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E-governance services for adolescents with mental health problems in Estonia

Master's thesis

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E-riigi teenused Eestis vaimse tervise probleemidega noortele

Magistritöö

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Author’s declaration of originality

I hereby certify that I am the sole author of this thesis. All the used materials, references to the literature and the work of others have been referred to. This thesis has not been presented for examination anywhere else.

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Abstract

Approximately one in seven young people aged 10-19 globally grapple with mental health conditions, often exacerbated by stigma, resource scarcity, or lengthy wait times for treatment. Given that physical symptoms frequently signal underlying psychological distress, effective mental health management is imperative. Unfortunately, in Estonia, adolescent mental health has not received adequate prioritization or funding, resulting in a significant treatment gap that could be mitigated by the implementation of e-services.

This thesis aims to assess the current landscape of e-services, identify key stakeholders, explore the reasons behind the lack of services, and determine the types of services needed in the field, if any. A qualitative study was conducted, utilizing semi-structured expert interviews. The study population comprised eight experts from four distinct fields. Thematic textual analysis was employed, combining both inductive and deductive methods.

Estonia faces a dearth of e-services due to limited prioritization and funding, compounded by a shortage of mental health specialists and a reliance on geographically based support services. Additionally, persistent stigmas surrounding mental health issues hinder the widespread adoption of innovative interventions. There is a pressing need for e-services offering low-level self-help resources, educational materials, and remote intervention options. These e-services must be tailored to the developmental needs of adolescents, providing structured yet individualized support that is fast, evidence-based, and trustworthy.

The gap in mental health support for adolescents is considerable. Although e-services hold promise in addressing this gap, their adoption is restricted, and they suffer from a lack of robust governmental backing and financial resources. Furthermore, in addition to prioritizing user-centered design, these services must be tailored to the individual needs of adolescents while also accommodating the developmental variations across different age groups.

This thesis is written in English and is 50 pages long, including 9 chapters, 5 figures and 3 tables.

Annotatsioon

E-riigi teenused Eestis vaimse tervise probleemidega noortele

Umbes iga seitsmes 10–19-aastane noor üle maailma kogeb vaimse tervise probleeme, mida sageli süvendavad häbimärgistamine, ressursside nappus või pikad ravijärjekorrad. Kuna füüsilised sümptomid viitavad sageli psühholoogilisele stressile, on tõhus vaimse tervise haldamine äärmiselt oluline. Kahjuks ei ole noorukite vaimne tervis Eestis saanud piisavalt tähelepanu ega rahastust, mis on tekitanud olulise puudujäägi raviteenustes, mida saaks leevendada e-teenuste kasutuselevõtuga.

Selle uurimistöö eesmärk on hinnata e-teenuste hetkeolukorda, tuvastada peamised sidusrühmad, uurida teenuste puudumise põhjuseid ning määratleda valdkonnas vajalikud teenused. Uurimine toimus kvalitatiivselt, kasutades poolstruktureeritud intervjuusid ekspertidega erinevatest valdkondadest. Andmeid analüüsiti temaatilise tekstianalüüsi abil, kombineerides nii induktiivset kui ka deduktiivset lähenemist.

Eestis on e-teenuste vähesus tingitud prioriteetide seadmise ja rahastamise piirangutest, lisaks vaimse tervise spetsialistide nappusele ja sõltuvusele geograafilistest tugiteenustest. Lisaks takistavad vaimse tervise probleemidega seotud stigmatiseerimine uuenduslike sekkumiste laialdast rakendamist. On selge vajadus e-teenuste järele, mis pakuvad noortele madala tasemega eneseabi ressursse, õppematerjale ja kaugsekkumisvõimalusi. Need teenused peavad olema kohandatud noorukite eripäradele, pakkudes struktureeritud, kuid individuaalset tuge, mis on kiire, tõenduspõhine ja usaldusväärne.

Noorukite vaimse tervise toetamisel on oluline ravilünk. Kuigi e-teenused võivad selle lünga lahendamisele kaasa aidata, on nende rakendamine piiratud ja neil puudub tugev valitsuse toetus ning rahalised vahendid. Lisaks sellele, peavad need teenused olema kasutajakeskselt disainitud ja kohandatud noorte individuaalsetele vajadustele, arvestades ka erinevate vanuserühmade arengulisi erinevusi.

Lõputöö on kirjutatud inglise keeles ning sisaldab teksti 50 leheküljel, 9 peatükki, 5 joonist, 3 tabelit.

List of abbreviations

ADHD	Attention deficit hyperactivity disorder
AI	Artificial intelligence
DMHI	Digital mental health intervention
EU	European Union
GDPR	General Data Protection Regulation
HBM	Health Belief Model
iCBT	Internet-based cognitive behavioral technology
ICT	Information and communication technology
mhGAP	Mental Health Gap Action Programme
NGO	Non-governmental organization
NIHD	The National Institute for Health Development (TAI)
OECD	The Organization for Economic Cooperation and Development
TAM	Technology Acceptance Model
UCD	User-centered design
VATEK	Estonian Mental Health and Wellbeing Coalition
VCPH	Virtual Campus of Public Health
WHO	World Health Organization

List of terms

Adolescent	Young people aged 10-19
E-mental health	The use of the internet and related technologies to deliver mental health information, services, and care
E-service	Services that make use of information and communication technologies (ICTs)

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1 Introduction

Approximately one in seven young people aged 10-19 worldwide are affected by mental health conditions, often going unnoticed and untreated (WHO, 2021). Such conditions expose adolescents to negative outcomes, including social exclusion, discrimination, educational difficulties, risk-taking behaviors, physical illness, and human rights violations (OECD, 2020; WHO, 2022b). The onset of mental disorders typically occurs before the age of 14, affecting nearly one in five young people in Europe (WHO, 2021). The COVID-19 pandemic has further heightened mental health concerns among children and adolescents due to psychosocial stressors, resulting in a significant prevalence of various mental health problems (Hossain et al., 2022; WHO, 2022b). Managing mental health during childhood and adolescence is crucial, with physical health complaints often serving as indicators of psychological distress (WHO, 2021; OECD, 2020; Hossain et al., 2022).

Adolescent mental health conditions often go unnoticed and untreated due to numerous factors, including stigma, lack of awareness campaigns, limited access to services, lengthy waiting lists, and difficulties among parents and teachers in recognizing mental disorders. Untreated childhood mental disorders can lead to short- and long-term morbidity and mortality, affecting functionality in education and social relationships (Sacco et al., 2022; OECD, 2020). Risk factors for adolescent mental health issues include heavy drinking, smoking, drug use, poor nutrition, and lack of physical activity (OECD, 2020). Suicide is a significant concern, driven by mental health problems and psychological distress (OECD, 2020; WHO, 2022b). Adolescents with a family history of substance abuse, access to firearms, or those experiencing difficult life events are more prone to suicide attempts (OECD, 2020).

The integration of digital health technology into mental health care is seen as a promising approach, with tools such as mobile health, wearables, virtual reality, and online platforms gaining significance, especially among the tech-savvy youth (Wies et al., 2021). However, ethical considerations and vulnerabilities, including cyber security

risks and manipulation through digital devices, must be carefully addressed (Wies et al., 2021; Lattie et al., 2022). Achieving a balance between the potential benefits and ethical implications is crucial for the responsible and effective deployment of digital mental health (Wies et al., 2021). Interdisciplinary collaboration, ongoing research, and the establishment of ethical frameworks will play pivotal roles in harnessing the full potential of digital mental health for positive global impact (Wies et al., 2021; Lattie et al., 2022).

To the best of the author's knowledge, no prior studies have been conducted in Estonia specifically examining e-services for providing mental health support to adolescents.

The main aim of this thesis is to explore current and potential e-services and government interventions in Estonia to aid adolescents in accessing essential support for mental health issues. Moreover, the thesis will provide insights from various stakeholders regarding these prospective solutions.

1.1 Aims and objectives

The primary objective of this research is to examine the availability and demand for e-mental health services provided to adolescents in Estonia. Additionally, the study aims to identify the existing challenges that hinder the broader utilization of potential digital services for adolescents dealing with mental health issues.

To address the primary objective and purpose of this thesis, the following research questions and sub-questions were formulated:

RQ1. What kind of e-services are available for adolescents with mental health problems?

> **SQ1.1.** What are the current e-services offered to adolescents with mental health problems in Estonia?
>
> **SQ1.2.** What kind of e-services are provided for adolescents with mental health problems in other countries?

RQ2. How can e-governance services be tailored to better meet the diverse needs and preferences of adolescents with varying mental health conditions?

SQ2.1. How do various stakeholders, such as healthcare providers, educators, and service designers, perceive the impact and relevance of e-governance services in addressing mental health issues among adolescents?

SQ2.2. What are the challenges to implement e-governance services for adolescents with mental health problems in Estonia?

1.2 Thesis structure

This thesis comprises nine chapters. The first chapter is an introduction, outlining the study's aims and objectives. In the second chapter, a literature overview is presented, covering topics such as adolescent mental health, the accessibility of mental health services, and the availability of e-services both in Estonia and internationally. The third chapter delves into the theoretical frameworks relevant to the thesis topic. Chapter four details the methodology, including data collection methods, the interview participant selection process, data analysis techniques, and ethical considerations. Chapter five presents the findings from expert interviews conducted as part of the study. In chapter six, the results are analyzed, and the research questions are addressed. Chapter seven will explore the main contribution of the study. Chapter eight will examine the study limitations and propose avenues for future research. Lastly, chapter nine will provide a summary of the thesis.

2 Literature overview

The literature overview will present a comprehensive examination of adolescent mental health and e-services provided for support, addressing Research Question 1 and Sub-Questions 1.1 and 1.2. This will be achieved by delving into the background of the research problem and providing insights into the current landscape in Estonia as well as internationally.

The literature review was performed by utilizing various search engines and academic databases, including general Google search, Google Scholar, PubMed, Scopus, and Web of Science. The author employed keywords such as adolescent mental health, e-mental health, mental health e-service, digital mental health, and related terms to gather relevant information.

2.1 Adolescent mental health

Mental health, according to the definition provided by the World Health Organization (2022a), stands as a foundational element of holistic well-being. It empowers individuals to navigate the challenges of life, excel in educational and professional pursuits, and actively engage in their communities. As a result, mental health plays a crucial role in advancing personal development, fostering community well-being, and contributing to socio-economic progress (WHO, 2022a).

Adolescence, categorized as individuals aged 10-19 years by the United Nations and WHO, significantly shapes mental well-being, influenced by birth circumstances, upbringing, and life experiences (WHO, 1988; UNFPA, 2023; WHO, 2022b). Risks at individual, family, community, and structural levels manifest across life stages, with developmentally sensitive periods having particularly detrimental effects (WHO, 2022b).

The adolescent phase is crucial for cultivating social and emotional habits that significantly influence mental well-being, including healthy sleep patterns, exercise, coping skills, and effective emotional management. Supportive environments in family,

school, and community are vital, but various stressors, including adversity and societal expectations, complicate this period. Adolescents facing risks like violence or discrimination are particularly vulnerable to mental health issues due to challenging living conditions and constrained access to support services (WHO, 2021).

Emotional disorders, particularly anxiety and depression, are pervasive among adolescents, impacting school attendance and performance. Suicide, the fourth leading cause of death for older adolescents, is associated with risk factors such as alcohol misuse, childhood abuse, societal stigma, and digital media influence (WHO, 2021; OECD, 2020). Estonia exhibits one of the highest suicide rates among EU countries, particularly among teenagers, underscoring the imperative for extensive prevention initiatives (OECD, 2020; ERR, 2021c).

Behavioral disorders, such as ADHD (attention deficit hyperactivity disorder) and conduct disorder, exert a substantial influence on education and may potentially escalate to criminal behavior. These disorders are more prevalent among younger adolescents, highlighting the critical significance of early identification and intervention (WHO, 2021; OECD, 2020).

Eating disorders, such as anorexia nervosa and bulimia nervosa, pose significant risks, with anorexia nervosa carrying a heightened risk of premature death (WHO, 2021).

