews with the psychologists, these professionals were already informed of the project beforehand. These interviews were conducted remotely via Zoom to accommodate the provider's busy schedules, and they took place in a one-on-one setting, with no nonparticipants present. The interview and discussion were approximately 35 minutes long; permission to audio-record the providers gave the interview prior to the interview and participation was voluntary.

The interview with the SA Representative was scheduled and took place at the Student Association headquarters, in a one-on-one setting, with no nonparticipants present. The interview and discussion were approximately 32 minutes in length, and permission to audio-record the interview was given by the SA Representative prior to the interview.

## 5.4 Data Analysis

The testimonials and notes from the interviews with the students were organized by question and thematic analysis [53]. A set of patterns arose from these interviews, and, through discussion with all the stakeholders in the project, a list of insights was

developed that guided the positioning of the content for the product.

Recordings from the psychologists were transcribed and analyzed individually. The contents from these recordings were reviewed according to the content and topics addressed by the participants, using a general inductive approach. With the breakdown of the insights from the psychologists, it was possible to identify patterns that informed the development of the features for the app. The discrepancies in the therapeutic methods were also considered topics to be discussed and validated with the psychologists in later interviews. The recording from the SA Representative was analyzed similarly to the psychologists' process, and insights were gathered according to thematic similarity. The report provided by the SA Representative was already dissected regarding their insights and data, but it served as a useful tool to validate assumptions from the students and psychologists.

## 5.5 Results

### 5.5.1 Students

The analysis of the student interviews was sorted into three general topics: students' perspectives on their study methods; factors that impacted academic achievement; and measures for institutional support for their academic success (see Figure 5.1).

Complementary to the general themes mentioned by the students, and upon analyzing the notes from the interview, it was possible to draw distinctions between the experience of first-year students in comparison with seniors at the same university.

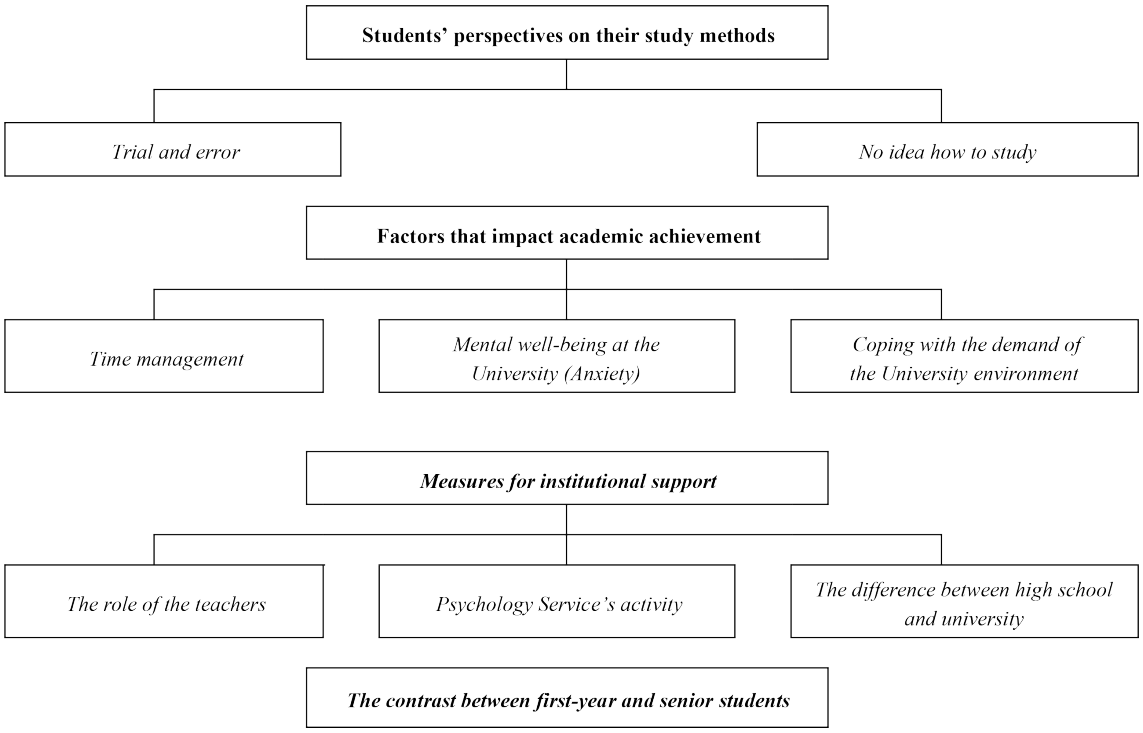



Figure 5.1: Summary of students' main concepts and subthemes.

### Students' perspectives on their study methods

***Trial and error*** *"In the first year, we had no idea how to do it well (how to study); in this second year, instead of staying at home with distractions, I come to the library, to a study room."* – S1

From the interviewed students, 60% of students mentioned they are not aware whether the way they study is *"the correct one"* – adjusted to the subjects they were enrolling in and considering how they assimilated knowledge – thus not showing confidence in the study methods they used. The most discussed argument for this disconnection was related to the variety of subjects and the disconnection from their previous experiences. This opinion was highlighted by the senior students interviewed, who mentioned that the experience from previous years allowed them to try different study methods and understand how they could manage them.

***No idea how to study*** *"We try (to learn how to study), but we aren't always able to assess the time we need for each subject – we have the notion that each subject has a*

*specific weight (in the curriculum) that has more information to learn, and that some are more important. But then there are other subjects that have a lot of material and in which the level of technical difficulty is higher – and those of us who don't have prior technical knowledge will not be able to do it. On top of it, we also have to be concerned with understanding how to apply the technical features to the practical classes. It's a lot to learn all at once by ourselves, and I have no idea if I'm doing it right."* – S9

All first-year students said they did not know what to expect from the university subjects and therefore did not know which study methods they should use. When inquired about what guided their study methodology, the time available for study was the most prevalent factor when considering which method to use. *"As long as it's enough to pass"* was a recurrent argument for these students.

### Factors that impact academic achievement

#### *Time management*

*"I have a lot of struggles managing time, taking time from my everyday life, knowing which subject is the most important and where to start – each subject has its weight, but we get so overwhelmed that we lose perspective. I think some guidance could help."* – S16

Difficulties in managing time, the school-life balance and difficulty meeting academic goals were the most prevalent issues raised by the interviewees. Of all the surveyed, the first-year students are the ones who raised this as a significant issue for them, linking its source to lack of communication in the institution and from professors, who, according to them, *"schedule everything at the same time"*.

#### *Coping with the demand of the University environment*

*"I noticed that (after Covid) the demand has increased, but they marked the evaluations all at the same time."* – S9

*"Sometimes there is no balance in the level of commitment that is asked of us."* – S10

When asked about the impact of COVID-19 and their current academic environment, half of the inquired mentioned they felt less engaged in the remote learning

environment. Although understanding that the changes happened quickly and were unprecedented, they attributed the lack of engagement to poor preparation from the institution and professors. When asked about the *"return to normal"*, 30% mentioned the professors' requirement levels were significantly higher than in the remote learning regimen.

### Mental well-being at the University (Anxiety)

*"I can't manage (anxiety) in the 'normal' year, let alone during exam season."* – S9

*"Sometimes there is no balance in the level of commitment that is asked of us."* – S10

The interviews revealed that 80% of students struggle with anxiety related to the university and the adjacent workload. Surprisingly, only 20% stated that their anxiety and stress were heightened by the end of the semester (finals season), indicating that these feelings of mental distress are transversal to the entire school period. There is also an acknowledgement by some students that they do not know how to address this issue but that they "manage it".

### Measures for institutional support

#### The role of the teachers

*"I can study in a way and take good grades in some subjects and bad grades in others because of the method. I think they (the teachers) should help us and present several ways of studying their subjects. It would help a lot"* – S10

In line with the emphasis on time management struggles and the difficulty in studying, the students referred that the university – especially professors – could do a better job at helping them navigate the subjects specificities'. Furthermore, among the interviewees who mentioned the institution's role in supporting the academic community, some students cited the apparent lack of communication between professors in booking exams and projects, and the inflexibility with deadlines, were two significant contributors to the high pressure levels felt by students.

**Psychology Service's activity**

*"I know there's a Psychology Service, but I thought it only treated people for depression, anxiety and related problems"* – S24

Of all the students interviewed, 70% mentioned that although they knew of the existence of the PS-UMa, they were unaware of the services provided in terms of study methods and time management. None of the students were aware of these services, or had attended any of the studying workshops administered at the beginning of the year.

**The difference between high school and university (and how it affects their mental well-being)**

*"They should do a better job at preparing first-year students – those of us who come from high school to university. It's a very big leap. We keep hearing that it's different, but no one prepares you for what it (university) really is."* – S23

All first-year students revealed they felt that the "jump" from high school to the university environment was *"too big"* and felt they lacked support from the teachers and the university. Some students suggested that this work should be done in connection with high schools in the region, so they can manage expectations and be more aware of the challenges in the university environment.

**The contrast between first-year and senior students**

*"This exam season was easier. Last year (first-year) was more complicated"* – S20

Upon analyzing the interviews, a relevant aspect to retain is the differences between the first-year students' experiences and the senior students. This contrast in academic experiences – especially regarding study methods – is due to the experience acquired by the senior students in the face of the difficulties they had previously. However, this predicament can help inform other solutions the institution can implement to overcome these weaknesses.

### 5.5.2 Psychologists

The analysis of the individual interviews with the psychologists was sorted into four general topics: psychologists' perspectives on the inclusion of technology in their practice; perspectives on behavioural tracking; suggestions on features to be included in the app; and strategies to maintain engagement (see Figure 5.2).

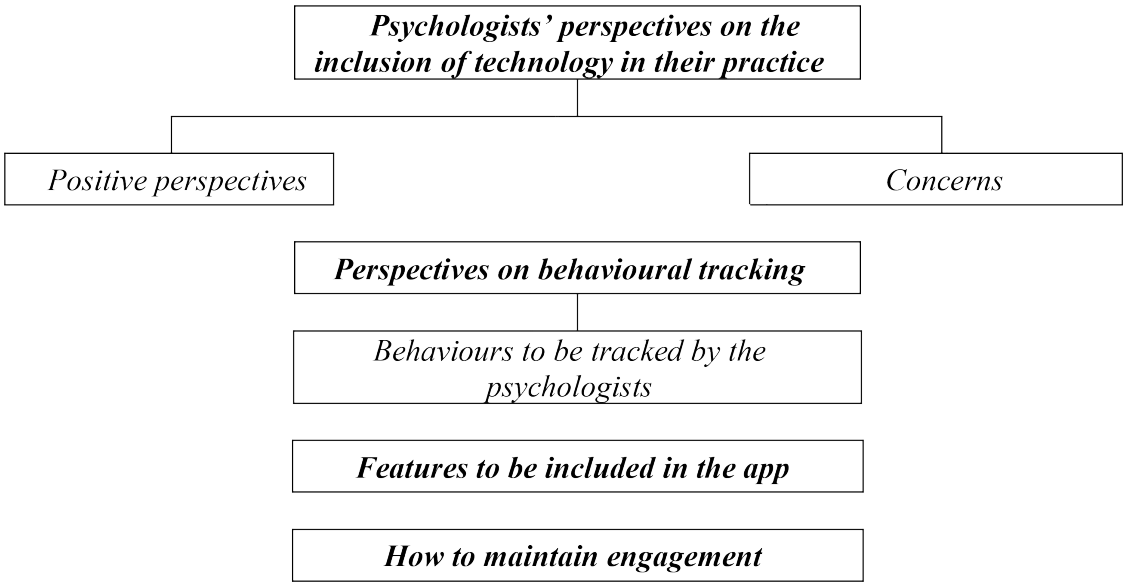



Figure 5.2: Summary of psychologists' main concepts and subthemes.

#### Psychologists' perspectives on the inclusion of technology in their practice

***Positive perspectives***

*"Many patients enjoy interacting with technology. If you ask a patient about what they felt towards a situation or something they don't like, they ask if they can go and check it on their phone."* – P1

*"I encourage some patients to use external apps for anxiety who have exercises for relaxation, to control the breathing, daily journals, etc. that I integrate them as at in the therapy consults."* – P2

*"More than a diagnosis to be made with these tools, the power of digital platforms is more related to promoting self-awareness and self-knowledge about oneself, one's thoughts, emotions, and behaviour. The diagnosis is something very complex – we do it based on instruments that are validated scientifically and that follow a set of procedures and protocols, which are time-consuming. However, these informal measures are very*

*important for the client, in the sense of promoting self-awareness and monitoring of what they feel."* – P3

The psychologists interviewed were confident about the user's engagement with a possible app to be incorporated into the therapeutic process. From their experience in the regional context, students already have a predisposition to interact with digital tools for their mental health management. The interviewees mentioned that this younger generation is highly connected with their phones, and that sometimes they track their emotions on external apps, and share them in consult. This was a common practice mentioned by all the psychologists interviewed.

They referred that an approach that is complementary to the in-person process is the next step into getting more data to help their clients – by having access to specific metrics adjusted to the client's needs, the psychologist can adjust the course of action, the therapeutic process, and the goals for the following sessions.

One of the psychologists interviewed mentioned that this could be an excellent opportunity to better the connection between the provider and the client, and that some of the work done in session could be extended to the app – i.e., the record of emotions – and that it could improve the support for some of the most severe cases.

***Concerns***

*"Aside from the privacy aspect and being easy to use, my biggest concern in the inclusion of technology (in my practice) is that this tool needs to be efficient for the patient. The patient needs to know that he can access it and that it has all the resources to help him right away – like managing anxiety, lifestyle, and study habits. It's all about prevention."* – P2

*"Privacy is the most important factor to consider. It is sacred – the data from a client, session or progress can only be accessed by them and us (psychologists)."* – P3

The two main concerns from the providers regarding the inclusion of technology were privacy and usability. From a privacy standpoint, the psychologists mentioned they do not include all the clients' data in a digital system. There is a protocol in place, but each psychologist has their method of organizing and preserving the clients' privacy – in terms of naming conventions or the level of information available on their computers. One of the psychologists referred that the "contract of trust" with the client is the most important aspect. Hence, a platform for the service "needs to be

adjusted to their frameworks" while also following strict rules to preserve the clients' identity.

Regarding usability, all the providers agreed that it needs to be easy to use to maintain the clients engaged with the platform without any problems.

### Perspectives on behavioural tracking

#### *Behaviours to be tracked by the psychologists, according to their current practice at PS-UMa*

*"The possibility for patients to self-monitor their feelings on a daily basis would be a very important aspect – especially in the inclusion of well-being scales. How do I feel today in terms of anxiety, if/how much I slept, among other aspects. This will also help me to correlate with the therapeutic goals in therapy – if the client is showing improvements, if those improvements are due to what we are implementing, how is the patient reacting..."* – P3

When asked which metrics they believe were important to be considered for the development of the behavioural tracking component of the app, the psychologists suggested a list of the most relevant metrics for their practice as seen below:

| **Basic information** | **Behaviours** | **Specific information** |
|---|---|---|
| Daily activities | Social situations | Medication |
| Emotions | Substance abuse | Suicidal ideation |
| Thoughts | Anxiety/stress | Psychiatric care |
| Exercise | Impulses | Therapy dropout rate |
| Diet | Log-off time | Individual perception |
| Sleep | Behaviours (situational) | Symptoms management |
| | Homework (from therapy) | |

Table 5.1: Important metrics defined by the PS-UMa for their practice .

One psychologist mentioned that it would be necessary for these metrics to be flexible and capable of being combined or excluded depending on the client in question. Allowing the psychologist to have this autonomy in the face of monitoring was a relevant step toward adjusting and personalizing the patient's experience in the application.

### Features to be included in the app

*"Speeding up the booking process is essential. As a Psychology Service for the community, we receive requests through several different channels, which is sometimes difficult to manage. We have to be present for a multitude of activities – consultations, workshops, clinical reports, diagnostic/analysis of tests, training – and it becomes difficult to respond to everything. The most important thing is always the consults with the clients, so streamlining the management of new requests would be key."* – P1

When asked what clinicians would like to see included in the platform, the development of a booking process system was mentioned in every interview. Since they book the appointments without an automatic system, booking an appointment takes a lot of their time off-consultation. Daily, the PS-UMa needs to be vigilant to four different channels of contact (e-mail, telephone, Facebook, institutional form, and personal recommendation) to not only contact the potential new client but analyze each request, rate it by urgency and direct it to the psychologist most apt to deal with the specific concerns of clients.

On a conceptual level, the psychologists urged the educational aspect of the platform, as they believe this would be an excellent format to share curated knowledge with the clients and students of UMa.

### How to maintain engagement

*"Having the possibility of sending messages and notifications brings the relationship between the psychologist and the client closer, not only in the office environment. It's small gestures that make a huge difference and that increase engagement in consultations – it signals that the therapist is committed and involved with the client as well."* – P3

While all the psychologists assured that their clients are engaged with technology, and would appreciate an app focusing on improving their therapeutic process, the same cannot be said about the general student population. The app in development will cater to different users, hence a problem that could occur is the dropout rate of users. With that in mind, when asked about features that could be added to maintain the engagement and interest of the users, the psychologists suggested:

- messages of encouragement and notification;
- notifications of content;

- agenda reminders for workshops and activities;
- helpful content with a closer relationship with the "real world" (job market, scholarships, external activities);
- connection with other apps from the university;
- accessibility to people with special needs – through audio, adjustable design, integration of other languages;
- motivational content;
- information simple but based on scientific evidence.

### 5.5.3 Student Association Representative

In the interview analysis, five general topics of interest emerged: the impact of the financial aspects on students' mental health; the stigma around mental health at the university, the leading causes of mental distress at the Student Association; the high rate of dropping out of university; and the intolerance in the community toward the identity of self as a cause of mental distress for minority students, all pictured in Figure 5.3.

Complementary to the interview, the SA Representative provided a report on a survey developed by the Student's Association at the beginning of the 2021–2022 school year, in which students were asked about various aspects of their university experience. For the scope of this study, the pertinent data provided in this report was on how the poor preparation for distance learning practices became a source of academic difficulties and the challenges students faced at university.

