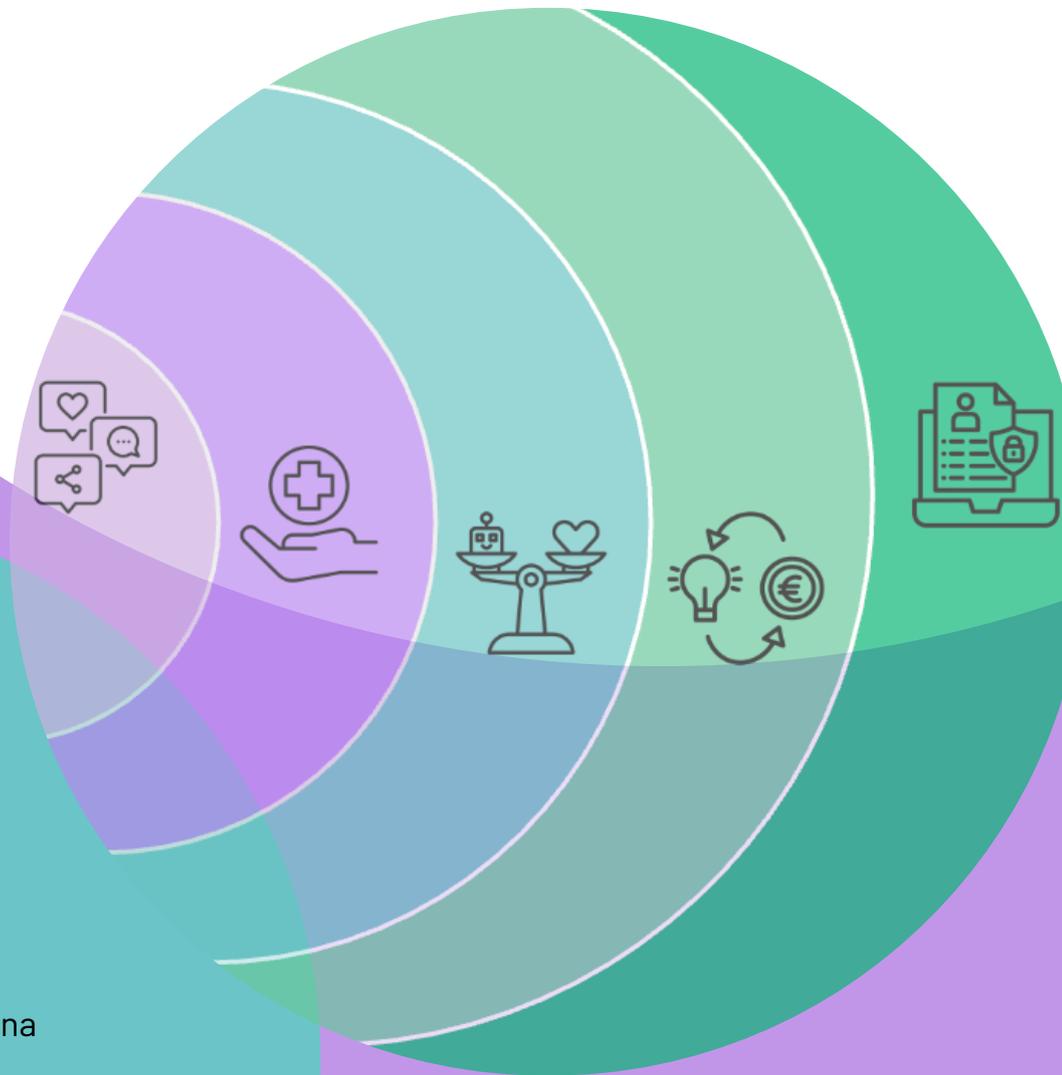


Transdisciplinary Field Research Project

Digitizing Mental Health: Entrepreneurial Pathways for AI Chatbots in the Irish Care Ecosystem

Opportunities and Challenges for Future of Digital
Mental Health Entrepreneurship



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Executive Summary

This project was part of the Transdisciplinary Field Research Training (TFRT) in the MSc Transition, Innovation and Sustainability Environments (TISE), equipping future practitioners on sustainable transitions through systems thinking and innovation. TISE is joint master's by University for Continuing Education Krems (Austria), Universidade Nova de Lisboa (Portugal), University College Dublin (Ireland), and Poznań University of Economics and Business (Poland).

The study explores how digital entrepreneurship can advance AI-powered mental health (DMH) chatbots for youth in Ireland, where rising mental health needs intersect with increasing demand for mental health services. While chatbots offer scalable, stigma-free support, their effective deployment requires ethical design, sustainable business models, and integration into care systems—highlighting the need for implementation science and active stakeholder involvement to navigate this complex landscape. Ireland's high youth mental health burden and growing digital health sector make it a highly relevant context for examining such innovations.