Psychotic conditions in late adolescence hinder engagement in daily life and education, resulting in stigma or human rights violations. Engaging in health-related risk-taking behaviors, such as substance use and risky sexual activities, initiated during adolescence, can lead to detrimental outcomes, including low educational attainment, injuries, involvement in criminal activities, and even death (WHO, 2021). Interpersonal violence, notably, stands as one of the primary contributors to mortality among older adolescent boys (WHO, 2019).

The psychosocial challenges from the COVID-19 pandemic contribute to mental health issues in children and adolescents, necessitating evidence-based interventions (Hossain et al., 2022; OECD, 2020). In Estonia, declining health behavior and elevated mental health risks, exacerbated by the Covid-19 pandemic, highlight the urgency of addressing these issues (TAI, 2023; Statistikaamet, 2021). Barriers within the healthcare system, including lengthy queues and excessive costs, impede access to mental health support,

with a shortage of school psychologists and other mental health specialists worsening the situation (Statistikaamet, 2021; ERR, 2021b).

Initiatives for mental health promotion and prevention in adolescents focus on emotional regulation, risk behavior alternatives, resilience building, and supportive social environments (WHO, 2021; Bantjes, 2022). Avoiding undue medicalization, prioritizing non-pharmacological approaches, and upholding children's rights are essential in addressing mental health needs (WHO, 2021). Enhancing mental well-being requires regular screenings, improved diagnostics, awareness promotion, reduced stigma, and early interventions, especially during periods marked by unprecedented risk factors (Sacco et al., 2022; Bantjes, 2022). A comprehensive and multifaceted approach is necessary to address mental health during adolescence effectively.

2.2 Accessibility to mental health care

Recognized globally as a pressing challenge, mental health conditions are not only widespread in every country but also inadequately addressed, posing a significant public health concern (WHO, 2022b). The barriers hindering young individuals from seeking professional assistance are diverse, including mental health stigma, embarrassment, limited knowledge, and negative perceptions of help-seeking (Radez et al., 2021; WHO, 2022b). Additionally, a proclivity for self-reliance and challenges with fully committing to the help-seeking process further obstruct access to mental health support (Radez et al., 2021). Addressing these issues necessitates widespread distribution of evidence-based interventions in schools, specifically targeting public stigma and enhancing the mental health knowledge of young people (Radez et al., 2021; WHO, 2022b; Wies et al., 2021). Collaborative efforts between schools and mental health services are crucial to minimize logistical barriers, ensuring access to evidence-based support for young people and their families. Mental health professionals must explore diverse avenues, including digital tools, to empower young individuals to independently access help (Radez et al., 2021).

Estonia grapples with a significant shortage of mental health professionals, notably psychiatrists, clinical psychologists, school psychologists, mental health nurses, and family doctors, contributing to increased waiting times for psychiatric care, particularly in Harju and Ida-Viru counties. The Health Insurance Fund's purchasing practices

further exacerbate these wait times, prompting discussions on the appropriateness of the current 42 day waiting period (Sotsiaalministeerium, 2020). Addressing these challenges requires comprehensive planning, ICT solutions, and strengthening the family doctor system (Sotsiaalministeerium, 2020; Estonian Human Development Report, 2023). Mental health challenges in Estonia are also influenced by stigma, evident in a 2016 survey revealing reluctance to disclose mental health issues. Despite notable progress over the years, a gap persists between the supply and demand for mental health services in Estonia, underscoring the need to address stigma, enhance accessibility, and incorporate preventive measures alongside diverse service options (Sotsiaalministeerium, 2020).

Digital technologies, encompassing websites and mobile applications, have traditionally played a role in supporting individuals in higher-income countries in achieving better mental health outcomes (WHO, 2022b; Torous et al., 2020). However, the increased global accessibility of these technologies, particularly in remote areas where mobile phones are prevalent, has become more pronounced, especially in the context of the COVID-19 pandemic (WHO, 2022b). Despite offering significant benefits, concerns about privacy and data protection are crucial ethical considerations in the utilization of digital interventions (WHO, 2022b; Torous et al., 2020). Moreover, potential adverse impacts of extensive screen time and digital technology use on mental health, especially among young people, are valid concerns (WHO, 2022b; Aboujaoude & Gega, 2020). Nonetheless, digital technologies have the potential to contribute to achieving universal mental health coverage by reducing travel time and expenses, offering flexibility, and providing anonymity to overcome stigma (WHO, 2022b; Wies et al., 2021). Digital approaches have proven effective in supporting mental health, particularly in middle-income countries, offering benefits such as accessible information, e-learning courses for healthcare workers, tele-mental health for remote care, and digital self-help interventions (WHO, 2022b).

Adolescents, actively engaged in various online communication channels over the past decade, have seamlessly integrated technology into their lives (Subrahmanyam & Greenfield, 2008). The term "e-mental health" encompasses the use of the Internet and related technologies, such as smartphone apps, websites, and social media, to deliver digital mental health interventions (DMHIs) (Lal, 2019). This approach, rooted in the broader concept of e-health, provides a promising solution to address the treatment gap

in mental healthcare (Lal, 2019). Digital mental health services, characterized by technology in mental healthcare, offer diverse applications, including online video communication for well-being promotion and treatment. Aligned with the preferences of adolescents familiar with digital solutions, these services aim to enhance user experiences and introduce novel interventions (Bond, 2023).

Despite the potential benefits of digital mental health interventions, addressing concerns about privacy, data protection, and the potential for a digital divide is paramount (WHO, 2022b). The design and implementation of digital mental health solutions must prioritize end-users, ensuring equitable access across diverse populations. The scarcity of evidence supporting the efficacy of many apps directed towards youth emphasizes the importance of rigorous testing and evaluation. Design considerations for youth digital mental health interventions include attention to language, brevity, and clear confidentiality practices. Approaching the integration of digital tools in mental health services with caution and a focus on inclusivity is essential to optimize their effectiveness and accessibility (Lattie et al., 2022). Web-based interventions often exhibit greater efficacy when complemented by face-to-face support or guidance, emphasizing the significance of personalized interventions and the crucial aspect of maintaining data privacy (Lattie et al., 2022; Torous et al., 2020; Ratheesh & Alvarez-Jimenez, 2022).

In a market saturated with publicly accessible mobile apps for psychosocial self-care and stress management, individuals, healthcare providers, and patients may question their efficacy (Lau et al., 2020). According to a systematic search and literature review by Lau et al. (2020), out of the myriad of available apps, only a minimal percentage (2.08%, or 21 out of 1009) have published peer-reviewed evidence demonstrating feasibility and/or efficacy. The evaluation, although, focused exclusively on free apps and those offering in-app purchases, thus not evaluating the purchasable applications (Lau et al., 2020). This underscores the necessity for the introduction of additional evidence-based and secure interventions to address the existing gap in the e-mental health landscape. This, in turn, would contribute to enhancing support for adolescents dealing with mental health issues and lead to an improved quality of life.

2.3 E-services for mental health in Estonia

In 2021, the Estonian government endorsed the Green Paper on Mental Health as part of the Ministry of Social Affairs' commitment to advancing prevention, early detection, and timely, high-quality care nationwide (ERR, 2021a). This policy document delineates the existing mental health care structures, tackles challenges with an emphasis on prevention and swift responses, and puts forth targeted developmental strategies (ERR, 2021a; Sotsiaalministeerium, 2020). Sizeable additional funds were earmarked in 2021 to enhance mental health care access for local authorities, backing community services and primary assistance for vulnerable groups (ERR, 2021a). A persistent and critical issue is the scarcity of mental health professionals and psychiatrists, resulting in prolonged wait times for patients (ERR, 2021a; Sotsiaalministeerium, 2020; Estonian Human Development Report, 2023). There is a pressing need for mental health nurses and clinical psychologists in both primary and specialist care, alongside shortages of school and occupational psychologists (ERR, 2021a; Sotsiaalministeerium, 2020). The 2021 state budget included extra funds as a permanent grant, specifically designated for the induction year of psychologists, with the goal of augmenting mental health care access (ERR, 2021a). The formulation of the Green Paper adhered to the Population Health Development Plan 2020-2030, aiming to extend Estonians' healthy lives by curbing premature mortality and morbidity (ERR, 2021a; Sotsiaalministeerium, 2020; Estonian Human Development Report, 2023).

Digital solutions are pivotal in reshaping mental health services, striving for patient-centric and personalized treatment approaches. Estonian company DocuMental is actively pursuing this objective by developing a clinical decision support system designed to enhance diagnostic accuracy and treatment effectiveness. This initiative recently secured funding from EIT Health, a leading European consortium for healthcare innovation. In response to the global challenge of expert-centric mental health services contributing to high misdiagnosis rates, DocuMental's approach focuses on reshaping traditional workflows and improving data quality and reliability in diagnosis and treatment (Pihlak, 2019).

Pre-Visit, another decision support system gaining backing from the Estonian Health Insurance Fund, operates as a clinical pathway for patients, utilizing AI to assess the urgency of a patient's problem and streamline the healthcare provider's workflow.

Additionally, a forthcoming search engine named DynaMed will furnish healthcare providers with the most recent medical evidence and guidelines in a structured manner, facilitating informed clinical decision-making. Another AI-based service, leveraging pharmacogenetic data from the Estonian Biobank, aims to enhance drug prescription by adding data on potential reactions to the patient's profile (Petrone, 2023). This multifaceted approach signifies a shift towards comprehensive digital mental health solutions with the potential to enhance personalized care and bridge treatment gaps.

The Estonian mental health game, Triumfland Saga, launched in 2021, focuses on promoting mental well-being among children aged 7 to 12. It offers an interactive and captivating experience designed to educate children about emotions, coping strategies, and self-care. The game incorporates enjoyable and educational mini games, allowing children to actively learn about emotions, stress management, and the cultivation of resilience. Beyond its educational features, Triumfland Saga emphasizes social and emotional learning, encouraging children to practice empathy and communication skills, essential for fostering healthy relationships and a sense of belonging crucial for good mental health. Triumfland Saga serves as a valuable tool for instilling healthy habits in children and contributing to the maintenance of good mental health. This age-appropriate adventure game, designed to build resilience in a fun and interactive manner, is accessible globally and supports multiple languages, including Estonian. Interested individuals can download Triumfland Saga from Google Play or the App Store. The game's methodology is grounded in scientific principles, actively assisting in the development of a measurable skill set for navigating through various feelings and emotions (Triumf Health, 2024; Global Estonian, 2023).

NGO Peaasi.ee, known as "Head Matters" in English, was established in 2009 by mental health professionals from the Psychiatry Clinic of North Estonia Medical Centre. The team has since expanded to include qualified mental health specialists, youth workers, and ICT specialists, among others. Peaasi.ee is dedicated to promoting the mental health of Estonian youth by aiding in the early detection of mental health issues and facilitating access to timely intervention. Their primary objectives include raising awareness about mental health, combating the stigma associated with psychiatric illnesses, and improving access to mental health services by directing young people to suitable resources. To achieve these goals, Peaasi.ee developed a website that offers comprehensive information on various mental health concerns and general well-being

topics. This platform also enables online consultations with clinically experienced mental health specialists, ensuring that young individuals with potential mental health issues receive prompt and appropriate assistance, self-education possibilities, and a live chat option. Currently, the NGO is also cooperating with the Ministry of Social Affairs and the Estonian Health Insurance Fund (Peaasjad MTÜ, 2024).

Currently, according to the literature review, there is a scarcity of e-services available in the market, and despite a growing interest in digital solutions, there remains a deficit of government-backed mental health e-services in Estonia.

2.4 E-services for mental health internationally

Over the past decade, Canada has witnessed considerable progress in e-mental health research and innovation. Notable examples include the Ontario Telemedicine Network (OTN), providing telepsychiatry services, and Kids Help Phone, offering 24-hour counseling services through various technologies, including a mobile application. An online therapy clinic at the University of Regina, operating since 2010, follows an Australian model for therapist-assisted iCBT (cognitive behavioral therapy), providing free interventions for depression and anxiety. Despite the recognized potential of e-mental health, Canada faces challenges in its integration, emphasizing the need for strategic leadership in governance and coordination (Lal, 2019).