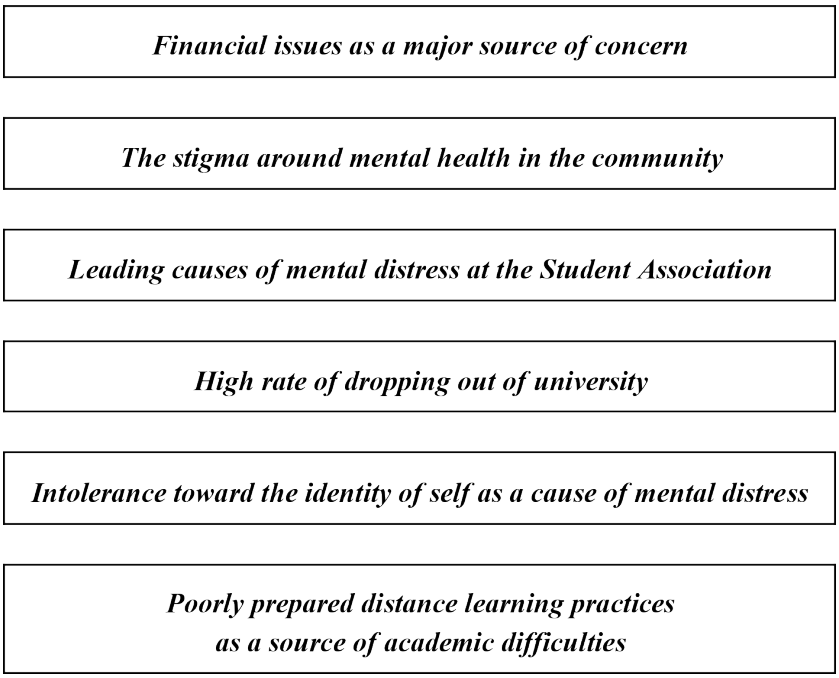



Figure 5.3: Summary of Student Association Representative's main concepts.

### Financial issues as a major source of concern

*"There is a lot of talk about the financial issues (of university students), which are extremely important because, without money, students cannot even attend the university, but little is said about issues related to the universe of mental health and student dropout rates. For a person who does not have the money to feed himself, it obviously affects the quality of his mental health and, consequently, his academic performance as a student. It's all related."* – SA Representative

*"We are the university with the highest percentage of scholarship students in the country. This may be seen as a great achievement from the university that can help many students, but it is also a reflection of the difficulties students face. This universe (Madeira) has the greatest economic difficulties in the country. And that is also directly linked with mental health."* – SA Representative

Due to the contextual circumstances of Madeira [11], financial difficulties have become a major factor in the well-being of students. This circumstance has become more present in the activity of the Student Association, as they are one of the institutional offices that most commonly inform and support students in the request for monetary aid. The SA Representative mentioned that school failure and dropout

rates are usually associated solely with financial issues. Nevertheless, the SA Representative believes this explanation gets too much importance – compared to the issues with mental well-being, lack of information about the courses or family support – and can even be a reductive view of the problem.

### The stigma around mental health in the community

*"Our role here (at the Association) is to build bridges and help students, referring students we see that are struggling to professionals – such as those in the Psychology Service. (...) If I say, "I'm going to an orthopaedist", nobody questions it. If I say, "I'm going to a psychiatrist", the community get alarmed and reacts completely differently. It is necessary to normalize these situations."* – SA Representative

Much of the role of the Student Association is to advise and serve students. The SA Representative mentioned that in addition to the community at large, the Association also works closely with 80 students, so he observed most of the community's problems from this sample. While he recognized that the university is already addressing the stigma associated with mental health, he has seen that there is still much apprehension in talking about the subject or asking for help. In his opinion, the stigma prevents students from accessing professional help earlier, impacting emotional distress levels. This has been in the work the Association has been developing alongside the University's Psychology Service.

### Leading causes of mental distress at the Student Association

*"Stress, anxiety, the immediacy of the present, lack of concentration, lack of ability to introspect, to disconnect – these are all conditions that I identify with the students who attend and work with the association."* – SA Representative

Due to his proximity to students, the SA Representative mentioned that he had noticed a significant increase in the emotional pressure of students. When asked about the type of situations he experiences most often, he noted that stress and anxiety are increasingly prevalent in this population. He also mentioned that students seem less apt to deal with unforeseen setbacks and that they have shown difficulties in being present which, in his opinion, seriously affects their ability to interact with others.

### High rate of dropping out of university

*"Universities have a hard time discussing abandonment and dropout in higher education. They do not seek to understand the reasons for these situations. They believe it's an unrelated situation (to mental health) and blame the institution itself, allowing for the situation not to be properly addressed. Mental health can, in fact, lead to dropping out or abandonment of school. These issues are rarely explored in the context of higher education."* – SA Representative

An aspect extensively mentioned by the SA Representative in the interview was the dropout rate at UMa, especially since the Association has little to no data on the subject. The SA Representative expanded on the intersectionality of the subject – between financial distress, lack of academic support, and poor grades – but especially the quality of the mental well-being he perceives in the students that visit and work at the Association.

This was a marker that was also present in the data from the 2021–2022 study. In terms of university abandonment, a considerable number of students (32,9%) mentioned they have thought about dropping out of the course in the face of possible difficulties and challenges. The main reasons were the difficulty in managing professional and family life (30%), lack of motivation (15%) and economic reasons (4,7%).

### Intolerance toward the identity of self as a cause of mental distress

*"It is essential to open the dialogue at Madeira to issues of race, gender, and identity. Here at the university, we have a group of LGBTQ+ students who have been targeted with verbal violence and jokes. This has had a tremendous impact on the mental health of this community."* – SA Representative

When asked about the Association's activity about the problems they identify on the ground, the SA Representative interviewed mentioned that issues of gender, sexuality and race are at the top of the problems that cross all students, which ends up also affecting the mental health of these minority communities. Specifically, the association has focused on developing awareness campaigns alongside the PS-UMa to educate the community on LGBTQ+ issues.

**Poorly prepared distance learning practices as a source of academic difficulties (from the report)**

Aside from the interview, the SA Representative shared data from a survey to the students [54], done at the beginning of the 2021–2022 school year. Students were asked about the greatest difficulties they faced at university.

From the data presented in the report, the key takeaways are:


| mentioned major difficulties during the semester | distance learning was assigned as the main reason for students' struggles | students have bigger concerns regarding evaluations in remote learning | consider very few professors are prepared for dis-tance learning practices |
|---|---|---|---|

Table 5.2: Biggest difficulties mentioned by students

The report also acknowledged that of the most significant challenges students faced during the last academic year:


| problems with teachers and teaching methodologies | lack of motivation | difficulty managing time for study | inability to concentrate |
|---|---|---|---|

Table 5.3: Most significant challenges students faced during the 2020-2021 academic year

The data from the report was seen as an external validation tool, as it connected the various insights from the interviews with the students and the psychologists' perspectives with the current development activities at the Academic Association.

## 5.6 Summary

*Research* describes the user needs identified for each group of stakeholders that emerged from the qualitative analysis of each set of interviews or informal contacts. In the interviews with the students, the questions focused on how the academic environment affects their mental well-being, which struggles affect them the most what they believe needs to be addressed to achieve academic success. The psychologists' interviews focused on the role of technology as an answer to the students' concerns and the development of a tool that can be used in this community to provide tools for mental well-being management – for clients and general students alike.

In analyzing the students' insights, it was surprising to understand that the most significant problems identified relied on time management and study methodologies, turning these issues into the source of anxiety and stress for university students. Considering these as the major struggles among students not in the therapy process, developing an app with a strong educational sense can be a solution to providing the academic community with tools to educate for these problems. The need to provide students with more tools for their development was mentioned by both the psychologists and the student representative, with the former advocating for credible and scientific information designed for this specific public and presented in a simple way. This could be done in the future through the *Toolbox* app, but, in the short term, the development of a program for mental health to be tested in the new academic year would be a consequent initiative to test these assumptions – such as workshops, a tutoring plan for older students and a welcoming kit with educational information for first-year students. This initiative would be designed to improve the communication of the university's existing resources – like the PS-UMa and the mentoring program – and developed with the welcoming kit provided yearly to students by the Student Council. The institutional investment in educational programs with the community will also raise awareness for the other initiatives already taking place – like the LGBTQ+ support program launched earlier this year – developing a close-knit community involvement and support for struggling students.

The contrast between first-year and senior students was also a factor to keep in mind in the project's next steps, as it validated the presumption that the younger students suffered the most from the changes that arose from entering the university. From an institutional standpoint, while some of the considerations given may not be applicable for an eMHI, they create an essential assessment for psychologists, so a cohesive strategy can be formulated to support students in the transition between high school and University environments. In the interviews with the students, it was suggested that the creation of presentations or workshops informing on carrier counselling and what to expect from the university could mitigate the clash between high school familiarity and the responsibilities of life at university.

From the perspective of psychologists, privacy regarding eMHIs constituted their biggest concern to be accounted for. The app features must follow the strict protocol defined by the psychology department and the university to guarantee the safety and protection of the clients' data and confidence in the Psychology Service. From a technical perspective, the privacy aspect of the app can be assured once the team integrates specialists from the Engineering Department of the University to devise a strategy to keep the data secure and accessible only to the clients and psychologists while also adhering to the protocols in place by the Psychology Department and Ethics Committee.

The providers interviewed were very much in favour of developing and including an eMHI complementary to their in-person practice. Considering the student community characteristics, the psychologists expressed the importance of a direct channel with their clients – i.e., a messaging service – for the clients to feel that the therapist is available when needed, outside of the office environment. When asked about the behavioural tracking aspect of an eMHI, the psychologists were sure of the engagement from their clients and that it would be particularly helpful in getting more information about the client's day-to-day struggles, homework, and well-being. Nevertheless, and in line with the recent literature on the subject, the providers interviewed expressed the need for the behavioural tracking metrics to be personalized, adaptable to the specific clinical case of each client and defined with a scientific basis. It should also be adaptable to the user's pace and preferences.

This was also stressed in terms of the content presented on the platform – it needs to have a robust scientific foundation, presented simply and clearly, and considering the accessibility and inclusiveness for students with special needs and language bar-

riers. These are aspects that will be accounted for in the development of the *Toolbox* with the integration with more professionals from the Psychology and Education Departments on the content and accessibility aspects and a creative team to design the content with solutions that consider the minorities of the student community.

The field study at this stage was instrumental in defining the core problems that need to be addressed and how much a digital platform can intervene. Aside from this, it uncovered the need to develop a better strategy to welcome the students entering the University, which we believe cannot be addressed only with the *Toolbox*. In the stakeholder meeting – at the end of *Research* – a workshop was held to discuss what has been done to address this issue, what worked and what did not, and what else could be developed with the University and the study council to address it.

From these discussions, the team devised a program for mental health initiatives to be tested in the new academic year – such as workshops, a tutoring plan for older students and a welcoming kit. The insights of what could be included in this initiative were:

- the creation of a closer partnership with the Student Association to communicate the Psychology Service and study workshops through a toolkit offered to the student at the beginning of the year;
- the development of a program with the high schools in the region to prepare students' expectations for university life;
- having student welcoming activities integrated with workshops at the beginning of the semester for first-year students;
- the improvement of the existing mentoring programs with older students to support younger students.

This initiative would be designed to improve the communication of the University's existing resources – like the Psychology Service and the mentoring program – and developed with the welcoming kit that is provided to students by the Student Association.

# Chapter 6

# Exploration

Upon realizing that the stakeholders were unaware of the importance of exploring the users' needs at the moment, the *Exploration* stage was introduced simultaneously to the *Research* in the regular digital workshop meetings. The PS-UMa team was focused solely on the data from the 2018 study [46] and on the problems they see in their practice. It became apparent that there was little awareness of the takeaways from the general student population, namely, how these users felt about mental health, their current problems at the university and why some of them were not engaging with the Psychology Service workshops'.

This allowed for the creation of the design artefacts in a collaborative way, with an educational attitude from both ends, characterizing the users, the design scope of the project and the precise needs of this community.

## 6.1 User definition

In *Exploration*, a series of user experience methods were used to define the user – personas, user scenarios, user stories – and the goals they are trying to meet – journey maps, user flows, and task analysis. The user definition allowed for a detailed need characterization, a list of what outcomes should be expected, and where to focus in terms of project efforts.

The team workshops resulted in the definition of three types of user, described according to the following aspects:

- a brief set of characteristics to situate the user's demographics, with a statement

taken from the interviews with the users in the previous chapter, to further ground the persona;

- a scenario, based on the insights from the *Research* stage, to define a brief story of the context, experiences and emotions of the user;
- a user story, a short, goal-oriented sentence that is focused on the perspective of the user toward the product;
- the definition of the main user objectives for the product;
- the description of the users' entry points and how a user first accesses the app;
- the customer journey, a mapping of the experience of using the app in a fictional contextual setting, informed by the scenario;
- the definition of specific features that are accessible for each user.

### 6.1.1 Student

A student that engages with the platform primarily focused on general educational tools – such as study methods and time management –, while also presenting questionnaires on anxiety and emotional management, allowing the user to dive deeper into mental health information. This simpler approach also aims to not stigmatize the work developed by the PS-UMa in their workshops and assistance for student health management.

**Maria, 18 years old**

*"They should better prepare first-year students – those who come from high school to university. It's a very big leap."*

### Scenario

As a first-year student, Maria must always be attentive to the work and responsibilities of the subjects of the Computer Engineering course. She is a good student, diligent and dedicated, but she is finding it difficult to manage the workload of this new phase of academic life. Maria tries to organize herself and understand the priorities in each subject, trying to structure the weeks so she can study a little bit of everything. However, she realizes that she still has not found an appropriate study method for each subject. In an attempt to better organize her study time, similarly to the previous semester, she realizes that some deadlines can coincide, making her feel anxious.

Maria would have liked to have been given guidance on integration into university education at the beginning of the year. This orientation could have been organized by the university and with the help of the professors – through face-to-face sessions or guides with tips that could make the transition healthier. Instead of going through trial and error to find the best way to study and manage her time, Maria would benefit a lot, if different study methods and organizational strategies were presented to her in a simple and direct manner. Thus, she could have developed a method that would be best adapted to how she learns, and correlates with the subjects she has to study.

### User Story

**As a** freshman at the university, **I want to** learn the best study methods for me **so that I can** respond to university assessments and assignments without feeling anxious or poorly prepared.

### Objectives:

— learn new strategies for studying;

— receive tips and exercises that help create better study habits;

— consult upcoming study support workshops.

### Entry point:

The most straightforward entry point for the students would be through a broad communication campaign by the university and primarily via the *Academic Toolkit*. This material is developed by the Student Association when welcoming students in the

new school year. This package contains valuable information for the students regarding university life and UMa's resources. It also contains a section on the Psychology Service activity, where the *Toolbox* app could be introduced.

A second entry point is via recommendation from other students and university personnel. While this is an act that happens more organically, the university community members could also spread awareness about the existence of this resource for all students – i.e., professors or older students involved with the academic association.

**Customer Journey – workshop registration**

1. After the first exam season, Maria realized she has had difficulties with how she was studying.
2. Her senior classmates told her to try the *Toolbox* application, which has several study methods features specific to the type of courses she will be taking in the semester.
3. The *Toolbox* lists several study methods and suggestions for what type of subject/subject they might be most beneficial for.
4. Maria looks in the "Agenda" section and finds out there will be a workshop on strategies to study better and decides to sign up.

**Specific features**

— Log in to reserved area

— Long and short-term exercises – study methods/study techniques

— Study methods – Subjects

— Progress Tracking

— Agenda of events and workshops

— Forum

— Incentive to share with users

— Learning zone

— Complementary science-based strategies

— Sharing of easy-to-understand articles from credible sources

— Presentation of the Psychology Service + call to action/consultation request

— Questionnaire

### 6.1.2 Client

The recurrent user is already attuned to the mental health strategies of the PS-UMa and will engage with the platform as an additional mental health management tool. This user will have access to all the educational materials that the student has, but with the added support from the therapists who will recommend exercises to complement their therapy work and monitor the daily routines. This monitoring will inform the therapeutic process.

**Alice, 20 years old**

*"Everything I felt in terms of mental health got worse with the pandemic. "*

#### Scenario

Alice has been attending the University for a few years now. She is a good student, the course is going well and she has a good group of friends, but she feels that her mental health has deteriorated substantially in recent years. After two years in an asynchronous regime with COVID-19, she noticed that the demand for the course has increased substantially, and she realizes that her anxiety has also gotten more out of control this last year. Due to the effects of her anxiety attacks during exams, she is being followed up by a psychologist. Maria feels that these sessions help a lot, and she feels better after the appointments, but she still can not maintain that balance a few days later.

Alice wants to learn ways to manage her emotions daily, complementing the work she does in sessions with the psychologist. She would like this learning to be tailored

to her, in self-management, avoiding being another added responsibility. As she is very comfortable with technology, a mobile solution would be ideal as it would always be accessible and practical. Ideally, Alice would like this solution to be related to the work she has already developed with her therapist, and to complement the approaches and exercises in consultation.

#### User Story

**As a** young adult suffering from anxiety, **I want to** learn ways to control my emotions daily **so I can** feel more balanced, manage my anxiety, and avoid feeling overwhelmed.

#### Objectives:

— learn ways to control anxiety;

— receive tips for maintaining symptoms, improving life habits and monitoring emotions.

#### Entry point:

Aside from the entry points from the students that are also accessible to this population, the *Toolbox* app entry point for clients would be the PS-UMa itself and the therapeutic process of the client with the psychologist. Due to the features and resources developed specifically for this population, the engagement with the app would be part of the clinical work and, therefore, the most accessible point of contact with this population.

#### Customer Journey – anxiety exercise

1. As she is in exam season, Alice is feeling a little anxious.
2. Check the *Toolbox* application and look in the Anxiety section if any tips can help me calm down.
3. The *Toolbox* presents its course in the Anxiety section, but also quick exercises validated by PS-UMa.
4. Alice sees that her therapist has recommended a specific exercise in the fast programs.

5. "This is it!"