In Australia and New Zealand, many mental health clinicians are incorporating digital healthcare into their practices, integrating online psychological therapies, mood tracking apps, shared decision-making tools, and smart medical record systems to encourage guideline adherence. Policymakers have recognized the need to harness digital technologies, as evident in the 2021 Australian Parliamentary report on Mental Health and Suicide Prevention and the 2019 New Zealand Digital Health Strategic Framework. This recognition is partly driven by the significant workforce shortages in mental health throughout both countries (Ratheesh & Alvarez-Jimenez, 2022).

In response to heightened mental health challenges during the COVID-19 pandemic in China, mental health professionals and health authorities developed online education and awareness programs. Utilizing social media and free e-books, these initiatives aimed to provide information on COVID-19 prevention, control, and mental health to medical staff and the public. In China, mental health professionals also established 24-

hour online psychological counseling services through free messaging applications across various regions. In Vietnam, a smartphone-based stress management program improved work engagement among hospital nurses, offering modules for cognitive-behavioral stress management skill training (WHO, 2022b).

The Virtual Campus for Public Health (VCPH), the learning platform of the Pan American Health Organization (PAHO), offers online courses on public mental health issues, including self-harm prevention, suicide prevention, and stigma reduction. Available in four languages and contributed to by 21 countries across the Americas, VCPH has been supporting public health training since 2008, with over a million enrolled participants (WHO, 2022b).

The Electronic mhGAP Intervention Guide (e-mhGAP-IG) provides clinical protocols for non-specialist providers to assess and manage mental health conditions. In Afghanistan, a locally tailored mobile application, based on the previously mentioned intervention guide, supported community health workers and facility-based healthcare providers, while including interactive guidelines for screening and management and facilitating teleconsultation. Preliminary evaluations indicated improved access to care, reduced stigma, and enhanced healthcare service quality in remote communities (WHO, 2022b).

The WHO Alcohol e-Health, an evidence-based self-help tool, was tested in Belarus, Brazil, India, and Mexico, proving effective in reducing harmful or hazardous alcohol use within six months. It suggests potential as a model for other low- and middle-income countries (WHO, 2022b).

Many suicide prevention apps exist globally, but oftentimes lack clinical evidence, and some may even pose risks, such as errors in providing suicide hotline phone numbers (Martinengo et al., 2019). Notably, Jaspr Health, a tablet-based application, shows clinical promise in supporting medical personnel with evidence-based interventions for suicide prevention. However, further research is crucial due to the sensitivity of the subject (Dimeff et al., 2021). The LifeBuoy smartphone app is designed to reduce suicide risk among young people with a history of suicidal behavior. While clinical trials are important, they alone are not sufficient. To fully utilize technology in adolescent mental health, safety, regulation, prescription practices, adherence, and integration into routine care must be considered. It is vital to avoid viewing technology narrowly as a replacement for human interaction but as a tool to enhance therapeutic relationships and support interventions provided by therapists (Bantjes, 2022).

Germany has made notable strides in the digital health sector, despite historically lagging in digitalization compared to other developed nations (Gerke et al., 2020). This progress is exemplified by the introduction of the Digital Healthcare Act, which empowers doctors to prescribe healthcare applications meeting specific criteria outlined by statutory insurance providers. A crucial requirement is the inclusion of the application in the official register for digital health applications, overseen by the German Federal Institute for Drugs and Medical Devices. Although challenges and complexities persist post-implementation of the Act, it marks a significant advancement in the realm of digital healthcare and serves as a model for Europe and beyond (Gerke et al., 2020).

Drawing from the literature, the author observes that although there is an initiative backed by scientific research and global policies to develop and employ digital mental health tools and services, there has been limited advancement in providing evidence-based and secure tools for adolescents and adults to improve their mental well-being. Additionally, the author contends that despite the continuous release of numerous applications annually, their unsupervised usage may have detrimental effects, possibly undermining confidence in the efficacy of digital interventions.

3 Theoretical framework

Theoretical frameworks encompass established theories, models, or conceptual frameworks that serve as the groundwork for comprehending and analyzing the research topic. They provide a structured methodology for organizing the study, directing the research design, data collection, analysis, and interpretation of results. These frameworks play a crucial role in contextualizing the study within existing literature and academic discourse, offering insight into research questions and hypotheses.

Exploring theoretical frameworks in the realm of digital mental health services reveals numerous avenues. Various fields of research have developed frameworks to understand the factors influencing technology adoption and innovation. These frameworks offer insight into human perceptions of technology and its adoption.

The Technology Acceptance Model (TAM) (Davis, 1989) is one such framework that assesses users' acceptance levels, providing valuable insights into how individuals perceive the utility and usability of digital mental health solutions. Addressing technology acceptance remains a significant challenge for developers of emerging technologies. Particularly in healthcare settings, patients are considered a vulnerable demographic, with their data, especially regarding stigmatized conditions like mental health, deemed sensitive. With the increasing integration of mobile technology into healthcare, the proliferation of potentially intrusive technologies such as sensing and machine learning is likely to heighten user apprehensions, exacerbating existing issues with user attrition and adoption of modern technologies. Moreover, healthcare providers' perceptions of technology are poised to influence treatment delivery significantly, particularly if the technology fails to garner sufficient acceptability (Nadal et al., 2020).

The Health Belief Model (HBM) (Rosenstock, 1974) explores the influence of beliefs and perceptions regarding mental health and digital solutions on their adoption and engagement. According to the HBM, health-related behavior is influenced by a range of factors, including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. Perceived susceptibility refers to an individual's assessment of their likelihood of contracting a particular illness or condition. Perceived severity pertains to an individual's perception of the seriousness of

a condition and its associated consequences. Perceived benefits relate to an individual's belief in the effectiveness of adopting a recommended health behavior in reducing the risk or severity of the condition. Perceived barriers encompass the perceived obstacles or costs associated with adhering to a recommended health behavior, even if it is believed to be beneficial in mitigating or eliminating the perceived threat. Self-efficacy refers to an individual's confidence in their ability to perform the healthy behavior in question. Individuals with low self-efficacy are less confident in their ability to engage in the behavior, which can impact the likelihood of its performance (Champion & Skinner, 2008; Rosenstock, 1974).

While not a conventional theory, User-Centered Design (UCD) (Roschuni et al., 2013) holds significant relevance in service and solution design, particularly for adolescents, as it emphasizes prioritizing user needs in the design process. However, due to ethical constraints and the sensitive nature of the subject matter, direct engagement with minors was not feasible, resulting in the unavailability of direct user input.

The RE-AIM Implementation Science Framework (Glasgow et al., 1999) evaluates the incorporation of digital mental health interventions into healthcare systems. These frameworks provide a basis for comprehending the complexities of digital mental health, aiding in the creation of interventions that are effective, ethical, and culturally sensitive. A holistic strategy entails incorporating components from various frameworks during the design and assessment of digital mental health services (Holtrop et al., 2021).

By employing the theory of triangulation (Carter et al., 2014), the aim is to conduct comprehensive examinations of all the crucial components and hypotheses outlined in the mentioned theories, assessing their validity, and integrating a citizen engagement (co-creation) element into it. The Quadruple Helix Model (Cai & Lattu, 2022) will introduce a variety of viewpoints and aspects through different stakeholders. The theory of triangulation and the Quadruple Helix Model will be extensively explored and elaborated upon in Chapter 4.1.

4 Methodology

The present thesis adopts a case study research design, which facilitates thorough and comprehensive investigations of intricate issues within their authentic contexts. Utilizing the case study approach is especially advantageous when seeking a profound understanding of a particular issue, event, or phenomenon within its natural real-life environment (Yin, 2018). This master's thesis also incorporates materials previously published by the author during the course of their master's studies, focusing on the same research topic.

The subsequent sections will offer a comprehensive insight into the research planning process, elucidate the methodologies employed for information acquisition, delineate the data analysis procedures, and discuss the ethical considerations inherent in both the chosen topic and its application within this thesis.

4.1 Data collection methods and instruments

To achieve the research objectives, an explanatory qualitative approach will be utilized for the planned case analysis. The decision to employ a qualitative approach in this study stems from its ability to delve into new knowledge and gain deeper insights into the research topic. Data will be collected using semi-structured interviews, chosen for their versatility and flexibility in eliciting the latest information from participants. The selection of the case study method is grounded in its effectiveness in elucidating complex causal relationships, portraying responses, and contexts, highlighting specific subjects, and providing insights into situations with unclear outcomes (Yin, 2018).

Expert interviews, as a qualitative empirical research method, have been widely utilized to gather information in specific areas of interest (Döringer, 2020). In this study, the expert interview structure will be semi-structured, allowing for a range of opportunities and adaptability to various research goals (Galletta, 2013). Semi-structured interviews are particularly suitable when the researcher possesses sufficient knowledge about the subject to establish the domain but does not have all the answers (Gubrium et al., 2012). This research design method provides enough structure to focus on detailed topics related to the phenomenon under study while allowing participants to contribute new insights and meanings to the research subject (Galletta, 2013).

One of the semi-structured interview's main advantages is its ability to focus on lived experience while addressing theoretically directed variables of interest (Galletta, 2013). By exploring the viewpoints and experiences of experts through interviews, researchers gain deeper insights into social reality, as experts possess specialized knowledge in their respective fields (Döringer, 2020). Experts are often distinguished by their positions and the virtue of their expert knowledge, making them valuable sources of information (Döringer, 2020). In qualitative research, individual interviews are the most employed data collection method (Gubrium et al., 2012). Individual interviews allow for focused attention on one person, enabling them to provide detailed information about their personal perspective, experiences, and their relationship to the context under investigation (Mann, 2016).

A triangulation research strategy (Carter et al., 2014) will be implemented across two dimensions: theory and data sources. This strategy will use different theoretical frameworks and combine case studies with semi-structured interviews involving representatives from the Quadruple Helix (Cai & Lattu, 2022).

The aim of the triangulation approach is to enhance the credibility and validity of research outcomes by utilizing multiple sources and methods to investigate the phenomenon under scrutiny (Noble & Heale, 2019). To assess public preferences regarding engagement in innovation collaborations, the study will adopt the Quadruple Helix Model of innovation, which acknowledges science, policy, industry, and society as the primary actors in the innovation system (Schütz et al., 2019). Semi-structured, in-depth interviews will be conducted to gather diverse perspectives from all stakeholders involved and delve deeper into the relevant topics. Figure 1 illustrates a visualization of the planned case study design process.

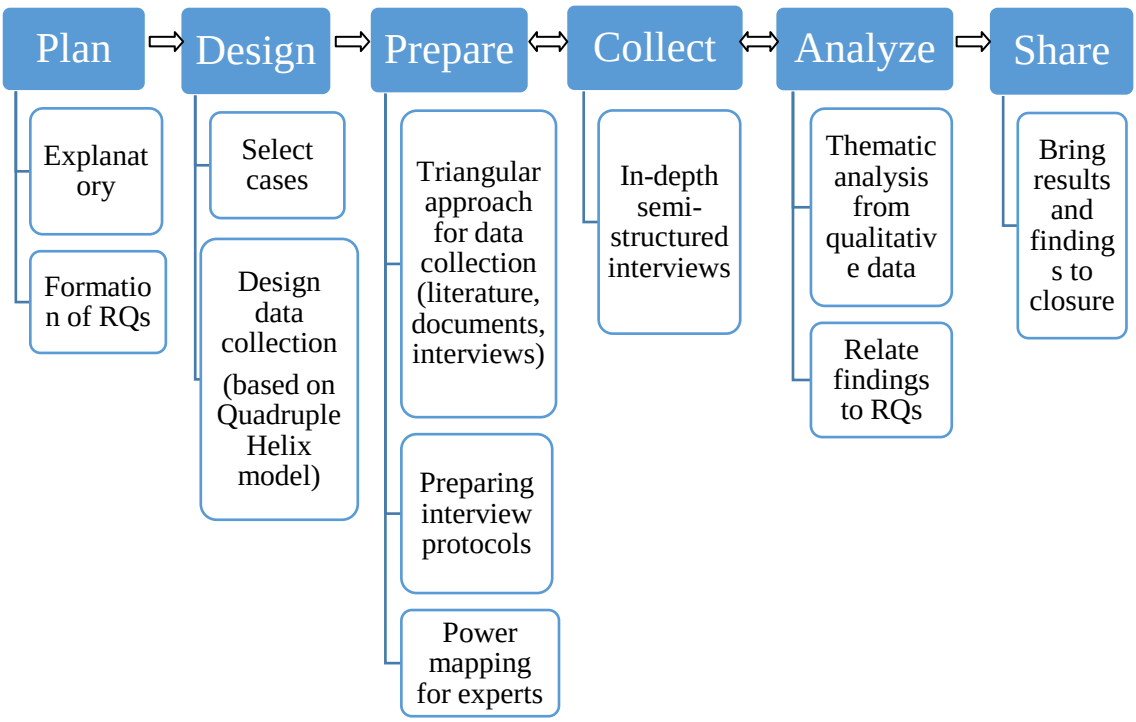

Figure 1. Case study research design applied for current thesis.

Participants for the expert interviews were selected from both public and private institutions, all of whom were members of the national mental health stakeholders' group and aligned with the Quadruple Helix Model. The expertise areas of the interviewees ranged from innovation to mental health. The selection of interviewees was conducted through a stakeholder power mapping process (Tiberghien, 2012).

The expert interviews took place from February to April 2024. Initial correspondence and scheduling were managed through the TalTech Office 365 email platform, where the purpose and organization of the interviews were outlined. In these emails, consent for recording the interviews was obtained (Appendix 2). Microsoft Teams served as the platform for conducting and recording the interviews. Depending on participants' preferences, interviews were conducted in either English or Estonian. All interview recordings were securely stored on the TalTech Office cloud server and will be used exclusively for this thesis, accessible solely to participants involved in the completion and evaluation of this thesis. The duration of the interviews varied, ranging from 26 minutes to 1 hour and 18 minutes, with an average duration of 37 minutes.

Throughout the expert interviews, participants shared perspectives on diverse facets of mental health support for adolescents, encompassing prevention, promotion, and service sustainability. The conversations extended to the use of e-services in this realm, where experts offered insights into the current deployment of digital technologies to aid adolescent mental health. Furthermore, experts were queried about the entity responsible for coordinating these digital health initiatives. For a comprehensive overview of the expert interview structure, please refer to Appendix 3.

4.2 Interview participant selection process

The selection criteria for interview participants were guided by the Quadruple Helix model and the research topic's intricacy, with consideration for the sensitive nature of subjects like adolescents. The initial step in identifying suitable experts for interviews was driven by the research questions. It was imperative to incorporate diverse stakeholder perspectives on the research topic, necessitating the recruitment of experts with a wide range of expertise and knowledge from various perspectives, thus employing purposive sampling. Purposive sampling involves selecting participants based on their specialized knowledge and expertise in a particular area (Õunapuu, 2014). In qualitative research, samples tend to be smaller compared to quantitative research to facilitate in-depth, case-oriented analysis (Vasileiou et al., 2018).

Fourteen experts were chosen for expert interviews based on the Quadruple Helix model and expert power mapping, representing expertise in adolescent mental health across different domains (Tiberghien, 2012), as depicted in Figure 2. Subsequently, eight experts were selected for contact via email (Appendix 2), where the purpose and methodology of the planned thesis, as well as data usage and consent, were explained. Each domain was represented by two experts, including:

- Science: Head of the Tartu University Center for Child and Adolescent Mental Health and the Health Technology Area Manager of the Connected Health Cluster (Estonian Health Innovation Ecosystem in Tehnopol).

- Policy: Minister of Justice, who also serves as the children's ombudsman, and the current Minister of Health representing government views.

- Industry: Mental Health Section Representative of Health Insurance Fund and the Head of the Health and Welfare Information Systems Centre E-service Department.

- Society: Head of the Center for Children's Mental Health and a representative from the NGO Peaasi.ee.

Of the eight emails sent, positive responses were received from four experts within four weeks: the Minister of Health (policy), the representative of the mental health section of Health Insurance Fund (industry), the Head of the Center for Children's Mental Health (society), and the Health Technology Area Manager of the Connected Health Cluster in Tehnopol (science). Despite multiple attempts, contact was not established with the University of Tartu Mental Health Center, the Minister of Justice, the Health and Welfare Information Center, and NGO Peaasi.ee declined to participate in the interview. Subsequently, additional emails were sent to recruit new experts identified through previous power mapping (Figure 2) to provide necessary input and information for the planned thesis. As of March 2024, three more experts were enlisted, comprising the Senior Specialist for the Department of Mental Health Promotion at The National Institute for Health Development, a representative from the School Psychologists Union, and a representative from the Mental Health Department of the Ministry of Social Affairs. The final expert in the domain of science and education from Tartu Healthcare College Mental Health Nursing was contacted and slated for an interview by the beginning of April.

The stakeholders who participated in the interviews are indicated in red in Figure 2.

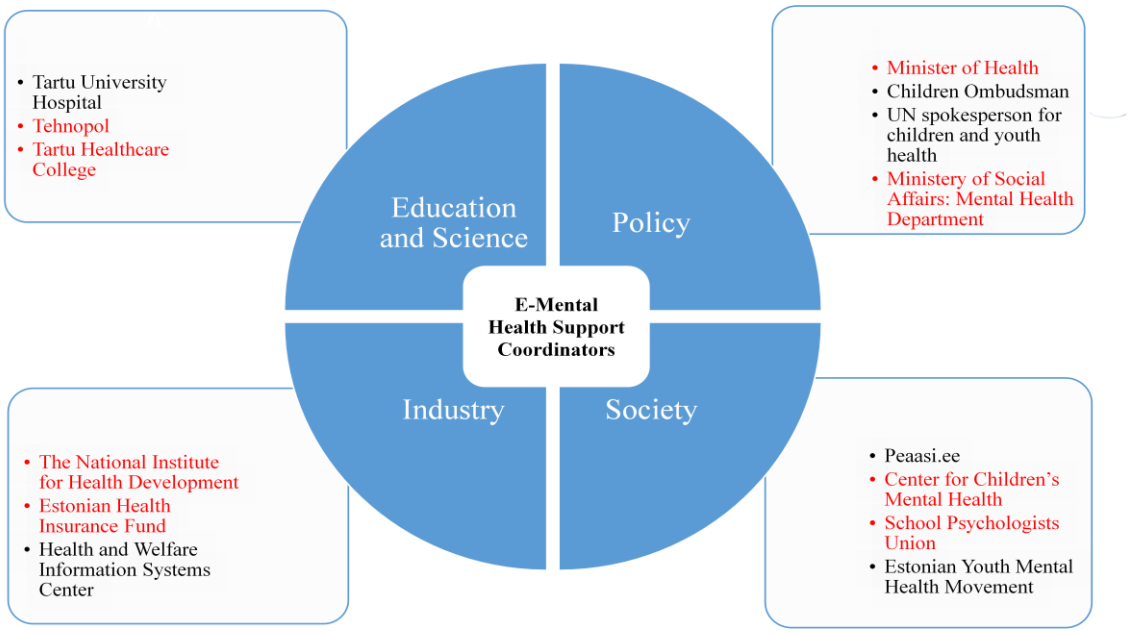

Figure 2. Power Mapping of stakeholders.

While additional interviews could have been conducted, two representatives from each group were selected to ensure validation and provide ample information about the respective area. The principle of saturation is commonly employed to determine sample size and evaluate its effectiveness (Vasileiou et al., 2018). Despite the potential for more interviews to yield additional insights, the expert interviews conducted for this study sufficed in gathering adequate data (Galletta, 2013). The methods employed in this study ensured that data saturation was achieved; in other words, any additional information would not significantly contribute to answering the research questions (Guest et al., 2020).

4.3 Data analysis methods

In qualitative research, the iterative nature of data analysis allows for a dynamic exploration of the collected information (Yin, 2018). As the research progresses, data analysis unfolds concurrently with data collection, enabling researchers to refine their understanding and delve deeper into emerging themes (Braun & Clarke, 2006). The semi-structured interview format plays a pivotal role in this process, fostering an environment of critical reflection between the interviewer and interviewee. Through open-ended questioning and thoughtful dialogue, participants are encouraged to share

their perspectives, experiences, and insights, enriching the pool of data available for analysis (Galletta, 2013).

Throughout this iterative journey, researchers engage in a constant dialogue between theory and data, leveraging insights from existing literature to inform their analytical approach (Galletta, 2013). As themes begin to crystallize, researchers iteratively refine their coding schema, ensuring that it accurately captures the breadth and depth of the phenomena under investigation (Braun & Clarke, 2006). This iterative process of data analysis is akin to a journey of discovery, where researchers navigate through the complexities of the data landscape, uncovering hidden insights and shedding light on the intricacies of the research phenomena.

The process begins with data familiarization, wherein researchers immerse themselves in the raw data through careful review of interview recordings and transcriptions (Galletta, 2013; Braun & Clarke, 2006). The interviews were digitally recorded and transcribed using web-based speech recognition technology, then checked manually. This hands-on approach enables researchers to gain a deep understanding of the nuances and intricacies embedded within the data, setting the stage for subsequent analysis. The transcribed data was then organized and prepared for coding, laying the foundation for the thematic analysis process (Braun & Clarke, 2006) as seen in Table 1.

Table 1. Thematic analysis stages.

Thematic analysis stages
1. Familiarization
2. Initial coding
3. Searching for themes
4. Reviewing themes
5. Defining themes
6. Producing the report

This study employs both deductive and inductive approaches to data analysis. Inductive research involves qualitative methods such as textual or visual analysis to identify patterns and themes within the data. On the other hand, deductive research utilizes quantitative techniques such as statistical analysis to validate theories or hypotheses (Braun & Clarke, 2006). In this study, deductive analysis stems from a comprehensive literature overview, serving as the groundwork for research questions. Deductive coding is applied using a predefined set of codes derived from key areas outlined in the interview plan (Appendix 3). After data analysis, new codes emerge, thereby enriching the analysis through an inductive process. The initial coding and categorization of data are illustrated in Figure 3.

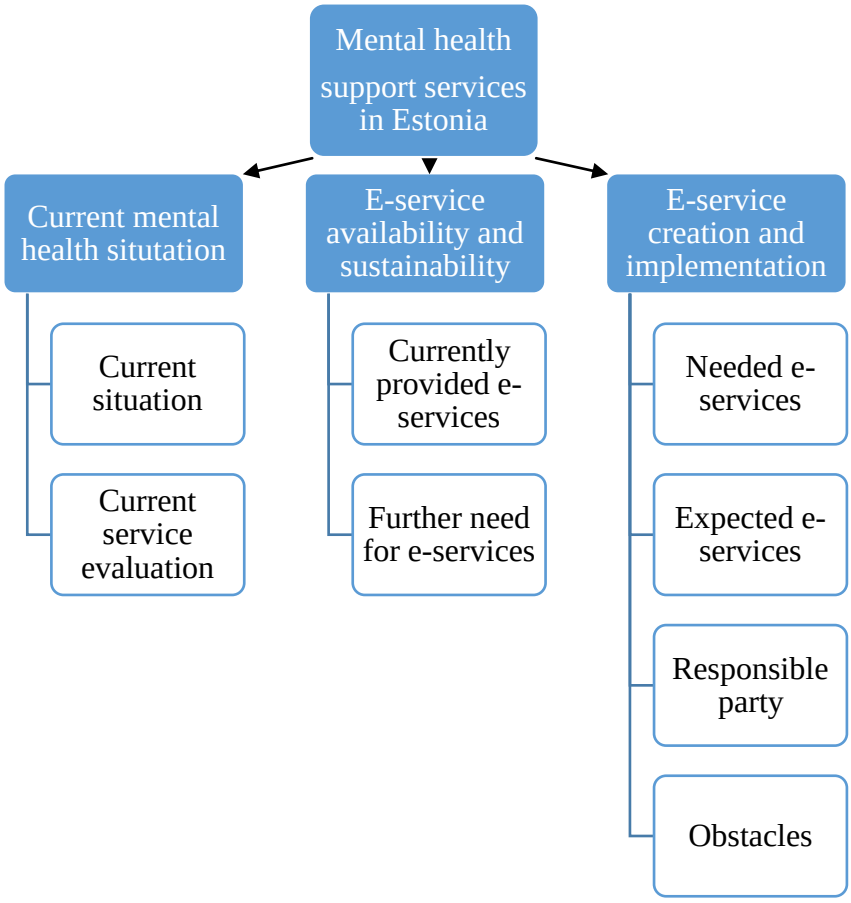

Figure 3. Initial data coding and categorization.