6. After the meditation, Alice feels better and decides to keep this exercise in her personal area.

**Specific features**

— Dedicated personal area with connection to a dashboard of the PS-UMa's queries

— Periodic state of mind analysis

— Long term exercises

— Adjustment of exercises according to the patient's progress in consultation

— Short term exercises

— Complementary strategies

— Grouped by duration, rating, theme, most popular

— Possibility of therapist recommendation

— Progress Tracking

— Chat

— Definition of messages/goals for your future self

— Suggestions for next steps

### 6.1.3 Psychologist

The psychologist of PS-UMa is the power user who controls the contents of the platform, but also has a dashboard for controlling the activity of the clients. In this specific platform, the psychologists will be able to manage not only the clients' progress and metrics, but also their day-to-day activity – such as booking the appointments, managing client conversations, and the contents to upload on the platform. Due to this, they have the dual role of being in the development side of the project ,while also being an active user to be studied.

### Margarida, 31 years old

*"Many patients enjoy interacting with technology.*
*If in consult you ask a patient what they don't like,*
*they ask if they can go and see it on their cell phone."*

#### Scenario

Margarida has been a therapist at the University for a few years. She is proud of the Psychology Service project, in all the activities they carry out and the impact it has on the lives of the patients she follows - especially after the pandemic.

She likes to closely monitor her patients so they can overcome their lives' difficulties, providing this support beyond what the University requires. She is concerned about the number of students who turn to the Psychology Service, and her lack of time and resources to handle all requests.

Margarida would like a platform to help her patients monitor their sessions progress remotely. She feels that this follow-up could not only substantially improve her patients' day-to-day life, but also impact other students who need help with other topics covered by the Psychology Service, such as learning how to study.

#### User Story

**As a** service psychologist at the university, **I want to** be able to give patients more exercises and self-knowledge strategies, **so that I** can improve their therapeutic plan beyond sessions or appointments through validated and customized complementary resources.

#### Objectives:

— provide clients with tools for mental well-being;

— increase the scope of services provided to students, in order to improve the well-being of the academic community.

**Entry point:**

Regarding the entry point of the psychologists of the PS-UMa, the *Toolbox* app has been developed as a working tool for the Psychology Service's practice. In the platform, the psychologists would be able to, for example, manage their day-to-day, the relationship with the clients outside of the consults, and content for the platform, making the entry point for these professionals the Psychology Service in itself.

**Customer Journey – daily routine**

1. With the flow of new patients to the Psychology Service, Margarida starts the day analyzing new requests and urgency levels in the *Toolbox* application. As her schedule intertwines with that of the Psychology Service, she quickly sees where she can fit these new patients depending on the urgency of the form.

2. Through the application, Margarida starts confirming and scheduling these appointments.

3. Next, she quickly looks at the patient's chart for the day and the activity they have had in the application – in the exercises and monitoring component – to understand what she may need to address in session.

4. When noticing an alert from the *Toolbox* about the inactivity of one of her patients, Margarida decides to send a new notification with a tip of the day, to promote engagement and understand if the inactivity is systemic or just occasional.

**Specific features**

- Dedicated dashboard to the Psychology Service
  - Agenda
  - Clients
    - History in consultation
    - Patient's progress in application
    - Metric adjustment
    - Notes

- New clients
- Alerts
- Chat
- Content creation/upload zone
  - Exercises
  - Forum
  - Launch of initiatives/alerts

## 6.2 Summary

The *Exploration* stage was developed in straight collaboration with the stakeholders and defined almost simultaneously with the *Research* stage. Aside from the systematization of the user profiles, it was also a useful stage to educate the Stakeholders on the importance of user-experience methods, the definition of the users, the demographic study and the creation of design artefacts to help define the problem space.

From the stakeholder meeting at the end of the *Exploration*, and parallel from the definition of the user archetypes, it was also decided that each user would have different permissions on the app, according to their needs – the clients would have broader access in comparison to the students, as they need mechanisms to contact their psychologists, and the psychologists have total access to the app, as the managers of content and accounts. It was also explored the possibility of the *Toolbox* presenting content according to the users' usability patterns. That said, due to the scope of the project, functionalities with machine learning processes will be reviewed in future iterations of the app, when there is a more present integration of an engineer team.

# Chapter 7

# Information Architecture

With the users' and product defined and validated by all the stakeholders, the team started to work on the product's infrastructure, features, and hierarchy – i.e., navigation, application functions and behaviours, content, and flows. This process was heavily informed by the heuristics analyzed in the *Discovery* stage, the recommendations from the literature and some case studies from similar studies in the industry.

At this stage, it was essential to consult with engineers on specific aspects of the app – such as privacy and security – as their expertise will inform the design team on the best practices for the project – from a technological standpoint – and to prevent any misunderstandings and unmet expectations further on.

## 7.1 Content audit

The first step in this stage was carrying out a content audit on the *Toolbox* [45] website to understand how the information would be presented, and organized in the app and assess which contents could be utilized in the new iteration. The Psychology Service validated this procedure to ensure that the content followed good mental health educational practices. This process was also done when finding the best practices informed by the specialized literature to understand what could be improved, what would have to be restructured for the type of media in question, and what no longer made sense to be presented in a mental health application.

In line with the heuristics developed in *Discovery*, the section on anxiety on the current *Toolbox* website proved to be complex in terms of content, with extensive and repetitive information. From the analysis, the following structure was collected:

- Anxiety
  - What is anxiety?
  - How do I know if my anxiety is excessive and pathological?
  - Different types of symptoms
  - A little anxiety is desirable!
  - How to deal with anxiety when it becomes pathological?
- Self-questionnaire (17 questions)
- Strategies (10 strategies)
- Exercises (6 exercises)
- Supplementary reading
  - Learn to relax
  - For students: Manage anxiety – tips for before, during and after the exam (PT/EN)
  - Confronting Anxiety
- Did You Know (9 Tips)

Regarding the content on study methods – a problem raised by students during the *Research* stage – the team from the Psychology Service provided educational content, and exercises related to this topic – materials that are part of the service activity in workshops with students. Although these materials were not designed for a digital environment, extracting content to guide the platform's design was possible. From the analysis, we collected the following structure:

- Study methodologies
- Exercises (2 exercises)
- Strategies (3 strategies)
- Questionnaire regarding study methods
- Did You Know (10 Tips)

Considering the features defined in earlier stages of the process (*Exploration*), the editorial guidelines were defined to guide the application content structure. In contrast with the *Toolbox* [45] website, instead of the information being organized by theme, the team decided that it would be organized by typology – exercises, learning, and complementary self-management tools (questionnaires). The educational content is presented separately from the exercises, and the self-management tools are introduced inside the different sections. The Psychology Service will also have a section with a booking system for their consultations. Sectioning the *Toolbox* in this way does not mean that the information would not be interconnected between the different areas of the app. However, with this reorganization, the team agreed that it becomes more accessible for the user to understand where it is, which content is available, what can be done, and what type of information is being delivered.

In the context of the design proposal of this study, only content related to study methods – provided by the Psychology Service – and emotional management linked to anxiety – were selected from the *Toolbox* 2018 website [45].

The design team processed and organized the content, and even though it is based on scientific information given by the psychologists of the Psychology Service, it cannot be considered reliable for a future pilot study of the platform. The information used only serves as a placeholder, an example of the content to be presented on the app. A future iteration will require content designed for this purpose by psychologists.

The new *Toolbox* app is organized according to the following map:

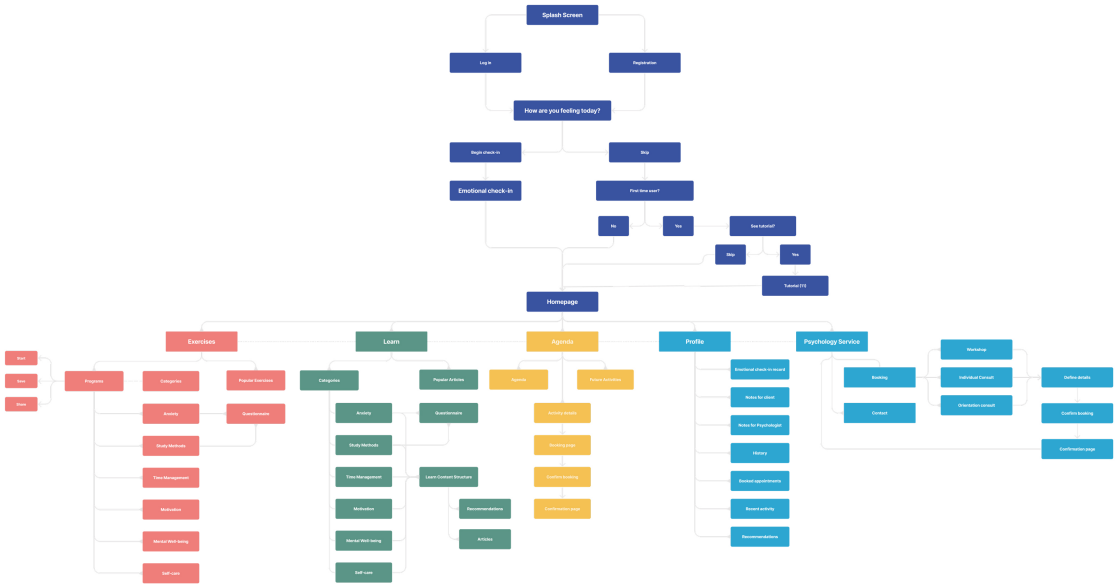



Figure 7.1: *Toolbox* Information Architecture scheme. In detail under Appendix C.

In this structure, there are areas where only clients will have access – such as data and definitions of the therapeutic process – and, others where only psychologists can use-such as the application's dashboard and access to data from all their clients.

## 7.2 Assessment of privacy metrics for behavioural tracking

Following the interviews with the psychologists, where behaviour monitoring metrics were listed as important by the psychologists, during the *Exploration* stages meetings, the team focused on understanding which exact metrics would be included in the application, and how sensitive these would be concerning customer data privacy.

Although customization for each case and client is a characteristic to be taken into account, the data mentioned by the stakeholders to be included on the user profiles for the *Toolbox* app are, among others:

| | | |
|---|---|---|
| Age | Depression Level | Scholarship (yes/no) |
| Genre | Anxiety | Diagnosis |
| Nationality | Somatization | Special Needs |
| Study Department | Relationship Problems | Eating Disorders |
| Academic Year | Psychoticism | Paranoid Ideation |
| Area of residence (displaced or island resident) | Guidance | |

Table 7.1: User profile required information mentioned by the PS-UMa psychologists.

In terms of behavioural data for the client profile on the app, the psychologists mentioned the following elements that should be considered:

| | | |
|---|---|---|
| Name | Birth date | Gender |
| UMa number | Scholarship (Yes / No) | Department |
| Type of client (i.e., student, professor) | Course / Year / First option | Dependents (i.e., children, elderly) |
| Personal contact and emergency contact | Entry point (i.e., self, teacher, another client) | Reason for seeking the PS-UMa |
| Sessions attendance | Follow-up of sessions | Informed consent |
| Previous psychological help (Yes/No) | Progress (notepad for psychologists) | First session expectations |
| Workshops attendance | Diagnosis | Medication |
| Depression level | Anxiety level | |

Table 7.2: User behavioural data to be included in the *Toolbox* app, as mentioned by the PS-UMa psychologists.

One aspect highlighted by psychologists is that these metrics are specific to the community of the UMa. Although they are not applied to all clients, they must allow for the possibility of having this information be filled in regularly by clients, at their own pace, and without the intrusive component of a questionnaire at the beginning of each consultation. It permits the psychologist to obtain this supplementary data in a non-invasive way for the users and at their own pace, revolutionizing the scope of the professional toward the client and significantly improving the treatment process.

## 7.3 Assessment of technical concerns

Alongside the behavioural tracking metrics, it was highlighted by all the stakeholders that for these metrics to be included, the privacy and security of this information had to be considered prior to any technical development. All the data handled by the PS-UMa is highly sensitive and requires careful management, always following the ethical regulations of the profession. This was an initial concern of all project stakeholders.

To this end, and in order to create a protocol that is in line with the technical parameters of security for the needs of the app to operate with the PS-UMa, the team consulted computer engineers regarding the aspects to be considered in the backend development of the project. The developers consulted advised to consider the following aspects:

- end-to-end encryption on all client-server communications;
- depending on the privacy requirements, use data encryption at rest (i.e., in the databases) so that only the users can access their data;
- the decision between the usage of hybrid apps (web-based) versus native apps (iOS + Android) must be accounted from the development team in accordance with the expectations on production time, accessibility, performance and investment from the University;
- total General Data Protection Regulation (GDPR) compliance, as the users must be able to review, update and delete their data;
- architecture API endpoints on the server to communicate between the apps and the databases.

## 7.4 Summary

Considering the level of information defined, this stage of the process requires validation with the psychologists at various moments to determine user-facing pivotal aspects like content delivery, engagement, tone, core interactions and connection with the user.

A content audit of the former *Toolbox* platform was done to understand which exercise programs were defined in the previous iteration and if the content was still applicable to today's expectations from the user we studied. It was found that the content presented was too exhaustive, not easy to read and delivered simultaneously, which is a counter-productive way to keep the users engaged in a therapeutic process. The team relied heavily on the psychologists' expertise as we were given examples of materials and exercises they develop in their practice and use with their clients.

# Chapter 8

# Design and Prototype

While it would have been ideal for designing the platform and evaluating it with users in a more finalized stage in a controlled environment, due to the nature of the project, it was clear there were advantages in merging the *Design and Prototype* and *Usability Testing and Iteration* stages, so some of the conceptual assumptions could be validated with the users. In the framework, this is the stage in which the design team goes from the concept to the materialization of the features developed in the earlier stages. By testing the design and prototypes in the early stages, valuable feedback was gathered from stakeholders and test groups with users. The project was iterated in three feedback phases, and analyzed from the following angles: identifying design and interaction problems, uncovering opportunities to improve and learning about the target users' behaviour and preferences with the platform. Nevertheless, this document separates both phases to expand on the methods of each stage.

## 8.1 Graphic Elements

In creating the *Toolbox* identity for the app, the design team considered the stakeholders' requests for a simple aesthetic that is easy to learn and understand, in which the design elements do not overlap with the content to be presented.

For that, the application's identity is based on three types of visual elements: colour, typography, and illustrations.

Regarding the colour palette chosen for this app, it originated around the already defined colour of the *Toolbox* 2018 [45] and the PS-UMa social channels – cyan. The rest of the colour palette was defined from this colour and considered the different

sections of the application. This colour palette guides the entire content of each application's sections and their illustrations.

On typography, it was essential to make a typographic selection that considered readability, accessibility and that did not create licensing problems. Thus, and taking into account the contents to be included in the application, three typographic fonts were chosen: *DM Serif Display* (highlights, titles and calls to action), *Red Hat Display* (titles and main text), *Nunito* (minor notations like time, dates, buttons).

The illustrations used represent the exercises/contents and guide the user to the contiguous contents of the different sections. The illustrations' design was based on two principles: that they are easily identifiable toward the themes of the information portrayed and that their design is modular, so it can be adapted to different contexts and organizations. The illustrations were collected from sites with free usage assets to allow the service to modify and reuse all the illustrations without copyright issues.

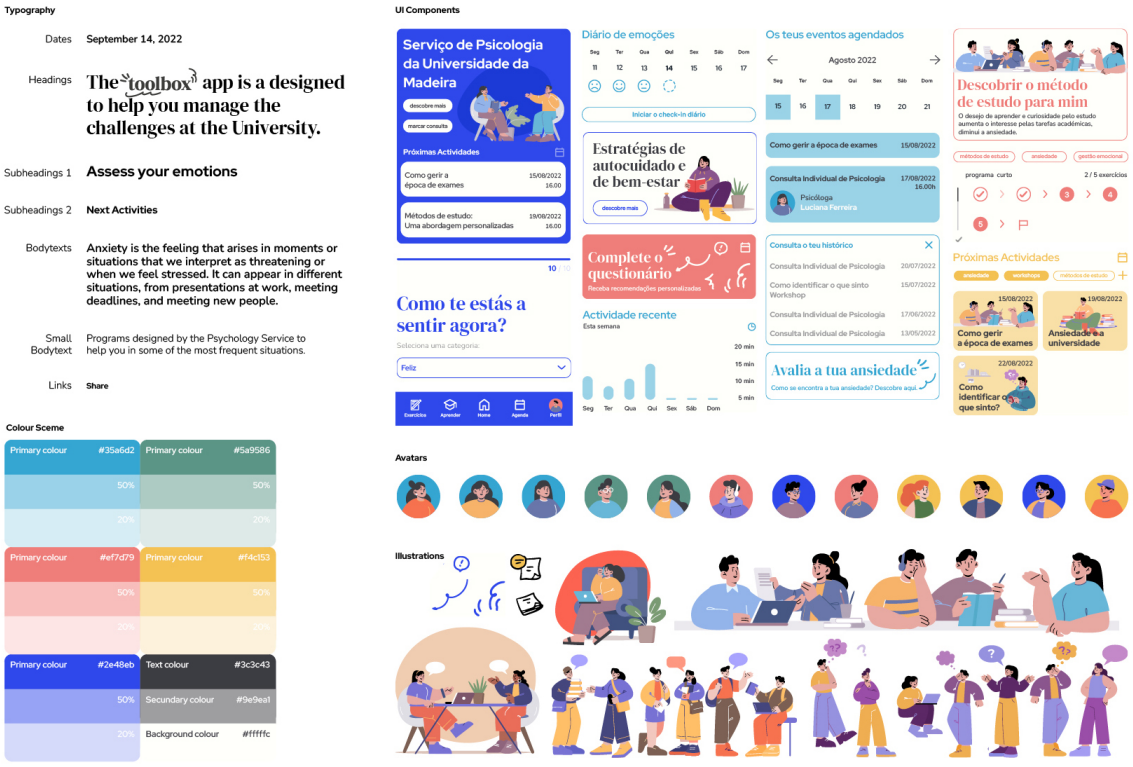



Figure 8.1: *Toolbox* graphic elements – see in detail under Appendix D.

## 8.2 Wireframes and Low-fidelity Prototype

Considering the plan to test the low-fidelity prototype with the clients, it was designed in Sketch – a digital tool that allows for products to be designed and tested within the software and remotely. This was useful due to the need to present it to the stakeholders and usability tests with students and clients.

It was made following the user stories and scenarios defined in the *Exploration* stage, as well as other requisites from the PS-UMa:

- navigation through educational content and exercises;
- the booking process of an appointment;
- discovery of related new content;
- continuation of an exercise program;
- booking of a workshop.