4.4 Ethical considerations and data protection

At the core of ethical conduct lies the principle of preventing harm. Key ethical considerations encompass securing informed consent, ensuring privacy, anonymity, and confidentiality (Mann, 2016).

Undertaking a thesis focused on digital solutions for adolescents' mental health involves navigating a spectrum of ethical considerations and committing to responsible research practices. Central to this endeavor is the prioritization of the well-being and privacy of child participants, necessitating informed consent from both the children and their guardians. It is imperative to safeguard the confidentiality and anonymity of sensitive information throughout the research process. Additionally, fostering cultural sensitivity and inclusivity is crucial, acknowledging the diverse backgrounds and perspectives inherent within the study. Given this research's sensitive nature, it is pertinent to note that direct involvement of adolescents will be avoided. Instead, primary information will be sourced from caregivers and stakeholders intricately involved in various facets of their lives.

Compliance with ethical guidelines, including those set forth by institutional review boards, and maintaining transparency in reporting methods and results are imperative. Responsible utilization of technology, safeguarding data security, and mitigating potential harm are vital ethical considerations. Researchers must carefully contemplate the potential impact of their findings on children's mental health, striving to make constructive contributions to the field. Continuous reflection on ethical principles and a steadfast commitment to upholding the highest standards of integrity are fundamental aspects of conducting research in digital solutions for children's mental health.

The recorded interviews and transcriptions are accessible solely to participants involved in the completion and evaluation of this thesis. Personal data was eliminated from transcriptions, and pseudonymized data was utilized instead. Transcribed analysis files will be deleted after five years from the defense of the study (May 2029) to facilitate publication of the data in scientific articles. Each expert was assigned a code to ensure confidentiality, with codes based on randomized enrollment. The handling of personal data, including its processing and storage, complies with the law and current research

purposes. The Estonian Personal Data Protection Act (IKS, 2019) and GDPR (EUR-Lex, 2016) requirements have been adhered to.

5 Results

The subsequent chapter unveils the outcomes derived from the expert interviews, providing a comprehensive analysis of the perspectives offered by the experts on various subjects. The expert interviews delineated three principal themes: the present state of adolescent mental health, the accessibility and sustainability of e-services, and the development and integration of e-services. Each overarching category encompasses smaller subcategories that encapsulate pertinent related topics.

5.1 The present state of adolescent mental health

In the initial section of the interview plan, the objective was to collect data regarding the present status and trajectory of support for adolescent mental health. This involved identifying well-structured services and identifying areas where services are deficient, while also elucidating the underlying rationales behind such perspectives.

5.1.1 Current state of adolescent mental health support

All stakeholders unanimously agreed that although the current situation is deemed unsatisfactory, there is a consensus that it has shown signs of improvement and has progressed positively over the years. One interviewee specified a significant increase in resources allocated to the mental health support sector after the Covid-19 pandemic. Similarly, I-6 highlighted that mental health is currently receiving heightened attention on the political agenda, leading to rapid development, albeit this prioritization is recent, indicating substantial areas of underdevelopment. Six out of eight interviewees pointed out a shortage of mental health specialists, with demand currently outstripping supply. Five specialists noted regional inequalities in resource distribution and specialist availability across different areas. Half of the interviewees highlighted a lack of low-threshold or community-level services (I-1, I-2, I-5, I-8), with only I-8 mentioning the additional challenge of fragmented coordination within the healthcare system hindering access to assistance. I-4 underscored issues with the synchronization of social and healthcare services and interoperability challenges in data movement and sharing between the two sectors. Furthermore, I-1 emphasized the necessity for a stepped care model, while I-5 mentioned the ongoing development of such a model.

5.1.2 Evaluation of services

Several noteworthy instances of effective mental health support services were highlighted. Parenting programs, such as Tarkvanem.ee, were mentioned three times (I-1, I-5, I-8), offering educational resources for parents to assist and guide their children (e.g., Imelised Aastad, Gordoni perekool), managed by the NIHD. Additionally, I-1 and I-4 noted government-provided e-services like e-consultations and e-referrals, primarily for general practitioners and specialists, to aid in mental health support. NGO Peaasi.ee (supported by the Health Insurance Fund and Ministry of Social Affairs) was repeatedly commended, providing extensive educational materials for adolescents, chat options with certified specialists, and self-testing questionnaires (I-2, I-3, I-5, I-8). Children's helplines, emotional support lines, and school psychologist support line, offering anonymous crisis assistance, were praised by I-6, I-7, and I-8. I-3 mentioned VATEK, a Coalition for Mental Health and Wellbeing (supported by the Ministry of Social Affairs), along with private companies like Triumf Health, collaborating with schools to provide interactive, evidence-based mental health games, and ALPA kids, a digital learning game for children aged 3-8. Additionally, I-5 highlighted programs such as the KiVa antibullying program (developed and certified by the University of Turku), NGO-based SoVa, a chat service for 7-16-year-olds seeking anonymous support, VEPA Good Behavior Game method (supported and managed by the NIHD), and NGO Vaikuseminutid, offering educational programs and practical exercises for better mental health. The last was also mentioned by I-8, who also noted Enesetunne.ee, a web platform managed by VATEK and supported by the Ministry of Social Affairs. Despite these positive examples, all interviewees acknowledged that the current arrangement is suboptimal. I-3 highlighted the need for a comprehensive approach, while I-4, I-5, and I-8 emphasized the necessity for improved coordination and organization within the system. The depiction of the results is shown in Figure 4.

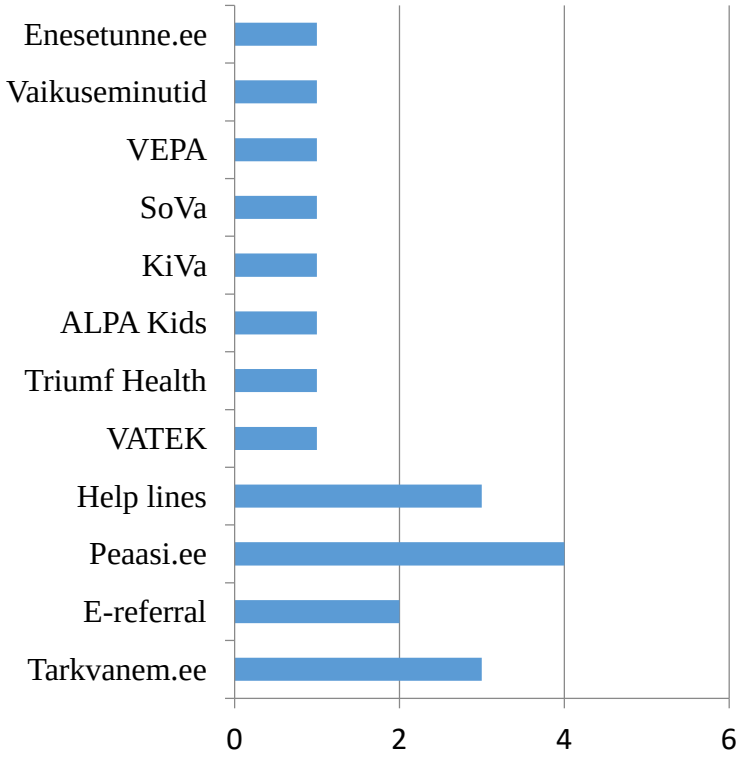

Figure 4. Illustrations of successful mental health services.

In terms of adolescent mental health services that the healthcare system is deficient in, five interviewees highlighted the need for lower-level, primary care, or community-based services. I-1 emphasized the ongoing necessity to combat bullying in schools and emphasized the importance of schools as safe and nurturing environments, suggesting a reevaluation of the entire educational system. I-1 also noted a lack of emotional and self-regulatory skills among adolescents. Similarly, I-2 and I-5 specified the need for self-assessment and self-intervention tools, while I-4, echoing I-5's sentiments, underscored the need for mental health-based educational counseling. I-3 and I-8 identified the need for clearer patient pathways within the system, with I-4 and I-8 also mentioning the absence of aftercare or ongoing home care services. When discussing the potential reasons for the absence of these services, I-2 and I-7 highlighted enduring stigmas surrounding mental health. Financing, budgetary constraints, resource shortages, and funding limitations were also frequently cited reasons (I-1, I-2, I-5, I-8). Furthermore, a lack of comprehensive vision (I-3) and insufficient focus in this area (I-5) were identified. I-8 drew attention to the transient nature of many services, which are often project-based and cease once project funding ends.

5.2 The accessibility and sustainability of e-services

In the second segment of the interview outline, the goal was to detail which e-services are recognized and endorsed, and to assess whether they offer adequate support. Additionally, the objective was to ascertain the actual demand for e-services from the perspective of each stakeholder, and to identify potential barriers to the current inadequacy in e-service provision.

5.2.1 Currently provided e-services

E-referral and e-consultations were mentioned in three interviews (I-1, I-2, I-3), while remote consultations were also noted in three interviews (I-1, I-4, I-8). Additionally, I-4 highlighted DocuMental, albeit as more of a diagnostic tool. Notably, in six instances, previously mentioned well-designed services were reiterated: Peaasi.ee (mentioned six times), lahendus.net (mentioned four times), SoVa (mentioned twice), ifightdepression (mentioned once), child helpline (mentioned once), Eluliin (mentioned once), psychologist support line (mentioned once), and Vaikuseminutid (mentioned once). In five cases, specialists acknowledged that existing services currently fail to provide sufficient assistance, while in three cases, the services were deemed efficient enough. However, in these three cases, I-5 suggested the need for more similar services to achieve sufficiency, I-7 found the services supportive but noted insufficient awareness of them, and I-8 highlighted the lack of clear pathways to guide patients through the system. The results of the interview are depicted in Figure 5.

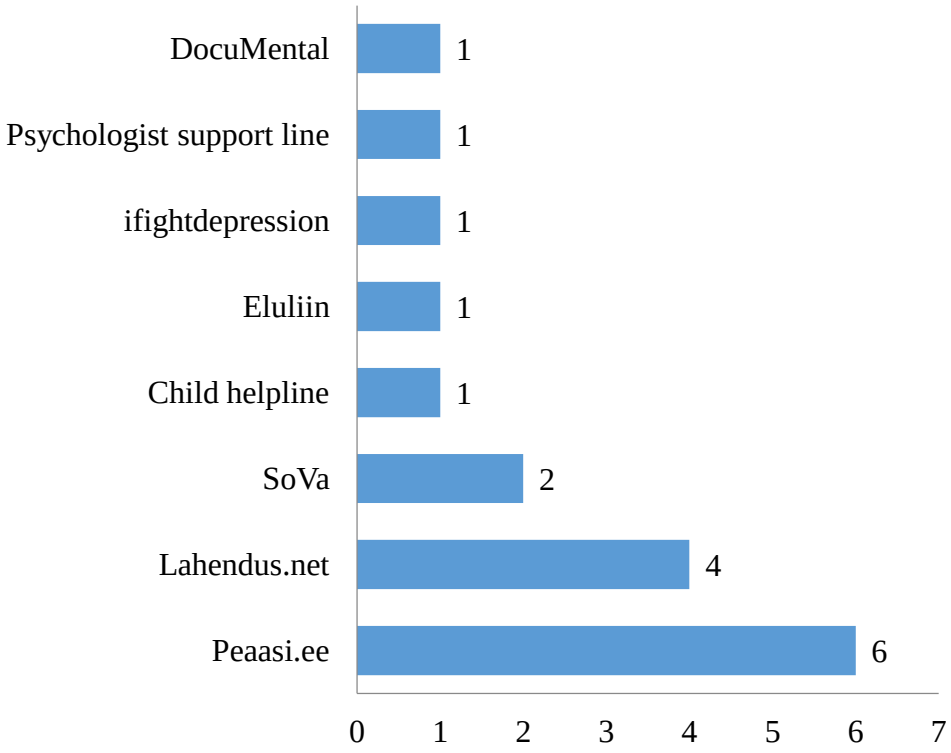

Figure 5. Current e-services based on interviews.