The design and prototype developed had a more refined look than a typical low-fidelity prototype due to the need to make it as perceivable and understandable for the testing subjects as possible. It used placeholder text from the *Toolbox* website, the sections were labelled, and there were no images to help the user navigate the design. The entire aesthetic was in shades of grey, not only to keep all the information at the same level of abstraction but also to test the core interactions and navigation of the product.


Figure 8.2: *Toolbox* Low-fidelity Prototype.

## 8.3 High-fidelity Prototype

Following the feedback from the first usability study, and due to the necessary adaptations and time constraints, the team decided to progress with a High-fidelity prototype, which suffered significant visual changes compared to the previous iteration.

The structure of the prototype was also altered according to the users' feedback: the pages became shorter in terms of length on information, and the types of interactions were adjusted (i.e., there is no longer a swiping motion to see more content on a specific section, having preferred a "see more" button that will lead the user to a different page). From a visual perspective, this prototype introduces the illustrations, fonts, colours, a new hierarchy of information and new and personalized icons.

These changes were well received when presented to the stakeholders, and the navigation became much easier. Some navigation struggles mentioned in the first round of tests were resolved by adding the colour and hierarchies.

This aspect was interesting to denote, as it validated the initial intention of having done the usability tests only at the Mid/High-fidelity stage of the design. Nevertheless, the Low-fidelity tests also allowed the team to understand the potential struggles, and opinions of the users regarding the integration of technology with mental health. These findings will be discussed in the next chapter.

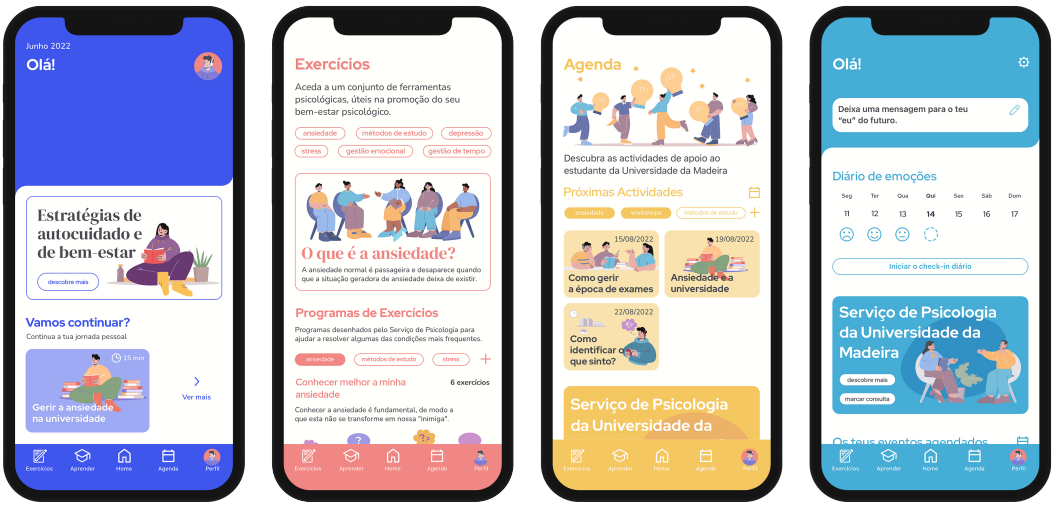



Figure 8.3: *Toolbox* High-fidelity Prototype.

## 8.4 Design Prototype

The Design Prototype revealed that in the next iteration, there was a need to create more redundancy in some elements. For that, the team adjusted some elements to reinforce some of the entry points for the tasks in the app. The reinforcement was added in the following elements:

- the booking of a consultation with a psychology service;
- the section guiding the user to the daily emotional check-in;
- the prioritization in the Profile page to add notes to the user's "future self" and their assigned psychologist.

As this was the Design stage, more content was added to the platform to show the range of content capabilities of the app. Regarding the dashboards of the psychologists, a workshop was done to fine-tune some of the elements in the screens, and to add extra metrics of management for clients. At this stage, the psychologist also asked for two additional features:

- explore different types of questionnaires to be added to the *Toolbox*;

- allow for the users to see their history of appointments and participated initiatives.


Figure 8.4: *Toolbox* Design Prototype.

## 8.5 Summary

The *Design and Prototype* stage was defined by the transition from the concept to the final prototype, done alongside the *Usability Testing and Iteration* stage.

In the first approach – the Low-fidelity prototype – the wireframes designed already had some recognizable elements. It was essential to begin the iteration process with the users from a version that would maximize the resulting insights. This version incorporated the conceptual aspects of the project – a mental well-being app developed for the student community of UMa – and some early interaction strategies to understand what works for the users.

The second iteration – the High-fidelity Prototype – marks the integration of colour, illustrations, and graphic elements to aid the user in understanding the different hierarchies and the app's aesthetic. This prototype validated some of the assumptions that transited from the first instalment of the design, introduced other interaction mechanisms, and reorganized the content structure of the app.

Finally, the third version of the prototype – the Design – incorporated all the feedback and iterations from the earlier versions. The adjustment of some of the

details in terms of UI elements – such as buttons, links between sections, and the overall organization of the app – allowed for the improvement of the users' overall experience for the third usability test.

The design choices were always informed by the usability testing insights that will be discussed in detail in the next chapter.

# Chapter 9

# Usability Testing and Iteration

To study the prototype's usability and validate the assumptions from the earlier stages on the app's interest in the community, three sessions of usability tests were done with all the users defined – Low-fidelity, High-fidelity and Design Prototype. The briefings were done by the design group and, due to the privacy of the service clients, it was decided that the psychologists would facilitate the tests to their clients.

## 9.1 Usability Testing protocol

### 9.1.1 Protocol and Materials

With the intent of controlling the integrity of the test, a protocol was defined alongside the PS-UMa to ensure they were applying the best practices for this type of user testing and not helping or interfering with the outcome of the results. This protocol contained a pre-test script, briefing and a post-test questionnaire (in detail under Appendix E, F and G, respectively), and the functional tools for the tests to be recorded – not the clients, just the tests – so the design team could analyze the results afterwards. To teach how these tests should be conducted, we scheduled a mock-up user testing workshop with the PS-UMa to exemplify how this process should go and to adjust if there were any questions.

Before testing started, the volunteers were informed about the project's purpose, the scope of the research, what would be asked from the tests, that no personal data would be collected to identify the subjects, and that this user test was done for academic reasons. The users were also informed on the screen recording of the tests,

on what it would be used for, that no audio or image would be recorded from the user, only the interactions with the prototype.

After this debrief, the users were asked if they had any questions. Once the users agreed to participate and use the screen recording, the test would begin with reading the briefing.

The briefing for the test was composed of a scenario to situate the users on the test's purpose, followed by the tasks to be completed by the user (in detail under Appendix F). From this moment on, neither the team administrating the tests (for the students) nor the psychologists (for the clients) would give any information or tips for the conclusion of the challenge presented.

Once the tests were finished, the screen recording would be stopped, and the administrators would give a printed post-test questionnaire to the users. This survey was non-mandatory and consisted of a System Usability Scale (SUS) [55] questionnaire for measuring usability, five multiple-choice and three open-ended questions.

After each round of usability tests, we did an interview session with the psychologists to discuss how these tests went and their takeaways from the process.

### 9.1.2 Sample

For the first two rounds of tests (Low-fidelity and High-fidelity prototypes), the sample consisted of 20 participants from different backgrounds per round, administered to 10 students from the University of Madeira and ten clients of the PS-UMa. For the Design user testing, only 12 clients of the Service of Psychology were selected.

The psychologists of the PS-UMa selected the clients according to their availability and the time frame for the usability tests. The design team was not involved in selecting or selecting these users.

## 9.2 Low-fidelity Prototype Usability Testing

### 9.2.1 Students'

*"I don't know if it's because it's a prototype, but I think more colour should be used in order to make the app more appealing. Also, I found the calendar a bit confusing. Otherwise, I think it's a very versatile and useful app."* – S7

When given the scenario and the tasks for usability testing of the app, the students showed considerable difficulties in understanding or completing the tasks, as they took longer than expected in each question, and were confronted with unforeseen challenges in most of the tasks given. Of the tasks given, the students showed more difficulty completing the following:

- Task 1 – Choose an exercise program regarding Study methods and save it for later; (40%)
- Task 5 – Fill out the questionnaire that helps you to understand if you have anxiety. (40%)

From the observation of the tests, the main problem was the disconnection between understanding that this was a prototype, and not a fully functional product – even though this explanation was given before the test and was included in the briefing. The constraints on different contents developed for this prototype and the fact that not every button present was clickable were significant deterrents in the conclusion of the tests. Nevertheless, even though it took a long time for each test, almost every student was able to conclude the challenges.

When asked about feedback on the app and what led to users having some difficulties, 60% of the students referred to the lack of colours and images as a significant deterrent for understanding how to navigate the prototype and the content hierarchy. Two students also mentioned that if the app integrates a tutorial to guide the user, it would be *"valuable in eliminating some of the confusion"* (S8).

On the design elements, the students mentioned the organization of the calendar in the Agenda section, and the size of the buttons as elements to be iterated in a new version of the prototype.

### 9.2.2 Clients'

*"It would be interesting to have an option to contact my psychologist"* – C1

On the user tests with the clients, the data shows they were more accepting of the tasks, showing fewer problems with completing the tasks and taking less time to finish the user testing. They mainly mentioned problems with one of the tasks, and when asked why it was challenging to complete the task, they mentioned that some of the buttons *"were not clicking"*. This shows that the problem with the understanding

that this was a prototype and not a fully developed product was also present in the test to the clients.

Regarding feedback for improvement on the next iterations, users mentioned the need for more colour and illustrations; the addition of inspiring phrases to motivate them during the day; the possibility of having a notepad to leave messages for themselves and to be able to contact their psychologist of the PS-UMa.

### 9.2.3 Low-fidelity System Usability Scale

Considering the size of the sample and with the intent of asking for assessments from the users in a quick and simple way – especially since not all the tests would be administered by the design team, the team opted for the use of the SUS to give the team a global view on the usability of the prototype.

Overall, with both groups of users, the low-fidelity prototype scored a total of 68%, which is graded as a C, entering the threshold of "Ok". When looking at the breakdown between the students and the clients (in detail under Appendix H and I, respectively), the SUS test confirmed that the students (63,5%) had more difficulties than the clients (72,5%) in terms of usability.

### 9.2.4 Feedback from Psychologists and Results

With the analysis of the questionnaires of both groups of users, some considerations and key takeaways were gathered to inform the next iteration:

- due to the nature of the prototype – no colour or images – some students had difficulties understanding how to navigate the prototype;
- 50% of the students were not sure if they would engage with the app if it were published, while every client mentioned it would use the app in their daily life;
- all clients were in favour of session/progress monitoring and appreciated the possibility of improving their therapeutic process with technology;
- both users and students deemed the functionalities of the app useful to be used in a therapeutic process;

- when asked about the frequency in which users would engage the app, the feedback shows it is best to leave this as an option for the user, as the results were dispersed between students and clients.

From the input of the psychologists that administered the usability tests for the clients, the key takeaways are:

- it took clients longer to understand that the prototype was not a functioning application, which was responsible for a long time in doing the exercises. This was especially prevalent in clients with special educational needs;
- the psychologists referred that adding confirmation notifications would have been valuable for the client to know when the task is finished (i.e., when an appointment is booked);
- every client mentioned to the psychologist during the post-test questionnaire that they are comfortable with monitoring technology integrated with the course of treatment, validating the questionnaire's answers.

## 9.3 High-fidelity Prototype Usability Testing

### 9.3.1 Students'

*"I felt the application has a lot of information; it should be simpler. However, it is something very interesting and important for students"* – S7

In the new round of usability testing, the students showed less difficulty compared to the other prototype. Of the tasks given, the students showed more difficulty reaching the PS-UMa section of the app. The disconnection between being a prototype and not a final functional product was mitigated, and the duration time of the tests was reduced significantly. The app's aesthetics were highlighted as a significant element of the experience of testing the new prototype. The students continued to be mixed in terms of the frequency in which they would engage with the app daily, and 70% of the users mentioned that some contents "should be organized differently" to make some sections more accessible (i.e., the Psychology Service page).

### 9.3.2 Clients'

*"I find it very interesting to have a daily-use application for managing and helping mental health"* – C1

*"I found the application interesting, insofar as, during the consultation, the patient can transmit to the psychologist the emotions he felt and experiences without forgetting"* – C7

On the user tests of the high-fidelity with the clients, the data from the questionnaires showed the major problem with the new iteration was scheduling an appointment with the PS-UMa – as 70% of the users reported this as the most significant issue when user testing. The feedback on this was related to the placement of the booking section, which, in the users' opinion, was *"too far down"* in the design. When analyzing the recordings, it was clear that the time per test completion increased exponentially. In the post-test questionnaire, clients reiterated that they would incorporate a platform like this in their daily life, and 60% of the responders stated they would engage with it daily.

In terms of improvements on the subsequent iterations, users mainly mentioned improvements in accessibility – more audio content and diverse language options to cater to international students. Some clients also said adding a feature to send messages and notes to the psychologist to share their daily situations and emotions.

### 9.3.3 High-fidelity System Usability Scale

The high-fidelity prototype test with both groups of users scored a total of 71,5%, which is described as a B and enters the threshold of "Good". When looking at the breakdown between the students and the clients (in detail under Appendix J and K, respectively), the SUS test confirmed that the students (68,5%) continue to have more difficulties than the clients (74,5%) in terms of usability.

### 9.3.4 Feedback from Psychologists and Results

With the analysis of the questionnaires of both groups of users, some considerations and critical takeaways were gathered to inform the next iteration:

- the new prototype had higher engagement and good reception from the students because of the User-Interaction (UI) aesthetic elements: i.e., colours, and

illustrations;

- some students mentioned the need to reinforce the notifications and confirmation messages on the app;
- In the post-test questionnaire of this test, the clients would incorporate a platform like this in their daily life, and 60% of the responders stated they would engage with it daily.

From the input of the psychologists, the key takeaways are:

- students from artistic or engineering backgrounds had a more enjoyable experience and were able to accomplish the tasks quicker and without problems;
- the psychologists referred that clients continued to be in favour of monitoring, adding that they would like to see a direct channel to connect to the psychologist;
- the clients tended to skip the app's tutorial, and then wonder out loud where to get to the sections to complete the tasks.

## 9.4 Design Prototype Usability Testing

*"I think the services and usability of the app are very good, but I think the app is still has a lot of information"* – C8

*"I thought it would be nice to have an option at the end of the record to write some more specific observation about how I was feeling at the moment"* – C6

On the last round of usability testing – only with the clients – the most prominent feedback was on the length of the content on the app, suggesting that making it simpler would make the platform more accessible and easier to use. This feedback reflects the implications of the content in the usability of the prototype. Nevertheless, and due to the nature of the content for this platform, the design team passed concern to the PS-UMa team to be an indicator for future implementation of the product.

From the post-test questionnaire, every client mentioned that they would incorporate a platform like this in their daily life, as more than half of the responders stated they would engage with it daily. The users were invited to provide suggestions and feedback on the app. The most recurrent suggestion leaned on the way to communicate directly with their assigned psychologist between appointments through

the app, in the form of small messages and notes. Regarding improvements on the design prototype, the questionnaires show the interaction with the "Save" button as the bigger interaction challenge, with 50% of the users mentioning trouble finding it. This button was duplicated, moved to a different place, and augmented to solve this issue.

### 9.4.1 Design System Usability Scale

The design prototype test with only the clients at a total of 81,46%, which is described as an A and enters the threshold of "Excellent" (in detail under Appendix L).

### 9.4.2 Feedback from Psychologists and Results

With the analysis of the questionnaires of both groups of users, some considerations and critical takeaways were gathered to inform the next iteration:

- with the new iteration of the prototype, every user was able to conclude the tasks and the duration of the tests was reduced significantly;
- the engagement with the app was maintained at a high level – following the previous test;
- 20% of users stated they felt that while the app was appealing, some sections could be "a bit overwhelming" for first-time users concerning the amount of content available for users;
- some students suggested adding redundancy to some graphic elements of the design to improve the quick accessibility of some tasks (i.e., monitoring feelings questionnaire).

From the input of the psychologists, the key takeaways are:

- the app's monitoring is still an aspect appreciated by users in order to improve the therapeutic process;
- the psychologists referred that the interest level in the future of the project was also highlighted during the sessions, with clients asking about a public launch of the app;

- the design aspect of the app – such as colours, illustrations and hierarchies – was highlighted as a key element for the users.

## 9.5 Psychologists' Dashboard workshop

After the last round of usability testing and iterations, and informed by the insights from the three rounds of testing, a workshop meeting was scheduled for the stakeholders to review the prototype, give their feedback, input, and discuss the dashboard for the psychologists of the PS-UMa. In this meeting, while reviewing this prototype, the psychologists assessed the implementation of the features and information needed to be included in the prototype. In terms of the dashboard design and prototype that was developed during this workshop session, the insights gathered from the meeting are:

- technical features of connecting the dashboard with previous platforms used by the PS-UMa to facilitate booking meetings and appointments;
- the possibility of exporting the data from the *Toolbox* to be included in the clients' files. This data is not to be the sensitive information about the client, but only the processed data (i.e., diagrams, graphs, insights from the self-monitoring);
- the inclusion of analytics on the dashboard. On the data and analytics needed by the service, the psychologists from the service mention not only data on each client (i.e., how many appointments have been attended, the engagement with the *Toolbox*, exercises dropout and homework) but also on the PS-UMa's activity as a whole (i.e., the predominance of psychological conditions, demographic of clients, growth of the service), and also regarding the app's behavioural tracking metrics.

The reflections from the psychologists for future iterations on the *Toolbox* prototype were:

- a need for the inclusion of new formats of content was mentioned in this last workshop, such as new questionnaires, different multimedia content;

- the integration with other digital platforms from the University and the Student Association to advertise the *Toolbox* app for the entire student community. When discussing this matter, all the stakeholders agreed that this needs to be included in the new communication strategy of the PS-UMa, which needs to be integrated with the UMa and all the other institutional partners of the University. This could mean that some of the information in the *Toolbox* also links to the other platform forms to create a net of resources for the students.