5.2.2 Need for further e-services

When asked about the actual necessity of e-services in the mental health domain, all interviewees unanimously affirmed their importance, particularly for the adolescent demographic. Adolescents require reliable information (I-4, I-5), with concerns about stigma and embarrassment (I-6), accessibility (I-2, I-6), and improved time management (I-2, I-6) being underscored.

Regarding the current obstacles hindering the provision of necessary e-services, six out of eight participants cited challenges related to financing, budgeting, and resource allocation. Additionally, I-1 noted a deficiency in digital service standards, while I-5 and I-4 highlighted issues with inadequate interconnectivity between different systems and lacking interoperability. A significant concern expressed was the absence of scientific evidence supporting the effectiveness of app-based interventions (I-1, I-2), along with the time-consuming nature of obtaining ethics committee approval (I-5). Furthermore, I-8 emphasized the fragmented nature of the overall system and the lack of central coordination in the landscape of e-services and digital solutions. I-4 also raised

concerns about the inadequacy of secure hardware and software to handle sensitive matters, while I-7 questioned whether the appropriate platforms or channels were being utilized to reach adolescents experiencing difficulties. Lastly, I-6 posed a pertinent question regarding funding, particularly in the context of anonymous online services.

5.3 Development and integration of e-services

The final segment of the interview blueprint aimed to offer perspectives on the types of e-services deemed necessary, their potential benefits, and the specific aspects that adolescents would prioritize. Furthermore, it involved identifying responsible entities and potential hindrances to the utilization of e-services.

5.3.1 What services are needed?

When exploring the types of e-services that adolescents may require, there were numerous suggestions to directly consult the target group, although for ethical reasons regarding the sensitive nature of the topic, this approach was presently unfeasible for this thesis. Nonetheless, specialists in the field still identified several potential needs among adolescents. They highlighted the necessity for educational tools and reliable information (I-1, I-7, I-8), self-help resources and guidance on where to seek assistance (I-1, I-2, I-3, I-7, I-8), as well as a preference for web-based counseling (I-2, I-6) with human interaction rather than artificial intelligence (I-6). Adolescents also expressed a desire for swift solutions (I-5, I-4) and personalized services (I-3, I-8) that foster a sense of community (I-8).

When considering the potential benefits of these services for adolescents, two key points emerged: first, the potential for a faster, more accessible service that provides information and normalization, and second, guidance on next steps. Additionally, I-3 suggested that these services could potentially alleviate the burden on the healthcare system overall. The conclusions are presented in Table 2.

Table 2. Required services according to expert viewpoints.

Needed services	Number of experts mentioning this solution
Educational tools	3

Reliable information	3
Self-help resources	5
Web-based counselling	2
Swift solutions	2
Further guidance for help	5
Personalized services	2

5.3.2 What services are expected?

Approaching the question from a distinct perspective, the focus shifted towards adolescents and seeking insights into the types of e-services they might desire. While initial consideration was given to directly consulting adolescents, this approach was the subject of initial commentary. However, upon further reflection, I-1 favored gamification as it combines entertainment with educational elements, thereby maintaining user engagement. I-2 emphasized the importance of any form of remote assistance that could enhance accessibility for individuals in remote regions. Similarly, I-3 envisioned interactive solutions with educational components to offer social support. I-4 highlighted the adolescents' desire for round-the-clock rapid interventions to prevent panic and catastrophizing, as well as the preference for chat options due to shyness or embarrassment. I-5 also underscored the preference for swift and convenient solutions, along with online communication options. I-6 suggested that adolescents might be influenced by popularity, seeking guidance from influencers or role models. I-7 noted that adolescents value anonymity and may be incentivized by bonus systems for motivation. Lastly, I-8 observed that adolescents seek engaging and interactive, gamification-based solutions that are evidence-based and foster a sense of community. Additionally, they often seek contact outside of regular hours and desire to feel valued and listened to, with chat capabilities being particularly appealing. The findings are depicted in Table 3.

Table 3. Anticipated services according to expert opinions.

Services preferred by adolescents	Number of experts mentioning this solution
Gamification	2
Remote assistance	1
Interactive solutions with educational components	2
Round-the-clock rapid interventions	2
Chat option	1
Prominent role models	1
Anonymity	1
Bonus systems	1
Evidence-based, trustworthy information	1

5.3.3 Development coordinator

When queried about who is leading the coordination of development in the mental health and e-service domain, seven out of eight interviewees indicated that it is the Ministry of Social Affairs, with one mentioning the NIHD leading the development of a new stepped care model. While all respondents agreed that the Ministry of Social Affairs is the appropriate institution for coordination, all participants also emphasized the importance of close collaboration with various public and private entities. Additionally, I-7 highlighted the necessity of integrating adolescents or youth into the service development process to ensure their willingness to utilize the services tailored to them.

5.3.4 Obstacles in using e-services

In the final query of the interview, the author inquired about potential obstacles to utilizing e-services, if any. In three instances, concerns were raised regarding security and the ongoing lack of evidence-based support. Additionally, I-2 noted the prevalence of interventions in the final stages of implementation. I-4 expressed that patients prefer face-to-face interactions with specialists over utilizing online or e-services. I-6 speculated that this preference might exacerbate generational inequalities rather than disparities among adolescents. I-7 suggested that e-services are currently being promoted through ineffective channels, resulting in inadequate dissemination of information to adolescents. I-8 voiced concerns regarding the potential effectiveness of e-solutions. Furthermore, I-1 identified financing as a significant obstacle, proposing prioritization of the issue as a potential solution, a sentiment echoed by I-2. Suggestions for overcoming these obstacles included standardization or regulation of e-identification and teleconsultations (I-4), as well as a call for policymakers to adopt a more flexible approach and provide increased support to product or service designers to facilitate the implementation of novel solutions (I-3). It was also suggested that clearer communication regarding the safety and recommended usage of interventions is essential (I-5, I-7). Additionally, I-8 proposed that e-services may see greater utilization if they are presented in a manner tailored to the preferences of this age group, particularly through popular platforms.

5.4 Section for unrestricted expression, inquiries, and supplementary content

Further inquiries included seeking this thesis's purpose, its anticipated publication date, and underscoring the topic's significance. Additionally, I-4 emphasized the necessity for governmental and sustained funding for Peaasi.ee, suggesting the utilization of its already established successful trademark to bolster the collective objective.

6 Discussion

In the upcoming chapter, a thorough examination of the collected data will be conducted, aligning it with the insights garnered from the literature review. Answers to the research questions will be provided, elucidating the findings and their implications.

6.1 Current adolescent mental health situation in Estonia

The recognition of mental health issues and their associated difficulties has increased significantly, especially with the onset of the Covid-19 pandemic and the conflict between Ukraine and Russia. Adolescents bore a disproportionate burden given their vulnerable age and developmental phase (WHO, 2021; Estonian Human Development Report, 2023; Sotsiaalministeerium, 2020). Their ability to cope with such stressors was notably weaker than that of adults, leading to a swift and significant decline in their mental health, accompanied by heightened risk behaviors, psychosomatic symptoms, and increased rates of suicidal ideation (OECD, 2020).

Unfortunately, experts from different stakeholder groups agreed that the societal capacity to provide much-needed assistance in this domain was deficient (Sotsiaalministeerium, 2020). There was an insufficient number of specialists to meet the swiftly escalating demand, as noted by the experts (Sotsiaalministeerium, 2020). Moreover, the educational aspect in this realm has been lacking, leaving adolescents to navigate online resources independently, often without accessing evidence-based and trustworthy information and platforms. The lack of societal and community-level awareness regarding mental health issues (WHO, 2021) compounded the absence of adequate support, leading to a situation where professional-level intervention became imperative (Estonian Human Development Report, 2023; Sacco et al., 2022; Lattie et al., 2022).

Adolescents residing in urban centers had better access to assistance, whereas those in remote regions faced a shortage of specialists. Inequities across services, regions, and communities have been prevalent, with a lack of clear pathways and instructions evident, as highlighted by the experts and the literature (Estonian Human Development Report, 2023; Sotsiaalministeerium, 2020). Despite the existence of numerous services, communication regarding available solutions has been deficient, as revealed in expert

interviews. Furthermore, there has been a lack of communication between different institutions, along with inadequate coordination and accessibility to information and assistance, as indicated by the experts and the literature (Estonian Human Development Report, 2023; Sotsiaalministeerium, 2020).

The stakeholders highlighted that numerous aspects are lacking in the current mental health landscape in Estonia, despite the area undergoing rapid development. Historically, mental health has not been a high priority, leading to insufficient financing and reliance on project-based solutions. Clear pathways for patients and specialists in the mental health area are lacking, as recognized by experts, and corroborated by the Green Paper on Mental Health (Sotsiaalministeerium, 2020) and the Estonian Human Development Report (Estonian Human Development Report, 2023). There is a pressing need for self-help and self-assessment tools, as well as safe and trustworthy low-intensity interventions, available online and easily accessible. Integrating mental health education into educational and social care aspects is crucial to combat stigma surrounding mental health problems and facilitate a more comprehensive approach to mental health and health in general (Sacco et al., 2022).

6.2 Available e-services

Although the development of various e-services has been steadily increasing, the adoption of e-services or digital interventions in healthcare, particularly in mental health, has been modest, still leaving a care gap and unmet care need (OECD, 2020). Health, especially mental health, is a sensitive subject, and as such, evidence-based interventions undergo a rigorous approval process by ethics committees and governmental regulatory bodies (Gerke et al., 2020). Moreover, stakeholder interviews uncovered a lack of consensus regarding the definition of e-services or digital interventions, which impacts the perception of the current landscape. Terms such as "digital" and "e" remain novel and may evoke confusion, resistance, and skepticism. "E-services" is used as a broad term covering all services delivered electronically, while "DMHI" or digital mental health intervention refers to more specific and structured interventions aimed at mental health (Bond, 2023). However, these terms are closely interconnected and frequently overlap, with no prior expectation for experts in distinguishing between them.

It is important to emphasize that in healthcare, including mental health, DMHIs or e-services cannot replace human interaction. The goal of supportive interventions is to augment and facilitate the work of specialists by providing evidence-based information, aiding in data collection, interpreting self-testing results, and offering self-help tools and interventions (Bantjes, 2022). These tools aim to help individuals regulate emotions, track moods, monitor daily habits, manage medication intake, and seek assistance through accessible and trustworthy channels, regardless of location or time (Sacco et al., 2022; Lattie et al., 2022).

Among the most widely used e-services in mental health support are telemedicine options, which have proven beneficial in other countries, particularly when combined with face-to-face interventions (Torous et al., 2020). However, the interviews revealed that in Estonia, skepticism persists among mental health specialists regarding their effectiveness. Concerns also arise regarding software and hardware security, data processing in online environments, and identification methods. Limited knowledge and low digital literacy among specialists and end users contribute to the modest interest in adopting more innovative solutions (Lattie et al., 2022; Torous et al., 2020).

In Estonia, e-referral and e-consultation options are widely embraced and efficient digital solutions tailored for specialists, streamlining communication, and minimizing bureaucratic hurdles, particularly between general practitioners and specialists. Furthermore, experts also highlighted DocuMental as a valuable tool designed for the diagnosis, treatment, and management of mental disorders, but primarily intended for specialists rather than end-users.

During expert interviews, various e-services were discussed, but some effective solutions were not strictly e-services, such as children's helplines, school psychologist support lines, and emotional support hotlines. While these services were cited as exemplary, there is a lack of awareness regarding e-services.