## 9.6 Summary

In reaction to each prototype from *Design and Prototype*, the *Usability testing and Iteration* stage described the various tests, feedback and insights from the usability sessions with the clients and students.

Three usability tests were done: Low-fidelity and High-fidelity prototype tests with students and clients and a Design prototype test with clients. Each iteration informed the design's next steps, elements to improve, and perspectives of the students toward a digital mental health app to be used as a complementary tool to clinical care or academic self-improvement at the University.

In the individual debrief with the psychologist's post usability tests and workshops and influenced by the clients' acceptance rate of the concept and prototype, the higher demand for a centralized schedule and booking system was discussed. The team also addressed the possibility for improvement of the connection between the psychologist and the client, and the inclusion of client records' while maintaining the service privacy guidelines'. Regarding the types of content to be added to the app, the psychologists deemed it relevant to integrate more scales for mental health assessment regarding other conditions.

# Chapter 10

# Final Prototype, Recommendations and Documentation

As a final stage of the methodology, the team is asked to review and summarize the conception and design process of the *Toolbox* to prepare the materials for the next steps.

Due to the nature of this project, and its impact on the student population, the development of the product could not advance at this stage, as it needs to be submitted for internal approval in the University. This circumstance made the need for comprehensive documentation, limitations, and future steps assessment even more pressing.

## 10.1 Final Design Prototype

Due to the merge of the *Design* and *Usability Testing* stages, which resulted in three rounds of iteration, feedback and validation that informed the design on various details – from interaction, UX and UI aspects – the final design prototype suffered minimal adjustments. In terms of additional alterations to the design, and informed by the psychologists' workshop, the history of the scheduling activities and appointments was added to the profile page and two other questionnaires were added, exploring the different possibilities of what the app could feature.

In terms of the design features of the app, the team decided to devise a simple language, that could be adaptable for any type of content, while keeping the style recognizable and consistent. Below is a visual systematization of the main elements

that compose the *Toolbox* app: in detail under Appendix M. A *Toolbox* functional prototype is complementary to this thesis, and it can be found in the CD media package, along with instructions for opening and testing.

Figure 10.1: *Toolbox* Design Prototype – in detail under Appendix M.

In terms of the psychologists' Dashboard, the design generally used the same elements as the app. That said, some of the pages were slightly adjusted to the psychologists' preferences, to have some resemblance to the resources they currently use: in detail under Appendix N. A functional prototype of the psychologists' Dashboard is complementary to this thesis, and it can be found in the CD media package, along with instructions for opening and testing.


Figure 10.2: *Toolbox* Dashboard Design Prototype – in detail under Appendix N.

## 10.2 Recommendations and Documentation

Considering this project is inserted in a thesis for an MSc degree, the entire process is already documented at length in the previous chapters. As the last stage of the frame

devised for this project, a set of documents would be made available to pass along to the future contributors of the project. In this case, it would be new stakeholders and technicians that would be working on the implementation of the *Toolbox* app.

The *Discovery, Planning and Definition* phase of the project was centred on defining the problem space, gathering the appropriate stakeholders to integrate the project, and outlining the social context and assumptions for the project from a conceptual and project point of view. This phase resulted in the general objectives for the study and an idea of what the project could entail based on the expertise of the stakeholders at play. From these meetings, the team defined the groups of users that would be impacted by the app – students and clients of the PS-UMa – and that the study with the users should include the variable of the study methods, adding it to the anxiety and stress management segments.

The insights from the *Research* phase were structural to the development of the user profiles for the project, as they informed the following steps in the product development process. By gathering the perspectives of students and psychologists working in the community, it was possible to circumscribe essential features to be added to the app and validate preconceptions from the literature on what will be better accepted by this academic community. Consequently, having a better understanding of the user increases the likelihood of the resulting product being implemented in the UMa community as a complement to in-person therapy services and a tool for educating the general student population on strategies to improve their mental well-being. This study adds to the growing literature [23], [21], [27] on assessing the preferences of mental health care providers towards technology, behavioural tracking, and mental health interventions with young people. On the other hand, by including the perspectives of students not involved in therapeutic processes, it explores how the general population can be included in developing these technological tools.

Simultaneously to the *Research* stage, and informed by its interviews and insights, in*Exploration*, the team systematized the user profiles – for the student, client and psychologist – in a detailed characterization of the needs and wants that informed the decisions taken in the rest of the project.

In the *Information Architecture* stage, when assessing the type of content to take into account for the design of the *Toolbox* app, three strategies were put in place:

- analyzing the content of the *Toolbox*, 2018 [45] to understand the type of program the PS-UMa had put in place in terms of anxiety, an approach that the

stakeholders later validated;

- inquire with the PS-UMa team about the type of information and materials to be used on the study methods component of the prototype. The PS-UMa team then provided all the information to be used on the prototype;
- a workshop with the PS-UMa team to define which metrics should be included in the app regarding the behavioural tracking component.

In parallel, and as a result of the sensitive information the *Toolbox* would contain, a consultation with computer engineers to define which aspects needed to be taken into account in the project's development.

Due to the project unique characteristics – and with the intent of testing the validity of the concept and acceptance from the users – both the *Design* and *Usability Testing* stages. The *Design* stage is when the project goes from the concept to the materialization based on the work developed in earlier stages. Combining it with the *Usability Testing* stage also permitted for the iteration of some interaction and conceptual components with both users' groups – students and clients.

Three usability tests were developed – Low-fidelity, High–fidelity and Design – and in each iteration, the team uncovered aspects to improve and learned more about the subjects' usability patterns, behaviours, and preferences towards the *Toolbox* prototype.

As for future recommendations, after the user testing stage, a final debrief was done with the stakeholders to understand what worked, what could be improved, and how this process can inform the following stages of the project.

The involvement of all the stakeholders in the process encouraged a constant reflection on what could have been done differently to improve the process or avoid some oversights. In terms of recommendations, after the user testing stage, a final debrief was done with the stakeholders to understand what worked, what could be improved, and how this process can inform the following stages of the project. From that meeting, the following considerations were agreed on as instructions for the new *Toolbox* implementation process:

- inclusion of additional stakeholders. While this process was cohesive and considered the main contributors to be part of the project, in hindsight, it would have been valuable to include some other partners. The reflection on the types

of stakeholders involved arose from the analysis of some of the insights from the *Research* and *Exploration* stages. This *Toolbox* process should have included:

  - an institutional partner as a stakeholder so that the team can expedite some bureaucratic issues;
  - professors of different scientific areas of the UMa as consultants for the project. These professionals should have also been interviewed, as their opinions on the teaching processes and methodologies – towards the students but also the University – would have been a valuable contribution to understanding the full scope of the dissonance between students and the institution;
  - specialists from the Engineer Department in terms of privacy and the integration with the UMa's databases, so assure all the criteria are for security are met;
  - specialists from an Educational background to help the improvement of the educational content, in line with the best approaches for digital learning and interventions, taking into account the particularities of the current UMa population;

- integration with other platforms from the UMa environment;
- development other content structures – i.e., multimedia, sound, micro-games – to promote engagement;
- considering the accessibility aspects of the *Toolbox* and making it available for students with special needs, exchange students and minorities in the UMa student community.

# Chapter 11

# Discussion

The impact of mental health disorders has been rising at an alarming rate worldwide. Studies have recognized that young adults are one of the most vulnerable demographics in terms of mental well-being, especially on the indicators of anxiety and depression when compared with the general population [16], and this is particularly predominant among university students.

Following the recent research studies on mental health apps [34], [21], [35], [36], it was fundamental to retrieve from the literature a series of considerations and best practices that could inform the design and development of an eMHI in a collaborative process. A framework inspired by Participatory Design [37] and RtD [56], [42] practices was defined to map out the integration of the project's various stakeholders.

The framework developed was informed by collaborative design methodologies and adjusted to the unique aspects of the project component of this study, setting up a method to guide the first stages of the process.

From a clinical perspective, this preliminary study highlights how a mobile app can be used as a behaviour-tracking platform for clinical practice, and as complementary anxiety management tool. Informed by the insights from the early exploratory study with the PS-UMa team, it will not work as an online diagnosis tool or online therapy forum, but rather as a non-invasive tool to help the students/clients keep track of their feelings and give appropriate care to manage their stress/anxiety in an integrated way with their diagnosis and course of treatment.

In this project, the team proposed developing a digital platform – an app named *Toolbox* – for mental health self-management alongside psychology counselling services at the UMa. The development of this app in cooperation with the PS-UMa

allowed for the platform to have a strong scientific and experience foundation while at the same time rethinking how the interaction with this type of technology could be appropriately adjusted to students' daily lives. The main goal was to understand how the *Toolbox* could positively impact students' well-being, and give them tools to overcome the challenges faced at the university.

This study aimed at addressing the following research questions:

1. In which capacity digital mental health platforms can be a helpful resource in aiding the management of mental health conditions within courses of treatment?

   The results from the study with the psychologists – from the interviews to the workshop sessions during the project – revealed that there is a lot of information that is lost between consults. Having a mental health platform that allows the clients to add more information about their daily habits, especially in metrics that are defined specifically for them by their therapist/psychologist, would improve the insights from the providers and better inform the course of treatment. On the other hand, the clients of the PS-UMa also expressed the willingness to engage with an app that allows them to learn more about mental health, improve their therapeutic process, and have a closer connection with their psychologist. Both groups of users highlighted the closer proximity to each other as a major positive element for including technology in therapeutic practices.

2. How does a RtD methodology supports the development of a technology-based approach to assist mental health clinical interventions in the context of University care?

   The collaborative aspect of the entire process of the *Toolbox* app was the only non-negotiable component when starting the project. This was the baseline defined with all the stakeholders when defining a strategy for working together. This stems from the understanding that only by working collaboratively can a project become an inclusive space for creation – when a team considers a multitude of perspectives on a subject, it gives the resulting product a chance to address various attitudes toward a problem effectively.

## 11.1 Limitations, Lessons Learned and Future Work

This project presented a design journey that explores the importance of including healthcare providers in the design process of technological solutions for mental well-being management in a combined in-person therapy approach that puts the user at the center of the design process. In doing so, it was discussed how a design process is adaptable to stakeholders' perspectives from different scientific backgrounds, especially regarding products that work around highly sensitive subjects.

In terms of the application, the next steps for the *Toolbox* must further explore the creation of a privacy protocol that includes the discussed concerns from the clinicians regarding their practice with the engineering team and the University to reflect on which technical challenges need to be solved. Part of this work will revolve around researching the levels of consent, access and privacy given by the user and the psychologists and research which data needs to be accessible so the app can become sustainable in providing the users with relevant interactions and data.

From a design perspective, the next steps on the project should focus on the creation of a stronger editorial project that considers the entire structure of the app and the accessibility of the content. This editorial project will be developed mainly with the PS-UMa psychologists – due to the scientific basis of the content –, the design team, and additional stakeholders (i.e., professionals with social sciences or education backgrounds) to inform on the best ways to device a narrative adjusted to the students and clients' needs collected during the usability tests. In terms of accessibility, the future *Toolbox* iteration should include the possibility of other languages that cater to the major minorities at UMa – namely English, as an international language for foreign students, and Spanish, for the Latin American community.

In terms of the work with the current stakeholders, the next step in the project will be the development of a larger-scale assessment in the community with the Toolkit (introduced in *Exploration*), of which the *Toolbox* app is a part, at the beginning of a school year. Realistically, this is a project that will not be ready to launch in the 2022-23 school year, but with the insights gathered from the last debrief with the stakeholders, there is a real possibility of developing these materials in conjunction with the study council and the University.

This work becomes itself a meta-reflection not only of the exploration process of the *Toolbox* project but especially on the participatory aspects of its development –

on which approaches were successful and which aspects need to be improved in future instances. Yet, it does not discuss in depth the challenges from the technical aspect of the app and its applicability in the future for the community. The analysis of these technical aspects is part of the future work to be developed with stakeholders from engineering backgrounds.

In terms of successful approaches, the methodology stages allowed for incremental changes to be added when addressing the stakeholders while also inviting new ones for their valuable information. In fact, it was found that the process allowed everyone involved to follow the project very closely and increased overall stakeholder engagement through more frequent contact points and immediate availability when requested. Being given the opportunity to follow the different prototype iterations and usability testing enabled them to provide constant feedback, and gather their support to improve these even more. Furthermore, being able to invite both direct and indirect users facilitated a richer understanding of the context and the user needs.

For the case of the clients, who were already familiar with the therapy process, it contributed to being even more engaged and reinforced the need for self-monitoring and having faster and direct access to psychologists. For the case of the other students, it helped in increasing their self-knowledge, essential to essential to learn how and when to seek specialized help and which resources are available when needed.

Overall, the team noticed that the level of engagement and enjoyment for the product was directly connected with the prototype's higher fidelity and concrete design, significantly increasing the usability tests' success. This realization was also corroborated by the stakeholders, suggesting the team to quickly move to a more polished version of the product, to make the users more comfortable in testing the prototype.

While approaching the final iterations, it was clear that including decision makers in what concerns the services' management would have allowed us to define the technical aspects, logistics and bureaucracy that must be solved for the application the be readily available to the overall academic community.

## 11.2 Conclusion

This study explored a preliminary approach to how technology can tangibly improve patients' well-being in mental health management, and the potential impact on the psychologists' course of treatment through developing a digital solution alongside

universities' counselling services. The process described in this document intends to show how, by bringing together mental health professionals, design, and engineering experts under a cross-disciplinary approach, it is possible to develop an eMHI platform that addresses students' mental health in a specific context.

For this multidisciplinary approach, a demographic study on different stakeholders from Madeira's academic environment – from students to psychologists and student representatives – was conducted to gather appropriate insights into the community's current needs. Based on these insights and using an iterative process of validation with stakeholders about the different areas of the project – from content, privacy and security concerns to interaction insights – the *Toolbox* app was designed, tested and iterated until a final design was agreed on.

The first and second usability tests involved groups of students and clients from the PS-UMa. These revealed that the clients were more interested in using an app for self-monitoring daily when compared with the students. However, both groups remarked on the importance of such tools to assist the student community. Some improvements were made based on the feedback from both usability rounds. A final version of the design prototype was tested on twelve clients from the PS-UMa service and reviewed in a workshop session with the psychologists to gather their opinions on the final product and the entire development process.

For the *Toolbox* project, it became clear that the goal was to combine a co-design mindset with a RtD methodological approach to better structure the process and prevent it from becoming stagnant. The dissection of the design process into stages that are not product but concept-oriented allowed for an unforeseen evolution of the project past the team's initial assumptions – with documentation and reflection components. The inclusion of stakeholders in a cooperative way reaffirmed the adjustment of the problem space in an informed manner – i.e., the inclusion of the study methods and the opening of the *Toolbox* for the at-large student community.

From a project point of view, a methodology like RtD justified the rapid testing, iteration, and validation of some insights that emerged from the *Research* and *Exploration* phase. The early stages of user testing and consequent iterations were insightful regarding what the user expects and dislikes from a design and interaction perspective. All these observations – on the concept, the design of the product and the interaction with the user – are instructive not only for the next steps in the project's development but for similar approaches to integrating technology in mental health

initiatives for the university context.

The results from this study demonstrate the potential to improve mental health interventions by integrating an eMHI, designed in combination with in-person therapeutic processes for the university environment, helping providers of mental health counselling services.

By integrating a mental health platform – like the *Toolbox* app – into the PS-UMa practice, the psychologists in the team emphasized how it positively impacts the clients' course of treatment, particularly with the integration of users' behaviour-tracking information. From the point of view of the students and clients, both groups expressed the willingness to engage with the *Toolbox* app daily to learn more about mental health self-management, improve their therapeutic process, and have a closer connection with their psychologist.

The methodology defined for the development of the *Toolbox* app exemplifies an adaptable process that takes into account all the stakeholders' expertise under a multidisciplinary approach to develop a digital mental health app that addresses students' mental health. For this, the reflections of this study expand on the entire creation process, from the early stages of the problem space definition and demographic research to the design, usability testing and final documentation of the process for future iterations. By delineating every stage, and through a collaborative meta-analysis with the stakeholders, this study describes the process and aspects affected by the involvement of a multidisciplinary team.

# Bibliography

[1] UNICEF, "The Changing Childhood Project: A multigene rational, international survey on 21st century childhood," UNICEF, New York, Tech. Rep., 11 2021.

[2] S. Teixeira, C. Ferré-Grau, T. L. Canut, R. Pires, J. C. Carvalho, I. Ribeiro, C. Sequeira, T. Rodrigues, F. Sampaio, T. Costa, and C. A. Sequeira, "Positive Mental Health in University Students and Its Relations with Psychological Vulnerability, Mental Health Literacy, and Sociodemographic Characteristics: A Descriptive Correlational Study," *International Journal of Environmental Research and Public Health*, vol. 19, no. 6, 3 2022.

[3] E. Iob, P. Frank, A. Steptoe, and D. Fancourt, "Levels of Severity of Depressive Symptoms Among At-Risk Groups in the UK During the COVID-19 Pandemic," *JAMA network open*, vol. 3, no. 10, p. e2026064, 10 2020.

[4] V. Conceição, I. Rothes, and R. Gusmão, "The Association Between Changes in the University Educational Setting and Peer Relationships: Effects in Students' Depressive Symptoms During the COVID-19 Pandemic," *Frontiers in Psychiatry*, vol. 12, 12 2021.

[5] E. Charbonnier, S. Le Vigouroux, and A. Goncalves, "Psychological vulnerability of french university students during the covid-19 pandemic: A four-wave longitudinal survey," *International Journal of Environmental Research and Public Health*, vol. 18, no. 18, 9 2021.

[6] R. P. Auerbach, P. Mortier, R. Bruffaerts, J. Alonso, C. Benjet, P. Cuijpers, K. Demyttenaere, D. D. Ebert, J. G. Green, P. Hasking, E. Murray, M. K. Nock, S. Pinder-Amaker, N. A. Sampson, D. J. Stein, G. Vilagut, A. M. Zaslavsky, and R. C. Kessler, "WHO world mental health surveys international college student

project: Prevalence and distribution of mental disorders," *Journal of Abnormal Psychology*, vol. 127, no. 7, pp. 623–638, 10 2018.

[7] D. Ochnik, A. M. Rogowska, C. Kuśnierz, M. Jakubiak, A. Schütz, M. J. Held, A. Arzenšek, J. Benatov, R. Berger, E. V. Korchagina, I. Pavlova, I. Blažková, I. Aslan, O. Çınar, and Y. A. Cuero-Acosta, "Mental health prevalence and predictors among university students in nine countries during the COVID-19 pandemic: a cross-national study," *Scientific Reports*, vol. 11, no. 1, 12 2021.

[8] J. G. Henriques, "Alunos sob pressão: "No Técnico há uma glorificação do sofrimento"," Lisbon, pp. 24–27, 5 2022. [Online]. Available: https://www.publico.pt/2022/05/13/sociedade/reportagem/alunos-pressao-tecnico-ha-glorificacao-sofrimento-2006148

[9] World Health Organization, "Mental health: strengthening our response," 3 2018. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response

[10] J. Barbosa, C. Cardoso, R. D. Alves, and M. d. C. c. Machado, "A Saúde dos Portugueses: Um BI em Nome Próprio," Médis – Companhia de Seguros de Saúde, S.A., Tech. Rep., 4 2021.

[11] T. Vos, S. S. Lim, M. Naghavi, C. J. L. Murray, and et al., "Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019," *The Lancet*, vol. 396, no. 10258, pp. 1204–1222, 10 2020. [Online]. Available: https://linkinghub.elsevier.com/retrieve/pii/S0140673620309259

[12] D. F. Santomauro, A. M. Mantilla Herrera, J. Shadid, P. Zheng, C. Ashbaugh, D. M. Pigott, S. I. Hay, T. Vos, C. J. L. Murray, H. A. Whiteford, A. J. Ferrari, and et al., "Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic," *The Lancet*, vol. 398, no. 10312, pp. 1700–1712, 11 2021.

[13] Eurofound, "Living, working and COVID-19 (Update April 2021): Mental health and trust decline across EU as pandemic enters another year," Tech. Rep., 2021. [Online]. Available: https://www.eurofound.europa.eu/topic/covid-19

[14] United Nations Children's Fund, "The State of the World's Children 2021 On My Mind: Promoting, protecting and caring for children's mental health — Regional Brief: Europe," Tech. Rep., 2021. [Online]. Available: https://www.unicef.org/media/108121/file/SOWC-2021-Europe-regional-brief.pdf

[15] A. Mehta, A. N. Niles, J. H. Vargas, T. Marafon, D. D. Couto, and J. J. Gross, "Acceptability and effectiveness of artificial intelligence therapy for anxiety and depression (Youper): Longitudinal observational study," *Journal of Medical Internet Research*, vol. 23, no. 6, 6 2021.

[16] T. Almeida, M. J. Caldas de Heitor, O. Santos, A. Costa, A. Virgolino, C. Rasga, H. Martiniano, and A. Vicente, "Saúde mental em tempos de pandemia – SM-COVID-19: relatório final," Instituto Nacional de Saúde Doutor Ricardo Jorge, Instituto de Saúde Ambiental da Faculdade de Medicina da Universidade de Lisboa, Sociedade Portuguesa de Psiquiatria e Saúde Mental, Lisboa, Tech. Rep., 10 2020. [Online]. Available: http://repositorio.insa.pt/handle/10400.18/7245

[17] L. Birrell, A. Furneaux-Bate, C. Chapman, and N. C. Newton, "A mobile peer intervention for preventing mental health and substance use problems in adolescents: Protocol for a randomized controlled trial (the mind your mate study)," *JMIR Research Protocols*, vol. 10, no. 7, 7 2021.

[18] H. Espírito Santo, J. Caballero, M. Constantin, S. Köpke, and U. Binggeli, "A recuperaçao do turismo começou, mas levará anos até Portugal recuperar totalmente. O que poderao fazer os principais intervenientes no setor?" McKinsey & Company, Tech. Rep., 6 2021.

[19] Instituto Nacional de Estatística, "Rendimento e Condições de Vida 2020 (Dados provisórios)," Instituto Nacional de Estatística, Lisboa, Tech. Rep., 2 2021. [Online]. Available: https://www.ine.pt/ngt_server/attachfileu.jsp?look_parentBoui=482413323&att_display=n&att_download=y

[20] T. Elmer, K. Mepham, and C. Stadtfeld, "Students under lockdown: Comparisons of students' social networks and mental health before and during the COVID-19 crisis in Switzerland," *PLoS ONE*, vol. 15, no. 7 July, 7 2020.

[21] C. C. Armstrong, E. J. Odukoya, K. Sundaramurthy, and S. M. Darrow, "Youth and provider perspectives on behavior-tracking mobile apps: Qualitative analysis," *JMIR Mental Health*, vol. 8, no. 4, 4 2021.

[22] World Health Organization, "Tuberculosis: Global task force on digital health," 6 2015. [Online]. Available: https://www.who.int/news-room/questions-and-answers/item/tuberculosis-global-task-force-on-digital-health

[23] J. Gunn, J. Cameron, K. Densley, S. Davidson, S. Fletcher, V. Palmer, P. Chondros, C. Dowrick, and J. Pirkis, "Uptake of mental health websites in primary care: Insights from an Australian longitudinal cohort study of depression," *Patient Education and Counseling*, vol. 101, no. 1, pp. 105–112, 1 2018.

[24] G. Marques, N. Drissi, I. d. l. T. Díez, B. S. de Abajo, and S. Ouhbi, "Impact of COVID-19 on the psychological health of university students in Spain and their attitudes toward Mobile mental health solutions," *International Journal of Medical Informatics*, vol. 147, p. 104369, 3 2021.

[25] T. Lecomte, S. Potvin, M. Corbière, S. Guay, C. Samson, B. Cloutier, A. Francoeur, A. Pennou, and Y. Khazaal, "Mobile apps for mental health issues: Meta-review of meta-analyses," 5 2020.

[26] K. K. Weisel, L. M. Fuhrmann, M. Berking, H. Baumeister, P. Cuijpers, and D. D. Ebert, "Standalone smartphone apps for mental health—a systematic review and meta-analysis," *npj Digital Medicine*, vol. 2, no. 1, p. 118, 12 2019.

[27] E. A. Phillips, S. F. Himmler, and J. Schreyögg, "Preferences for e-Mental Health Interventions in Germany: A Discrete Choice Experiment," *Value in Health*, vol. 24, no. 3, pp. 421–430, 3 2021. [Online]. Available: https://linkinghub.elsevier.com/retrieve/pii/S109830152034465X

[28] E. G. Lattie, S. K. Lipson, and D. Eisenberg, "Technology and College Student Mental Health: Challenges and Opportunities," *Frontiers in Psychiatry*, vol. 10, 4 2019. [Online]. Available: https://www.frontiersin.org/articles/10.3389/fpsyt.2019.00246/full

[29] I. Sukmawati, Z. Ardi, I. Ifdil, and Z. Zikra, "Development and Validation of Acceptability of Mental-Health Mobile App Survey (AMMS) for Android-based

Online Counseling Service Assessment," in *Journal of Physics: Conference Series*, vol. 1339, no. 1. Institute of Physics Publishing, 12 2019.

[30] A. Balaskas, S. M. Schueller, A. L. Cox, and G. Doherty, "The functionality of mobile apps for anxiety: Systematic search and analysis of engagement and tailoring features," *JMIR mHealth and uHealth*, vol. 9, no. 10, 10 2021.

[31] P. Chandrashekar, "Do mental health mobile apps work: evidence and recommendations for designing high-efficacy mental health mobile apps," *mHealth*, vol. 4, pp. 6–6, 3 2018.

[32] E. G. Lattie, R. Kornfield, K. E. Ringland, R. Zhang, N. Winquist, and M. Reddy, "Designing Mental Health Technologies that Support the Social Ecosystem of College Students," in *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*. New York, NY, USA: ACM, 4 2020, pp. 1–15.

[33] M. Olff, "Mobile mental health: a challenging research agenda," *European Journal of Psychotraumatology*, vol. 6, no. 1, p. 27882, 12 2015.

[34] S. Garrido, C. Millington, D. Cheers, K. Boydell, E. Schubert, T. Meade, and Q. V. Nguyen, "What Works and What Doesn't Work? A Systematic Review of Digital Mental Health Interventions for Depression and Anxiety in Young People," *Frontiers in Psychiatry*, vol. 10, 11 2019.

[35] E. Aboujaoude and L. Gega, "From Digital Mental Health Interventions to Digital "Addiction": Where the Two Fields Converge," *Frontiers in Psychiatry*, vol. 10, 1 2020.

[36] J. A. Kientz, E. K. Choe, B. Birch, R. Maharaj, A. Fonville, C. Glasson, and J. Mundt, "Heuristic evaluation of persuasive health technologies," in *Proceedings of the ACM international conference on Health informatics - IHI '10*. New York, New York, USA: ACM Press, 2010, p. 555.

[37] J. Costa, J. C. Diehl, and D. Snelders, "A framework for a systems design approach to complex societal problems," *Design Science*, vol. 5, 2019.

[38] A. Wallisch and K. Paetzold, "Methodological foundations of user involvement research: a contribution to user-centred design theory," in *Proceedings of the*

*Design Society: DESIGN Conference*, vol. 1. Cambridge University Press, 2020, pp. 71–80.

[39] F. E. Ritter, G. D. Baxter, and E. F. Churchill, "Foundations for Designing User-Centered Systems What System Designers Need to Know about People," Tech. Rep.

[40] F. Koppenhagen, T. Blümel, T. Held, W. Christoph, and P. D. Kollmer, "The challenging combination of agility and convergence in hybrid product development processes: An empirical analysis of Stanford´s ME310 process model," in *Proceedings of the Design Society*, vol. 1. Cambridge University Press, 2021, pp. 2991–3000.

[41] C. Naranjo-Bock, "Creativity-based Research: The Process of Co-Designing with Users," 4 2012. [Online]. Available: https://uxmag.com/articles/creativity-based-research-the-process-of-co-designing-with-users

[42] J. Zimmerman and J. Forlizzi, "Research through design in HCI," in *Ways of Knowing in HCI*. Springer New York, 1 2014, pp. 167–189.

[43] R. Pires, "Madeira: escolas possuem rácio de um psicólogo para 700 alunos," 9 2018. [Online]. Available: https://jornaleconomico.pt/noticias/madeira-escolas-possuem-racio-de-um-psicologo-para-700-alunos-359902

[44] Gabinete de Estudos OPP, "Parecer sobre o Rácio de Psicólogos," Ordem os Psicólogos Portugueses, Lisboa, Tech. Rep., 4 2017.

[45] Serviço de Psicologia da Universidade da Madeira, "Toolbox Estudante Universitário," 4 2018. [Online]. Available: https://www5.uma.pt/sp-toolbox/

[46] W. J. C. Santos, "WebProject – Toolbox Estudante Universitário," Funchal, 4 2018. [Online]. Available: http://hdl.handle.net/10400.13/2116

[47] J. Nielsen, "How to Conduct a Heuristic Evaluation," 11 1994. [Online]. Available: https://www.nngroup.com/articles/how-to-conduct-a-heuristic-evaluation/

[48] R. M. Vasconcelos, L. d. S. Almeida, and S. C. Monteiro, "Métodos de estudo em alunos do 1º ano da universidade," *Psicologia Escolar e Educacional*, vol. 9, no. 2, 12 2005.

[49] V. m. Cardoso, H. Brioso, H. Martins, H. Neto, and N. Vinha, "Insucesso Escolar: a Perspectiva dos Estudantes," in *Actas do Seminário "Sucesso e Insucesso no Ensino Superior Português"*, org. Conselho Nacional de Educação, Ed. Conselho Nacional de Educação – Ministério da Educação, 6 2002, pp. 37–90.

[50] K. T. Koshy, "How to study effectively." *Nursing mirror*, vol. 145, no. 26, p. 19, 12 1977.

[51] M. J. m. Miranda, "Factores de Sucesso/Insucesso," in *Actas do Seminário "Sucesso e Insucesso no Ensino Superior Português"*, org. Conselho Nacional de Educação, Ed., 2002, pp. 91–158.

[52] H. M. Iqbal, S. Sohail, and S. Shahzad, "Learning and study strategies used by university students in Pakistan," in *Procedia - Social and Behavioral Sciences*, vol. 2, no. 2, 2010, pp. 4717–4721.

[53] V. Braun and V. Clarke, "Using thematic analysis in psychology," *Qualitative Research in Psychology*, vol. 3, no. 2, pp. 77–101, 2006.

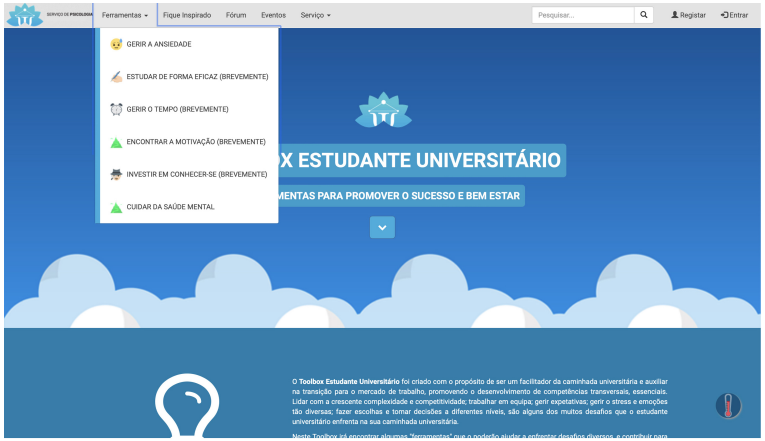
[54] Observatório da Vida Estudantil, "Resultado do Inquérito sobre as dificuldades dos estudantes da UMa – 2020–2021," Académica da Madeira, Funchal, Tech. Rep., 2022.

[55] J. Brooke, "SUS: A quick and dirty usability scale," 11 1995. [Online]. Available: https://www.researchgate.net/publication/228593520

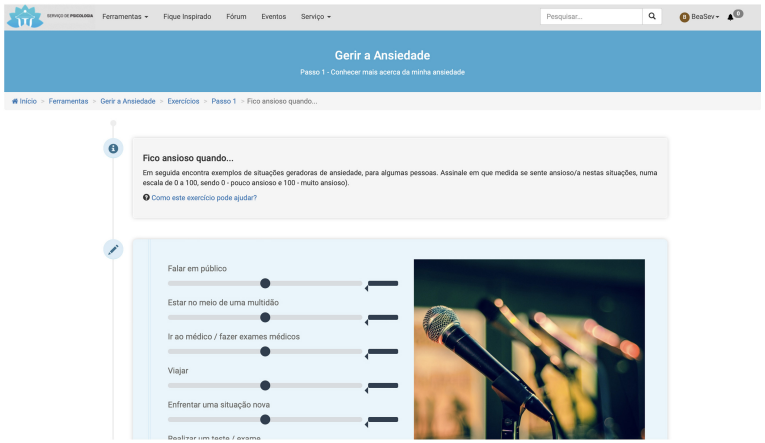
[56] J. Zimmerman, J. Forlizzi, and S. Evenson, "Research through design as a method for interaction design research in HCI," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. New York, NY, USA: ACM, 4 2007, pp. 493–502.