A notable e-service, as discussed in the literature review, is Peaasi.ee, a web platform providing trustworthy information on mental health topics, self-help resources, and access to professionals through chat, with government backing. It currently stands as the most recognized mental health support platform for both adolescents and adults in Estonia.

Another significant platform, highlighted multiple times, is Tarkvanem.ee (operated by the NIHD), which concentrates on parental education—a vital component in fostering adolescent development and cultivating a supportive environment for growth (Sacco et al., 2022). This aspect is pivotal in determining mental health outcomes for adolescents.

Other notable options include chat-based web counseling services like SoVa chat and Lahendus.net, offering anonymous counseling and crisis support, important to many adolescents (Bantjes, 2022). Websites such as Vaikuseminutid.ee, Enesetunne.ee, and ifightdepression.ee provide educational materials and self-help resources. Some of these services are offered by NGOs, while others receive partial support from governmental institutions or collaborate with them.

Educational methods like VEPA and KiVa aim to support the educational system and combat bullying in schools. The VEPA methodology is an evidence-based prevention activity that is used during regular teaching at school, helps to create a supportive learning environment using simple and playful classroom management techniques, supports the development of children's self-regulation and social-emotional skills, the mental health of the school family, and prevents risky behavior in children. KiVa is a program developed by the University of Turku in Finland to prevent and reduce bullying in schools. This research and evidence-based program is one of the most systematic in the world, containing many practical activities and materials for both bullying prevention and bullying resolution.

Moreover, interactive games such as Triumf Health, a personalized evidence-based mental health game designed for children aged 7-12, and ALPA Kids, high-quality digital learning games tailored for ages 3-8, offer entertaining and educational content. Although not backed by the government, these resources play a significant role in engaging younger adolescents in the educational sphere.

Evidence from numerous studies supports the use of similar supportive tools in different countries, with the objective of providing educational resources and self-help tools for understanding and managing mental health independently (WHO, 2022b). Additionally, there are easier interventions facilitated through DMHIs, such as Internet Cognitive Behavioral Therapy (iCBT), in collaboration with specialists (Lattie et al., 2022; Lal,

2019). DMHIs for youth have been shown to yield comparable outcomes to face-to-face interventions, with medium effects compared to waitlist groups (Lattie et al., 2022).

Moreover, there is evidence supporting the effectiveness of suicide prevention apps, like LifeBouy, which provide interventions for managing suicidal thoughts among individuals aged 18-25 (Bantjes, 2022). Similarly, Jaspr Health is a tablet-based application designed to support suicide prevention efforts (Dimeff et al., 2021). However, given the sensitivity of suicide and its impact on individuals, further research is needed across different age groups and its effectiveness.

Germany has introduced innovative measures by expediting the adoption of telemedicine and other low-risk medical devices/applications through the new German Healthcare Act, thereby enhancing the accessibility of healthcare solutions (Gerke et al., 2020). Similarly, New Zealand has implemented the Digital Health Strategic Framework to expedite the adoption and implementation of supportive tools in healthcare (Ratheesh & Alvarez-Jimenez, 2022).

The mental health action plan in Quebec, Canada, encourages the use of technology to enhance mental health services for youth. However, there's limited focus on specific guidelines and policies for e-mental health within provincial strategies. Provincial governments are starting to collaborate with national and international agencies to advance e-mental health research and practice. For instance, the Government of Newfoundland and Labrador partnered with the MHCC to implement and assess a stepped-care model combining online resources with in-person services. However, there's still substantial governmental progress needed in this area (Lal, 2019).

While discussions about changes are ongoing at the governmental level in Estonia and elsewhere, implementing these changes is neither swift nor straightforward. Despite the potential benefits of e-services and digital intervention tools, there are significant drawbacks to consider, particularly concerning sensitive demographics like adolescents. However, there remains a substantial treatment gap in mental health care for adolescents, and simply increasing the number of mental health specialists is insufficient to address this issue nationwide in Estonia, as well as globally. It is imperative to foster greater collaboration between innovative countries and

organizations to accelerate the approval and provision of effective and adequate mental health support.

6.3 Designing e-services

Adolescents, being enthusiastic early adopters of digital technology (Wies et al., 2021), dedicate a significant amount of time to online activities and offline communication with peers (Subrahmanyam & Greenfield, 2008). Therefore, as a receptive demographic, services should be tailored to meet their needs through the application of UCD principles. When creating e-services or DMHIs aimed at adolescents grappling with mental health challenges, it is important to recognize, as noted by one of the experts, that they may not be particularly inclined to engage with these services or seek assistance (Bantjes, 2022; Radez et al., 2021). Hence, the question arises: How can we effectively connect with these vulnerable demographics?

As emphasized by all experts, one strategy for creating services that adolescents will actively participate in is to involve them directly in the design process and seek their input. However, it is worth questioning whether adolescents truly have a clear understanding of their own preferences and needs. Given the broad age range of adolescents, spanning from 10 to 19 years old, younger individuals may not fully grasp what older ones are seeking, nor may they all benefit from the same solutions due to their varying developmental stages (Bond, 2023). While it is important to inquire about their preferences and requirements when selecting a platform or application that might attract their attention, it is equally crucial to communicate using language that resonates with their specific age groups (Lattie et al., 2022; Bantjes, 2022). Moreover, beyond soliciting their input, we must also consider their developmental needs and design solutions, accordingly, considering age-appropriate factors (Lattie et al., 2022). UCD plays a pivotal role in this process, not only in eliciting feedback from adolescents but also in ensuring that the product is tailored to the typical mental and cognitive development of young individuals (Bond, 2023). There is no universal solution; adaptability and customization are paramount when engaging with young minds striving to find their place while asserting their individuality (Bond, 2023; Ratheesh&Alvarez-Jimenez, 2022; Wies et al., 2021). As mentioned in the interviews, adolescents desire a sense of community, approval, unity, normalcy, and validation, yet they also value

independence and a clear understanding of themselves (Bantjes, 2022, Lattie et al., 2022). They are heavily influenced by their parents and surroundings, highlighting the importance of educational components to inform them about what is acceptable and normal. If support is lacking at home, it must be available externally (Hossain et al., 2022).

Adolescents often gravitate toward chatting and instant messaging (Subrahmanyam & Greenfield, 2008; Bond, 2023), whether due to feelings of shyness, embarrassment, time constraints, or concerns about their current environment's safety. Offering secure and confidential options is essential to ensure that they feel at ease when seeking help. Despite facing challenges, adolescents yearn to feel a sense of belonging and acceptance. As underscored by experts, they value solutions that are swift and readily available when needed, making scheduled or fixed appointments less suitable for delivering the interventions they seek (Radez et al., 2021). Additionally, it is crucial to note that even in online interactions, adolescents prefer engaging with real individuals rather than relying solely on AI or chatbots (Lattie et al., 2022).

An underutilized area involves self-monitoring tools such as online diaries, mood trackers, vital sign monitors, and medication intake logs, which can facilitate collaboration between patients and specialists. These tools enable remote monitoring of individuals with fragile emotional states (e.g., suicidal patients), chronic conditions (e.g., ADHD, depression, substance use, eating disorders), or acute issues (e.g., trauma, grief). The data collected through these tools can aid in evaluating lifestyle choices, tracking self-regulation efforts, and facilitating remote interventions, such as reaching out when patients fail to adhere to medication regimens or prescribed exercises (Bond, 2023; Torous et al., 2020). Mental health specialists could prescribe, evaluate, and coordinate the use of these tools to support post-care or home-care treatments effectively.

For younger adolescents, gamification and interactive elements are particularly important (Subrahmanyam & Greenfield, 2008). Educational and self-help materials should be engaging and enjoyable. They are drawn to rewards, bonuses, and healthy competition, and they want to use what their peers or idols are using. Therefore, we must approach them on their terms, understanding that what may seem logical to adults may not resonate with them.

It is imperative to establish safe, reliable, and supportive environments that offer avenues for seeking information, conducting self-assessments, and receiving personalized feedback. These environments should also present clear and accessible pathways for seeking assistance, transitioning gradually from self-help interventions to professional support (Radez et al., 2021). Achieving societal equity is crucial for fostering an environment that equips adolescents with the knowledge and support necessary for their growth and development, fostering healthy relationship dynamics and communication patterns. Mental health management is a lifelong journey, and the earlier adolescents acquire the skills to address their needs and seek assistance, when necessary, the better prepared they will be for adulthood. By promoting mental health awareness and delivering effective support during adolescence, we can nurture healthier and more resilient individuals who contribute positively to both society and the economy (Sacco et al., 2022).

Experts have highlighted the need to invest in the continuous improvement and promotion of existing e-services. This entails not only enhancing their technical functionalities but also ensuring their accessibility and usability for a diverse range of users. Moreover, efforts should be directed towards increasing awareness and knowledge about these services among various stakeholders, including healthcare professionals, educators, parents, and, most importantly, adolescents themselves.

To achieve these goals, collaborative initiatives involving government agencies, healthcare institutions, educational bodies, and technology developers are essential. By pooling resources and expertise, these stakeholders can work together to address the existing gaps and challenges in the provision of mental health services for adolescents. Furthermore, ongoing research and evaluation are crucial to assess the effectiveness of these e-services and identify areas for further improvement.

The overarching objective is to create a supportive ecosystem where adolescents feel empowered to seek help for their mental health concerns through easily accessible and user-friendly digital platforms. By continuously refining and expanding existing e-services, we can strive towards bridging the gap in mental health care and ensuring that adolescents receive the support they need to thrive.

6.3.1 The need for e-services and current obstacles

The consensus among stakeholders and literature alike suggests that e-services represent a pivotal avenue for meeting the contemporary youth's desire for accessible and reliable information, along with prompt access to online assistance or guidance when needed (Lattie et al., 2022; Subrahmanyam & Greenfield, 2008). E-mental health services, delivered via mobile apps or web platforms, have the potential to transcend regional boundaries and expand accessibility (Lattie et al., 2022). Moreover, it empowers young individuals to take charge of their mental health education and equips them with the knowledge and tools necessary for self-help (Radez et al., 2021).

In Estonia, mental health has not historically been a governmental priority, resulting in a landscape that is characterized by the stakeholders by fragmentation and inadequate coordination. Insufficient financing has hindered the development of much-needed services, particularly highlighted by the challenges brought about by the COVID-19 pandemic (Lattie et al., 2022). Despite increased resource allocation, progress remains slow, leaving a gap in the provision of interventions to address the escalating mental health needs of adolescents (Sotsiaalministeerium, 2020).

A crucial aspect of implementing e-services is the attitudes of mental health specialists and patients towards these digital interventions (Lal, 2019). While there is still skepticism among mental health specialists regarding the efficacy of e-services and digital interventions, it is imperative to recognize that the primary aim of such services is not to replace specialists but to provide evidence-based information and guidance to those in need (Lattie et al., 2022; Bond et al., 2023). Research suggests that combining e-services with face-to-face interactions yields greater efficacy (Lattie et al., 2022; Bond et al., 2023; Ratheesh & Alvarez-Jimenez, 2022), thereby bridging the gap created by the scarcity of mental health specialists.

Stigma surrounding mental health, particularly across generations, persists, and not all parents and school environments offer support (Lattie et al., 2022; Radez et al., 2021; Wies et al., 2021). The experts have brought out that community-based support systems are lacking, and even where services are available, there is often a lack of connectivity and a dearth of holistic approaches, leaving adolescents to navigate the system independently (Radez et al., 2021).

Data privacy concerns remain a significant issue, despite the potential benefits of high-quality data collection (Lattie et al., 2022; Bond et al., 2023; Wies et al., 2021). Standardization and regulation of e-services, including approvals from ethics committees, as well as governmental policies, are crucial in either facilitating or impeding the implementation of innovative technologies (Lattie et al., 2022; Wies et al., 2021; Aboujaoude & Gega, 2020).

Effective communication and marketing strategies, consensus between literature and stakeholders, suggested along with UCD principles, are essential in overcoming barriers to e-service implementation (Lattie et al., 2022; Bond et al., 2023). Educating specialists and youth alike on the safe and appropriate use of e-services is imperative (Torous et al., 2020). Digital literacy is also crucial, as individuals must possess basic competencies to derive maximum benefit from these solutions (Torous et al., 2020; Aboujaoude & Gega, 2020).

Normalization of mental health discussions and the eradication of associated stigma are vital in promoting the utilization of e-services and fostering a supportive environment for those in need (Radez et al., 2021).

Another significant consideration regarding e-services, which may not be bound by geographical regions or require identification, is the issue of funding. While many mental health support services fall under the financial responsibility of local governments, the question arises: when creating anonymous services that transcend regional boundaries, who should bear the financial burden for these services?

7 Research Contribution

This thesis's central aim is to examine the landscape of governmental mental health support for adolescents through a thorough analysis of existing e-services and digital interventions in mental health. By conducting an extensive analysis, this study aims to shed light on the breadth and depth of available resources and interventions tailored specifically for adolescents.

In addition to mapping out the existing services, this thesis also aims to provide valuable insights into areas where gaps in mental health support for adolescents exist. By identifying these gaps, the study aims to emphasize the critical types of services missing in the landscape, which are crucial for enhancing the mental well-being of adolescents.

Additionally, this research aims to explore the potential preferences and tendencies of adolescents concerning the use of mental health services, drawing insights from specialists who engage with adolescents across various domains. By exploring the types of services that adolescents are more likely to engage in, the study aims to inform the development and implementation of future interventions that are better aligned with the needs and preferences of this demographic.

Furthermore, beyond merely identifying the gaps and preferences, this thesis endeavors to delve deeper into the underlying obstacles that hinder the effective provision of e-services in the mental health domain. By soliciting perspectives from various stakeholders, including mental health professionals, policymakers, and specialists working with adolescents directly, the study aims to elucidate the challenges and barriers that need to be addressed to enhance the accessibility and effectiveness of mental health services for adolescents.

Based on the findings of this research, several significant conclusions can be drawn:

1. The persistence of stigma and embarrassment surrounding mental health issues among adolescents acts as a significant hurdle to seeking help. It is imperative to address and alleviate this stigma to ensure that adolescents feel comfortable seeking the support necessary for their mental well-being. Raising awareness of mental health issues

at the societal level is vital for fostering a supportive environment for adolescents to flourish. This includes initiatives focused on promoting mental health education and reducing stigma in various settings, such as homes, schools, and communities.

2. In Estonia, there is a noticeable dearth of government-provided mental health e-services tailored specifically for adolescents. Furthermore, existing services suffer from fragmentation, disarray, and inadequate communication. The lack of interoperability among these systems further complicates adolescents' access to mental health support. The current health system lacks clear pathways and reliable low-intensity interventions aimed at assisting adolescents in managing their mental health. Limited access to information, basic self-diagnostic tools, and self-help resources underscores the necessity for the development of accessible and trustworthy resources.

3. There exists a significant gap in aftercare and homecare services, as well as remote monitoring capabilities for adolescents with long-term or acute mental health conditions in Estonia. Addressing this deficiency is crucial for providing comprehensive and continuous support to adolescents in need. While incorporating input from adolescents is crucial for designing effective services, it is equally important to consider their cognitive and developmental stages. Tailoring services to align with adolescent growth and mental health needs ensures that interventions are relevant, engaging, and impactful.

4. The development of e-services and digital mental health interventions is gaining momentum both in Estonia and globally. These advancements leverage technology to address the shortage of human resources in mental healthcare and provide accessible and culturally sensitive services to adolescents, irrespective of geographical or socioeconomic barriers.

5. Despite the growing investment in e-services, Estonia still lacks sufficient frameworks and legislation to expedite the implementation of innovative solutions. Strengthening regulatory frameworks and adopting evidence-based practices are crucial for advancing the development and delivery of digital mental health services in the country.

8 Limitations and Future Work

In the upcoming chapter, the author will discuss any limitations encountered during the research process and propose avenues for future research to further advance understanding in this field.

8.1 Study limitations

The primary limitation encountered in this study was the exclusion of adolescents aged 10-19, which restricted the exploration of their unique preferences and needs regarding e-services. Unfortunately, due to ethical considerations, it was not feasible to include this demographic in the research now. However, future studies should aim to overcome this limitation by incorporating the perspectives of adolescents, as they are the primary beneficiaries of mental health services targeted towards their age group. By engaging directly with adolescents, researchers can gain valuable insights into their unique needs, preferences, and challenges, thus informing the development of more tailored and effective e-services.

Another limitation of this study was the small sample size of experts participating in the interviews, comprising only 8 individuals from 4 distinct stakeholder groups. While this sample size may appear modest, it is important to note that the insights provided by these experts were rich and diverse, covering a wide range of perspectives and experiences related to the provision of mental health services for adolescents. Despite the limited number of participants, the depth and breadth of information obtained were deemed sufficient for addressing the research questions and objectives outlined in this thesis. Moreover, it is worth considering that increasing the number of participants may not necessarily have significantly enhanced the value of the information gathered, as the key themes and insights had already been adequately captured.

Despite these limitations, this study offers valuable insights into the development of new e-services for adolescents and provides important considerations for future endeavors in this area. By highlighting the importance of obtaining input from both specialists and adolescents, this research underscores the need for a collaborative and user-centered approach to the design and implementation of e-services in the mental health domain. Furthermore, while acknowledging the limitations of the current study, it

is important to recognize that it serves as a foundational exploration of the topic, laying the groundwork for more targeted and in-depth research in the future. As such, this study represents a valuable contribution to the existing literature on e-services in mental health and provides a solid basis for further investigation and exploration.

8.2 Future research

A potential avenue for future research, as previously suggested, involves incorporating the adolescent or youth demographic into the study to obtain their perspectives, with a focus on user-centered design principles. By directly involving adolescents in the research process, researchers can gain valuable insights into their preferences, needs, and expectations regarding e-services and digital interventions in mental health. This could be achieved through various methods, including surveys, focus groups, interviews, or participatory design workshops. Through active engagement with adolescents, researchers can ensure that the services developed are relevant, accessible, and engaging to the target audience, thus enhancing their effectiveness and usability.

Furthermore, another crucial area for future investigation would entail developing a framework for assessing novel services, platforms, and digital intervention tools, aiming to furnish users with pertinent information. This framework could encompass various dimensions, such as usability, effectiveness, accessibility, privacy, and user satisfaction, among others. By systematically evaluating these aspects, researchers can provide valuable insights into the strengths and limitations of different e-services and digital interventions, helping users make informed decisions about their use. Moreover, such a framework could serve as a valuable resource for developers, policymakers, and mental health professionals seeking to design, implement, and evaluate digital mental health solutions. Additionally, researchers could explore the feasibility and acceptability of implementing such a framework in real-world settings, assessing its utility and effectiveness in guiding decision-making and improving the quality of care provided.

Overall, these potential avenues for future research hold significant promise for advancing our understanding of how best to design, implement, and evaluate e-services and digital interventions in mental health. By incorporating the perspectives of adolescents and developing robust frameworks for assessment, researchers can

contribute to the ongoing efforts to enhance the accessibility, effectiveness, and quality of mental health care delivery in the digital age.

9 Summary

The primary objective of this thesis was to survey the landscape of mental health support available to Estonian adolescents through e-services. Qualitative data was collected via interviews with stakeholders involved in adolescent mental health.

The interviews revealed unanimous agreement among experts regarding the inadequate mental health support for adolescents, characterized by a lack of coordination, fragmented services, and a dearth of clear pathways and reliable lower-level interventions. Despite recognizing the necessity of e-services in this domain, experts cited insufficient resources and delayed governmental prioritization as key obstacles. There also appeared to be some skepticism regarding the benefits of e-services, with concerns about their potential to replace traditional mental health specialists. Issues of mistrust in processes, personal identification, and the lack of evidence-based interventions were also raised.

Experts emphasized the need for trustworthy and evidence-based informational resources to provide insights into problems and offer potential solutions to adolescents. Education was highlighted as crucial for empowering adolescents to make informed choices about their mental health. The absence of simple interventions and clear pathways for accessing help was identified as a significant gap, particularly for adolescents in remote areas or those hesitant to seek traditional therapy.

While several e-services are currently operational, many lack government support or funding to deliver adequate assistance. Experts suggested leveraging existing solutions and enhancing them rather than creating entirely new interventions, as many existing projects are short-lived due to funding constraints.

In summary, addressing the substantial treatment gap in adolescent mental health requires the provision of easily accessible, low-level, and trustworthy services. Additionally, raising awareness and normalizing discussions around mental health issues and help-seeking behavior in society is crucial. Further research is warranted to involve adolescents in the design of services that align with their preferences and address their specific needs.

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Appendix 2 – Informed consent for experts

Tere kena tööpäeva!

Lugupeetud (intervjueeritav). Olen TalTech MA tudeng e-riigi teenuste ja tehnoloogiate erialalt ning kirjutan magistritööd teemal „E-governance services for adolescents with mental health problems in Estonia."

Teie kui (asutuse esindaja) seisukoht noorte vaimse tervise hetkeolukorrast oleks väga oluline sisend kaardistamaks praegust maastikku ning leidmaks uusi lahendusi noorte vaimse tervise toetamiseks.

Kasutan andmekogumise metoodikana intervjuusid spetsialistidega erinevatelt erialadelt, kes puutuvad kokku noorte ja/või terviseinnovatsiooni valdkonnaga ning paluksin võimalust ka Teiega intervjuu läbi viia. Intervjuu toimuks MS Teams keskkonnas, magistritöö huvides video salvestatakse, kuid on kasutamiseks ainult antud teadustöö huvides.

Intervjuu kätkeb endas küsimusi noorte vaimse tervise, olemasolevate ja võimalike e-teenuste kohta. Intervjuu kestus jääb orienteeruvalt 30min-1h ringi. Võimalusel viiksime intervjuu teadustöö huvides läbi inglise keeles, kuid kui see ei ole võimalik, võib intervjuu olla ka eesti keeles.

Kui sooviksite antud teadustöösse oma panuse anda, saaksime juba Teile sobival ajal intervjuu aja kokku leppida.

Parimate soovidega

Anneli Belkin

Hello!

Dear (interviewee). I am a TalTech MA student majoring in e-government services and technologies and I am writing a master's thesis on "E-governance services for adolescents with mental health problems in Estonia."

Your position as a (representative of the institution) on the current situation of youth mental health would be an important input to map the current landscape and find novel solutions to support youth mental health.

As a data collection methodology, I use interviews with specialists from various disciplines who encounter the field of youth and/or health innovation, and I would like the opportunity to conduct an interview with You as well. The interview would take place in the MS Teams environment, the video will be recorded for the sake of the master's thesis, and only be used for the sake of this research.

The interview contains questions about the mental health of young people, existing and possible e-services. The interview lasts about 30min-1 hour. If possible, we would conduct the interview in English, but if this is not possible, the interview can also be in Estonian.

If you would like to contribute to this research, we could arrange an interview at a time convenient for You.

Best wishes

Anneli Belkin

Appendix 3 – Interview plan

Topic	Question	Extension	Time
Background information about the interviewee	What is your current occupation?	How long have you been working in this field?	3-5 min
Current mental health situation	If you think about children's mental health support, then how would you describe the current situation?	How, in your opinion, are current processes and solutions functioning?	10-20 min
	What services are currently well organized in the system? What kind of services are currently lacking in the health system?	Is this kind of arrangement optimal? If there are services missing, what do you think is the reason behind it?	
E-service availability and sustainability	What kind of mental health e-services are provided for adolescents currently?	Do the existing services provide sufficient and effective assistance?	7-15min
	Is there a need for e-services in that field in your opinion? Why/why not?	What are the current obstacles in your opinion?	
E-service creation and implementation	What kind of e-services would adolescents need?	How could e-services benefit adolescents?	8-15 min
	What kind of e-services would adolescents want to use?	Why is that?	
	Who, in your opinion, is coordinating the development in this area?	Who, ideally, should be coordinating this field and taking responsibility?	

	What are the main obstacles in using e-services?	How could these obstacles be overcome?	
Free speech	Is there anything else you would like to add?		2-5 min