# Appendix

# Reference of *Toolbox*, 2018 website

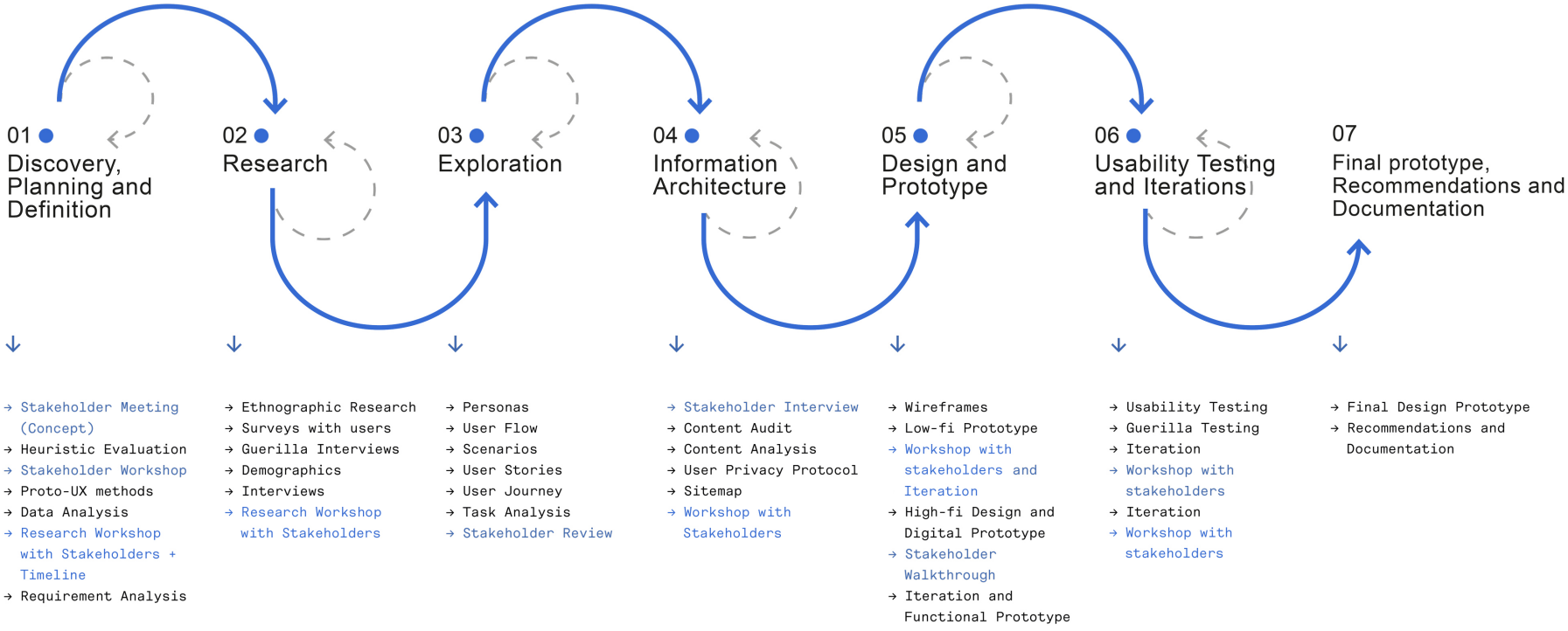




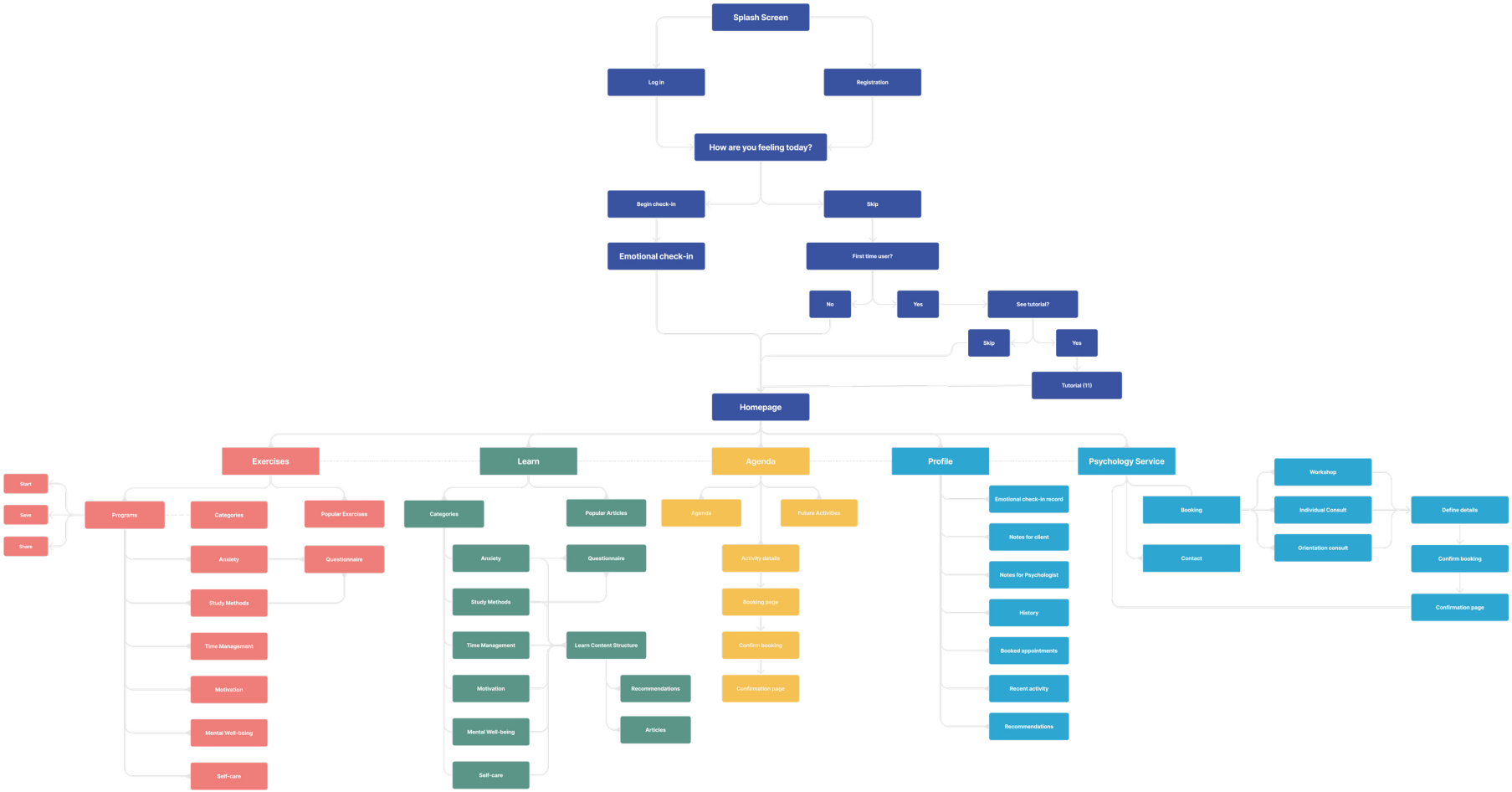
# Appendix B

## *Toolbox* methodology — detail



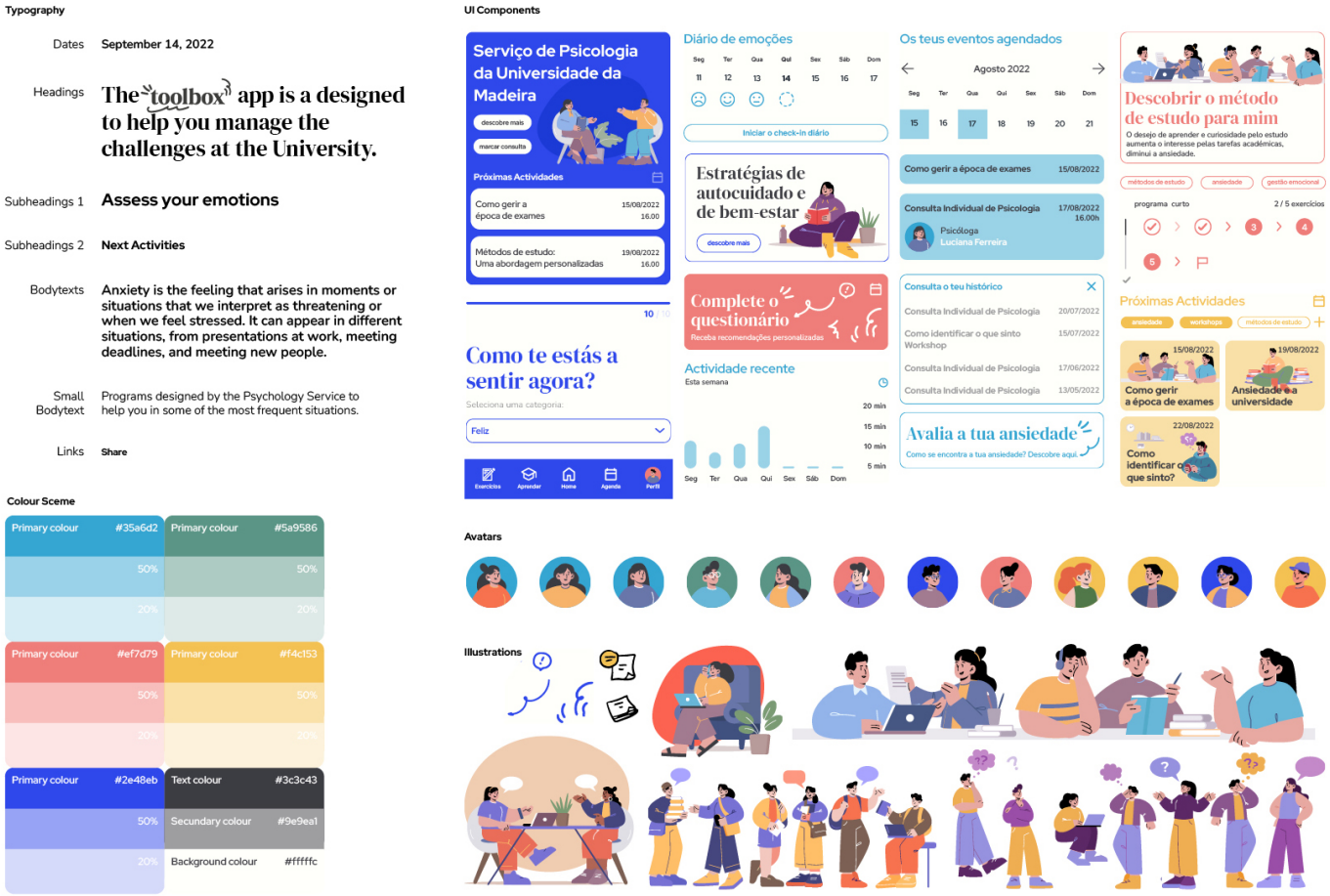
# Appendix C

# Information Architecture Map



# Appendix D

## *Toolbox* graphic elements



# Appendix E

# Usability Testing — Psychologists' Pre-test Script

## E.1 Introduction

Thank you very much for agreeing to participate in this usability test. The prototype evaluation we will carry out is part of a dissertation for the Master's in Interactive Media Design in collaboration with the Psychology Service of the University of Madeira. In this investigation, we are looking at how technology can be used to help students manage their day-to-day emotional life.

Participation in this study will help us better understand the university's academic context and develop services that support the study and practices of psychological well-being.

Your participation is voluntary, anonymous and confidential and the results will be used exclusively for scientific purposes.

We want to clarify that we are testing the application, not the user. There are no right or wrong answers, you can skip or skip tasks at any time. We want to understand what works, but more importantly, what doesn't.

The test consists of 3 tasks and a final feedback questionnaire.

Finally, we just want to confirm that you are comfortable with recording the prototype in action. Audio or video of the test will not be recorded, only the screen. No personal information will be collected during the entire test. Can we proceed?

## E.2 Tasks

Now I will read a contextualization scenario for the use of this application and the tasks to be performed, which are also in this document:

*[refer to briefing]*

This test will not be guided and I will not be able to answer questions related to the tasks to be performed.

From now on, I won't intervene anymore and you can start exploring the prototype at will.

This prototype is still under study so not all sections are functional, but you can explore at will. When you want to get started, return to the Homepage.

*[Give the user the sheets with the tasks and the post-test questionnaire]*

## E.3 Post-test Questionnaire

Now that we've completed testing, I'd like to ask you to answer a few questions regarding your experience with the prototype.

Thank you so much for your time and availability. Your help will be essential for this study.

# Appendix F

# Usability Testing — Briefing

## F.1 Low-Fidelity Prototype Briefing

### F.1.1 Students

Scenario:

*Imagine there was a mobile app developed by UMa, which seeks to teach strategies for emotional management and study methods.*

*The purpose of this application was to provide users with additional tools in the areas that made the most sense to them — study methods, anxiety and stress management, personal development, and motivation, among others.*

Tasks:

1. Choose an exercise program regarding Study methods and save it for later;
2. Make a daily record of your emotions;
3. How would you make an appointment if you felt that you needed additional study support from the Psychology Service.
4. UMa also has a schedule of student support events. Sign up for an anxiety management workshop during exam season.
5. Fill out the questionnaire that helps you to understand if you have anxiety.

### F.1.2 Clients

Scenario:

*Imagine that there was a mobile application developed by the Service, to complement the exercises/tasks we do here. The purpose of this application was to provide users with additional tools in the areas that made the most sense to them — study methods, anxiety and stress management, personal development, and motivation, among others.*

Tasks:

1. Choose an exercise program and save it for later;
2. Make a daily record of your emotions;
3. Book an Individual Psychology Consultation;

## F.2 High-Fidelity Prototype Briefing

### F.2.1 Students

Scenario:

*Imagine there was a mobile app developed by UMa, which seeks to teach strategies for emotional management and study methods.*

*The purpose of this application was to provide users with additional tools in the areas that made the most sense to them — study methods, anxiety and stress management, personal development, and motivation, among others.*

### F.2.2 Clients

Scenario:

*Imagine that there was a mobile application developed by the Service, to complement the exercises/tasks we do here. The purpose of this application was to provide users with additional tools in the areas that made the most sense to them — study methods, anxiety and stress management, personal development, and motivation, among others.*

Tasks:

1. Choose an anxiety exercise program and save it for later;
2. Make a daily record of your emotions;
3. Book an Individual Psychology Consultation;
4. UMa also has a schedule of student support events. Sign up for an anxiety management workshop during exam season.

## F.3 Design Prototype Briefing

### F.3.1 Clients

Scenario:

*Imagine that there was a mobile application developed by the Service, to complement the exercises/tasks we do here. The purpose of this application was to provide users with additional tools in the areas that made the most sense to them — study methods, anxiety and stress management, personal development, and motivation, among others.*

Tasks:

1. Choose an anxiety exercise program and save it for later;
2. Make a daily record of your emotions;
3. Book an Individual Psychology Consultation;
4. UMa also has a schedule of student support events. Sign up for an anxiety management workshop during exam season

# Appendix G

# Usability Testing — Post-test Questionnaire

## G.1 Post-Test Questionnaire

Thank you so much for testing this prototype. Your opinion will be very important for the continuation of this study. Finally, we would like your opinion about the prototype we are testing.

- Which of the proposed tasks did you find it most difficult to complete?

- In case you experienced any difficulties in the tasks, can you tell us why?

- Regarding the prototype under test, and on a scale where 1 means "Strongly Disagree" and 5 "Strongly Agree", consider that:

| | Strongly Disagree 1 | 2 | 3 | 4 | Strongly Agree 5 |
|---|---|---|---|---|---|
| 1. I think that I would like to use this system frequently. | | | | | |
| 2. I found the system unnecessarily complex. | | | | | |
| 3. I thought the system was easy to use. | | | | | |
| 4. I think that I would need the support of a technical person to be able to use this system. | | | | | |
| 5. I found the various functions in this system were well integrated. | | | | | |
| 6. I thought there was too much inconsistency in this system. | | | | | |
| 7. I would imagine that most people would learn to use this system very quickly. | | | | | |
| 8. I found the system very cumbersome to use. | | | | | |
| 9. I felt very confident using the system. | | | | | |
| 10. I needed to learn a lot of things before I could get going with this system. | | | | | |

- If a platform like the one presented in this test were made public, to be used by students at the University of Madeira and integrated with the Psychology Service, would you be curious/interested in using it in your daily life?

  Yes // No

- If not, can you tell us why?

Some of the features of the application under study encourage the user to make a daily analysis of their emotions, so that this data can inform not only the user of their state of mind over time, but also help the therapy process with the psychologist of the Service. These features would be optional, private and confidential.

- If you were a user of this application, do you think these features would be useful for the user and in consultation?

- As a user, would you be interested in using these features?

  Yes // No

- If so, what frequency do you consider most comfortable to ensure that you continue to engage with the app?

  Daily // Every other day // 3x a week // Other

- If you have any suggestions or feedback about the prototype under study — what aspects do you think could be improved, what other features you think should be included, etc — we would love to hear from you. Thank you very much.

# Appendix H

# Usability Testing, Low-Fidelity — Students' SUS

| | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **user 1** | 3 | 2 | 2 | 1 | 3 | 2 | 3 | 1 | 2 | 1 |
| **user 2** | 4 | 3 | 3 | 1 | 4 | 4 | 4 | 3 | 2 | 1 |
| **user 3** | 4 | 2 | 4 | 2 | 2 | 2 | 3 | 1 | 4 | 1 |
| **user 4** | 3 | 4 | 2 | 3 | 3 | 5 | 4 | 4 | 3 | 2 |
| **user 5** | 3 | 4 | 2 | 4 | 4 | 4 | 3 | 4 | 3 | 3 |
| **user 6** | 4 | 2 | 4 | 1 | 4 | 2 | 3 | 2 | 3 | 1 |
| **user 7** | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 2 |
| **user 8** | 5 | 1 | 4 | 3 | 4 | 4 | 4 | 2 | 3 | 3 |
| **user 9** | 5 | 1 | 4 | 1 | 4 | 2 | 4 | 2 | 4 | 1 |
| **user 10** | 5 | 2 | 2 | 1 | 4 | 2 | 4 | 2 | 4 | 1 |

**System Usability Score questions:**

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

**System Usability Score scale:**

| **Strongly Disagree** | | | | **Strongly Agree** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

**System Usability Score score: 63,5 %**

# Appendix I

# Usability Testing, Low-Fidelity — Clients' SUS

| | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **user 1** | 5 | 4 | 4 | 2 | 5 | 2 | 4 | 2 | 3 | 2 |
| **user 2** | 4 | 2 | 4 | 1 | 4 | 1 | 5 | 1 | 5 | 1 |
| **user 3** | 4 | 3 | 2 | 3 | 3 | 2 | 4 | 2 | 2 | 3 |
| **user 4** | 5 | 1 | 4 | 1 | 4 | 2 | 4 | 2 | 4 | 1 |
| **user 5** | 5 | 3 | 3 | 2 | 4 | 3 | 4 | 2 | 4 | 2 |
| **user 6** | 5 | 1 | 3 | 2 | 4 | 4 | 4 | 2 | 3 | 3 |
| **user 7** | 5 | 4 | 5 | 1 | 4 | 1 | 5 | 1 | 5 | 1 |
| **user 8** | 5 | 2 | 2 | 1 | 4 | 1 | 3 | 3 | 2 | 1 |
| **user 9** | 4 | 4 | 2 | 3 | 4 | 2 | 1 | 4 | 3 | 2 |
| **user 10** | 4 | 1 | 4 | 4 | 4 | 1 | 4 | 2 | 4 | 1 |

**System Usability Score questions:**

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

**System Usability Score scale:**

| **Strongly Disagree** | | | | **Strongly Agree** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

**System Usability Score score: 72,5 %**

# Appendix J

# Usability Testing, High-Fidelity — Students' SUS

| | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **user 1** | 4 | 2 | 3 | 1 | 3 | 2 | 3 | 1 | 2 | 4 |
| **user 2** | 5 | 2 | 3 | 1 | 2 | 4 | 5 | 4 | 4 | 5 |
| **user 3** | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 5 |
| **user 4** | 3 | 4 | 2 | 3 | 3 | 5 | 4 | 4 | 3 | 3 |
| **user 5** | 3 | 4 | 2 | 4 | 4 | 4 | 3 | 4 | 3 | 3 |
| **user 6** | 5 | 2 | 4 | 1 | 5 | 6 | 5 | 2 | 3 | 5 |
| **user 7** | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 5 |
| **user 8** | 5 | 3 | 3 | 4 | 5 | 1 | 3 | 3 | 2 | 5 |
| **user 9** | 5 | 1 | 5 | 1 | 3 | 1 | 4 | 4 | 5 | 5 |
| **user 10** | 5 | 3 | 3 | 4 | 5 | 1 | 3 | 3 | 2 | 5 |

**System Usability Score questions:**

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

**System Usability Score scale:**

| **Strongly Disagree** | | | | **Strongly Agree** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

**System Usability Score score: 68,5 %**

# Appendix K

# Usability Testing, High-Fidelity — Clients' SUS

| | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **user 1** | 4 | 2 | 4 | 1 | 5 | 2 | 5 | 2 | 4 | 4 |
| **user 2** | 5 | 4 | 3 | 2 | 3 | 1 | 4 | 4 | 5 | 5 |
| **user 3** | 4 | 4 | 4 | 3 | 4 | 2 | 3 | 4 | 3 | 4 |
| **user 4** | 5 | 3 | 3 | 3 | 4 | 4 | 4 | 3 | 4 | 5 |
| **user 5** | 4 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 4 |
| **user 6** | 5 | 1 | 5 | 5 | 5 | 3 | 4 | 1 | 5 | 5 |
| **user 7** | 4 | 2 | 3 | 2 | 3 | 2 | 4 | 2 | 3 | 4 |
| **user 8** | 5 | 2 | 3 | 1 | 4 | 2 | 3 | 2 | 4 | 5 |
| **user 9** | 4 | 4 | 3 | 1 | 3 | 3 | 4 | 2 | 4 | 4 |
| **user 10** | 4 | 2 | 4 | 4 | 4 | 1 | 5 | 3 | 3 | 4 |

**System Usability Score questions:**

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

**System Usability Score scale:**

| **Strongly Disagree** | | | | **Strongly Agree** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

**System Usability Score score: 74,5 %**

# Appendix L

# Usability Testing, Design — Clients' SUS

| | Q1 | Q2 | Q3 | Q4 | Q5 | Q6 | Q7 | Q8 | Q9 | Q10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **user 1** | 5 | 1 | 3 | 1 | 4 | 3 | 5 | 3 | 4 | 1 |
| **user 2** | 5 | 2 | 3 | 1 | 2 | 3 | 2 | 4 | 4 | 4 |
| **user 3** | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 |
| **user 4** | 5 | 1 | 5 | 1 | 5 | 3 | 5 | 1 | 5 | 1 |
| **user 5** | 5 | 2 | 4 | 1 | 5 | 3 | 5 | 2 | 3 | 1 |
| **user 6** | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 |
| **user 7** | 5 | 3 | 3 | 4 | 5 | 1 | 3 | 3 | 2 | 4 |
| **user 8** | 3 | 4 | 2 | 3 | 4 | 2 | 1 | 1 | 2 | 2 |
| **user 9** | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 |
| **user 10** | 4 | 1 | 3 | 1 | 4 | 1 | 4 | 1 | 3 | 1 |
| **user 11** | 5 | 3 | 4 | 2 | 4 | 1 | 4 | 3 | 3 | 1 |
| **user 12** | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 | 5 | 1 |

**System Usability Score questions:**

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

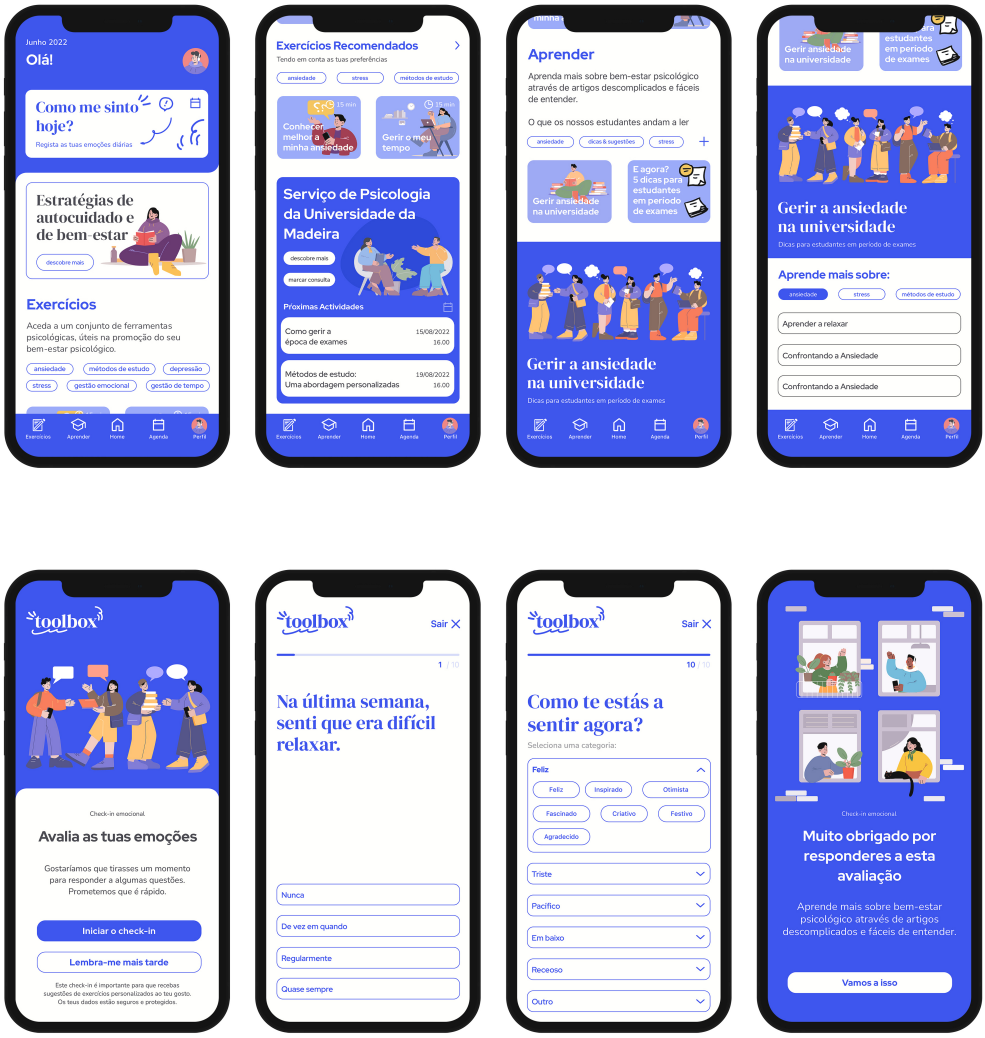
**System Usability Score scale:**

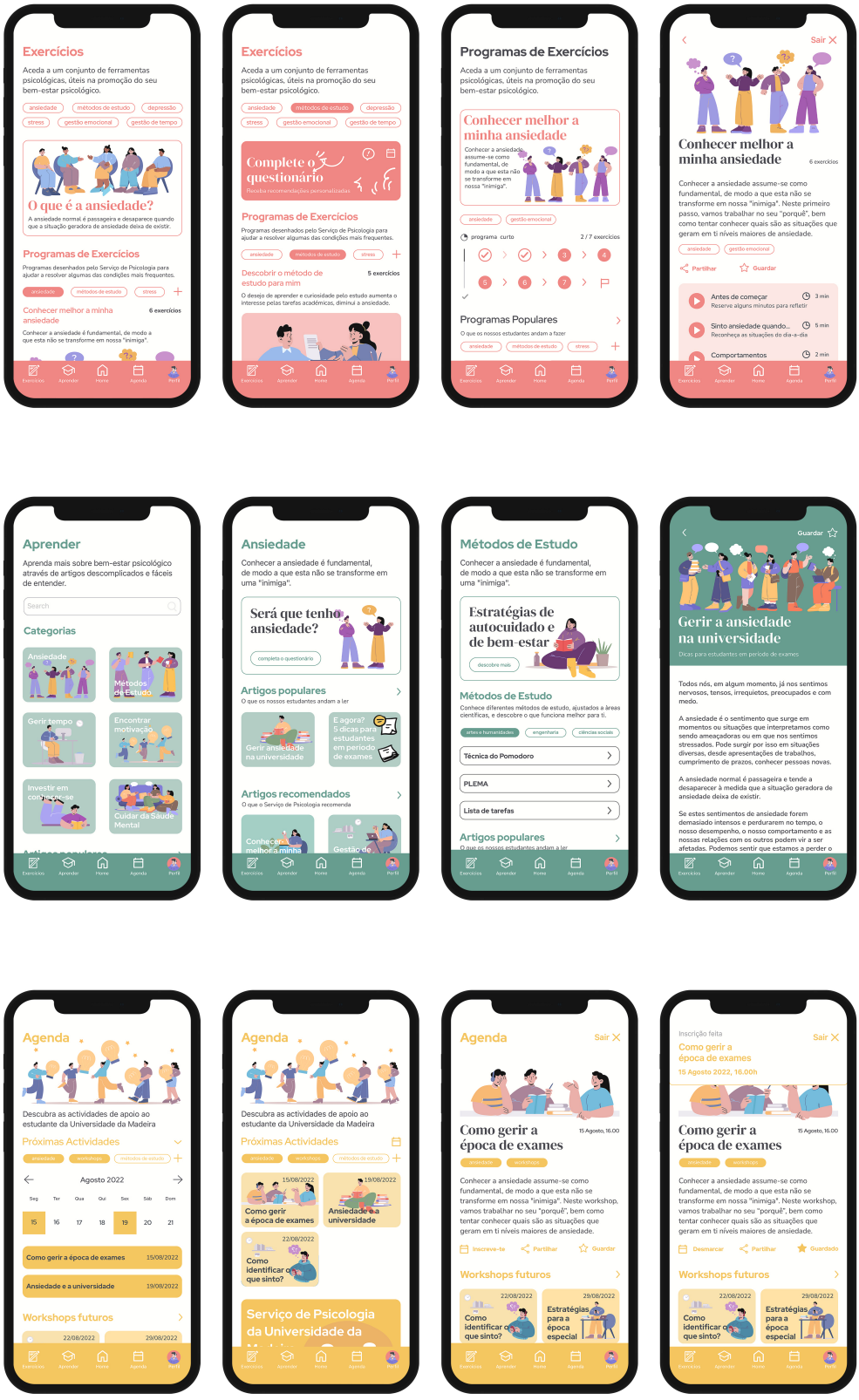
| **Strongly Disagree** | | | | **Strongly Agree** |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

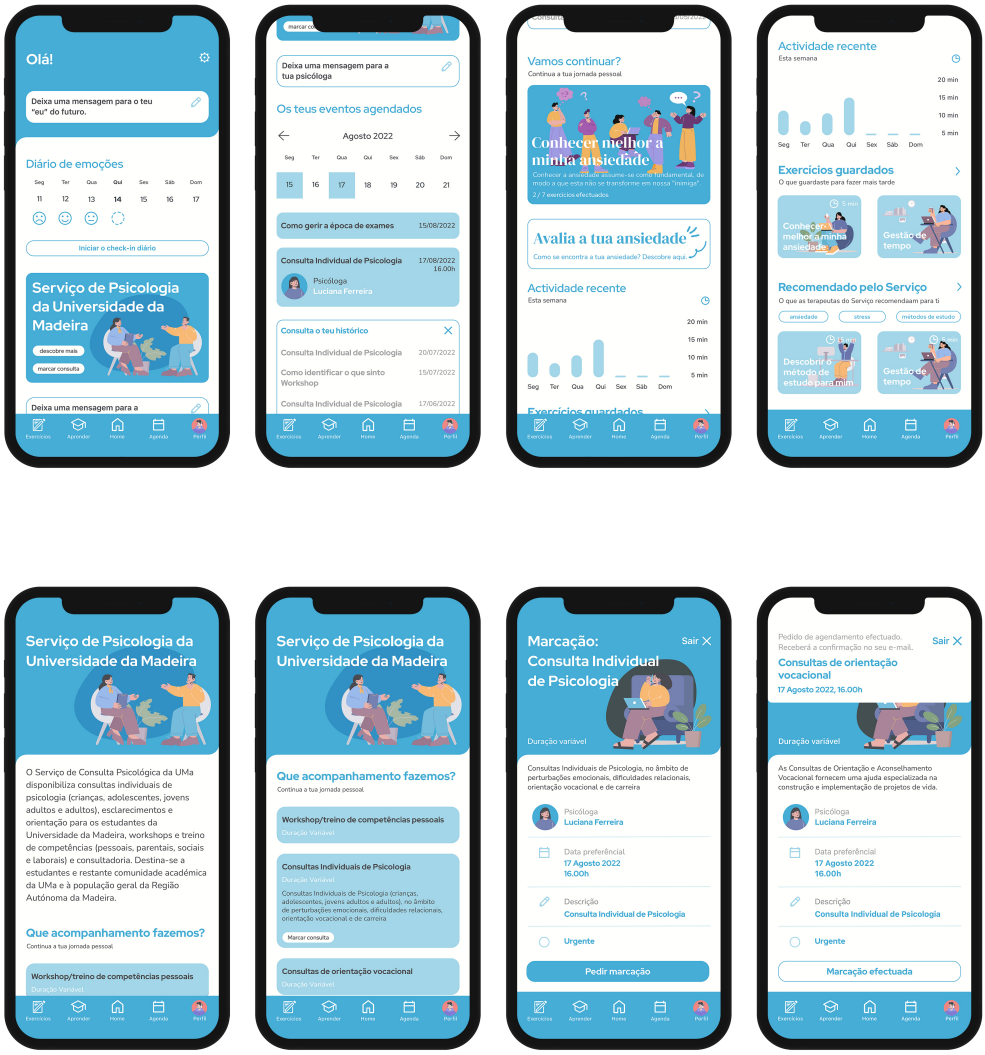
**System Usability Score score: 81,45833333 %**

# Appendix M

# Final Design Prototype



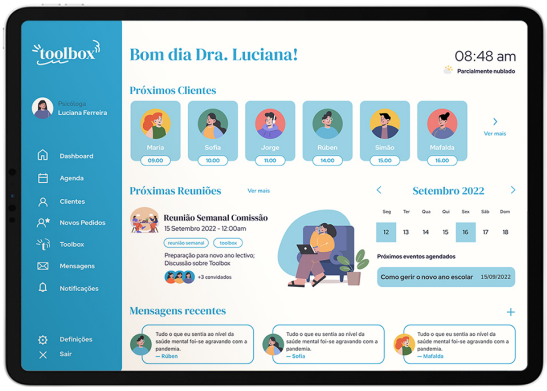

Exercícios
Programas de Exercícios
Programas de Exercícios
Conhecer melhor a minha ansiedade
Programas Populares
Sair
Aprender
Ansiedade
Métodos de Estudo
Artigos populares
Artigos recomendados
Guardar
Agenda
Próximas Actividades
Workshops futuros
Como gerir a época de exames
Ansiedade e a universidade
Como identificar o que sinto?
Estratégias para a época especial

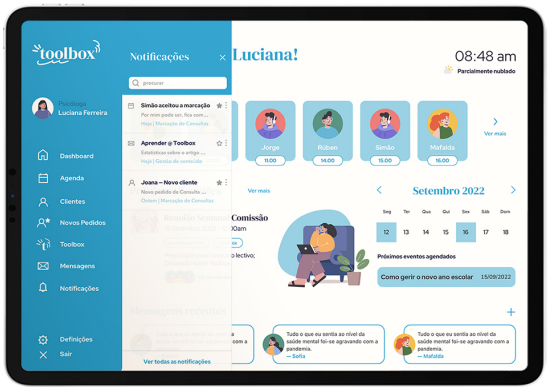

Olá!
Deixa uma mensagem para o teu "eu" do futuro.
Diário de emoções
Iniciar o check-in diário
Serviço de Psicologia da Universidade da Madeira
descobre mais
marcar consulta
Deixa uma mensagem para a tua psicóloga
Os teus eventos agendados
Agosto 2022
Como gerir a época de exames 15/08/2022
Consulta Individual de Psicologia 17/08/2022 16.00h
Psicóloga Luciana Ferreira
Consulta o teu histórico
Consulta Individual de Psicologia 20/07/2022
Como identificar o que sinto Workshop 15/07/2022
Consulta Individual de Psicologia 17/06/2022
Vamos continuar?
Continua a tua jornada pessoal
Conhecer melhor a minha ansiedade
2 / 7 exercícios efectuados
Avalia a tua ansiedade
Como se encontra a tua ansiedade? Descobre aqui.
Actividade recente
Esta semana
Exercícios guardados
Recomendado pelo Serviço
O que as terapeutas do Serviço recomendaam para ti
ansiedade
stress
métodos de estudo
Descobrir o método de estudo para mim
Gestão de tempo
Exercícios
Aprender
Home
Agenda
Perfil


Serviço de Psicologia da Universidade da Madeira
O Serviço de Consulta Psicológica da UMa disponibiliza consultas individuais de psicologia (crianças, adolescentes, jovens adultos e adultos), esclarecimentos e orientação para os estudantes da Universidade da Madeira, workshops e treino de competências (pessoais, parentais, sociais e laborais) e consultadoria. Destina-se a estudantes e restante comunidade académica da UMa e à população geral da Região Autónoma da Madeira.
Que acompanhamento fazemos?
Continua a tua jornada pessoal
Workshop/treino de competências pessoais
Duração Variável
Consultas Individuais de Psicologia
Consultas Individuais de Psicologia (crianças, adolescentes, jovens adultos e adultos), no âmbito de perturbações emocionais, dificuldades relacionais, orientação vocacional e de carreira
Marcar consulta
Consultas de orientação vocacional
Marcação: Consulta Individual de Psicologia
Sair
Consultas Individuais de Psicologia, no âmbito de perturbações emocionais, dificuldades relacionais, orientação vocacional e de carreira
Psicóloga
Luciana Ferreira
Data preferêncial
17 Agosto 2022
16.00h
Descrição
Consulta Individual de Psicologia
Urgente
Pedir marcação
Pedido de agendamento efectuado. Receberá a confirmação no seu e-mail.
Consultas de orientação vocacional
17 Agosto 2022, 16.00h
As Consultas de Orientação e Aconselhamento Vocacional fornecem uma ajuda especializada na construção e implementação de projetos de vida.
Marcação efectuada

# Appendix N

# *Toolbox* graphic elements — Dashboard

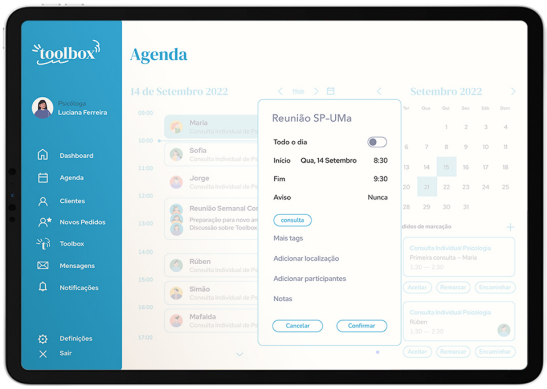




# APPENDIX N. *TOOLBOX* GRAPHIC ELEMENTS — DASHBOARD








# Appendix B

# *Toolbox* methodology — detail