The study used systems and design approaches, engaging stakeholders from academia, industry, and policy to explore the key opportunities and challenges in developing mental health chatbots for youth in Ireland—and how collaboration can drive responsible digital entrepreneurship in this space. In this report, we explore the pathways for digital mental health (DMH) entrepreneurship in Ireland, and in doing so, we address three interrelated questions that shape our understanding of this evolving landscape. Firstly, we examine the current context by identifying key factors influencing the development and implementation of chatbot-based mental health solutions, revealing the structural and contextual dynamics at play. Second, we explore how tensions between emerging opportunities and ongoing challenges could shape future directions, leading to plausible pathways that expose potential risks, trade-offs, and prospects for responsible innovation. Finally, we propose a sustainable transition framework that emphasizes ethical alignment, stakeholder collaboration for the future of DMH in Ireland.

In conclusion, mental health chatbots offer scalable, stigma-free support for young people, presenting a promising avenue for addressing gaps in mental health care. However, their success depends on navigating ethical, clinical, regulatory, and business viability challenges. Strong policy frameworks, close collaboration between developers and mental health professionals, and the development of sustainable and viable business models are essential to ensure these tools are safe, effective, and accessible for those who need them most.

Team

David Vuth

David is from Cambodia and has an academic background in economics. He has worked with a multilateral organization with a focus on socio-economic development. His interest in the project lay in understanding how public institutions can support entrepreneurial solutions that enhance well-being in community contexts.

Lucy Namakula

Lucy is from Uganda and has a background in community psychology. She has previously worked as a mental health social worker supporting young people. Her experience contributed towards shaping the group's understanding of real-world challenges in mental health care as she contributed with she simultaneously researched on emerging mental health chatbots markets in Uganda

Sabira Ataibekova

Sabira is originally from Kyrgyzstan and has a background in linguistics. She joined the project with both academic interest and personal curiosity as a user of mental health chatbots. She contributed with her technical and creative expertise in positioning this research aligning the research focus while prioritising the young people's use of technology.

Safaa Zaki

Safaa is from Morocco and holds an academic background in Engineering and management science. She has professional experience in marketing and digital entrepreneurship. Her contribution to the project focused on the role of technology and business in creating impactful mental health solutions, with an emphasis on user engagement and innovation.

Shivam Shumsher

Shivam is from India and a social worker by training with a background in public health and responsible business. He contributed towards technical expertise along with stakeholder participation and adapting towards collaborative practice for transdisciplinary and implementation science for emerging care-technologies.

Supervisor: Dr. Liliya Satalkina

Dr. Liliya Satalkina is a postdoctoral researcher at the Department for Knowledge and Communication Management at the University for Continuing Education Krems (also known as Danube University Krems) in Austria. Her research focuses on digital entrepreneurship, innovation systems, and social innovation. She has authored several publications, including "Digital Entrepreneurship and its Role in Innovation Systems: A Systematic Literature Review as a Basis for Future Research Avenues for Sustainable Transitions" and "Social Innovation: A Retrospective Perspective." Dr. Satalkina has also contributed to projects such as "Migrant Digital Entrepreneurship: Migrants' Startups as Drivers for Innovative Regional Development."

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1. Introduction

1.1. Mental Health Challenges and the Promise of Digital Solutions

Mental health struggles are rising globally, especially among younger people. In Europe, the Global Burden of Disease (GBD) Study 2019 revealed that, between 1990 and 2019, mental health conditions posed a major health burden for young people, leading to both disability and premature deaths yet many of them often remain undetected and untreated for extended periods (Castelpietra et al., 2022). Digital mental health (DMH) refers to the use of digital technologies—such as mobile applications, web-based platforms, and telepsychiatry—to deliver mental health services. These tools aim to enhance accessibility, reduce costs, and provide flexible support options for individuals seeking mental health care (Harty et al., 2023).

Despite their potential, several gaps exist in the current DMH landscape. A study evaluating the first year of a national digital cognitive behavioral therapy (CBT) service in Ireland found that while digital interventions can be effective, challenges remain in ensuring consistent user engagement and integrating these tools into traditional healthcare settings (Harty et al., 2023). Additionally, barriers such as digital literacy, data privacy concerns, and the variability in the quality of digital mental health interventions (DMHIs) can hinder widespread adoption (Bamijoko-Okungbaye & Idemudia, 2020).

1.2. Digital Entrepreneurship and the Irish Mental Health Landscape

Entrepreneurship can offer a pathway to address these gaps by fostering innovation and developing user-centered DMH solutions. Collaborations between clinicians and digital industries can lead to the creation of ethical, evidence-based, and quality-controlled interventions that are both effective and engaging (American Psychological Association, 2024). By leveraging technological advancements and business acumen, entrepreneurs can design scalable DMHIs that cater to diverse populations, ultimately enhancing the reach and impact of mental health services (Balaskas & Coyle, 2024; Insight SFI Research Centre, 2024). This rise of DMH startups also aligns with the growing recognition of entrepreneurial technology ventures as key drivers of societal improvement, while patients increasingly adopt the role of medical consumers (Achtys et al., 2023).

In 2025, the Irish government allocated €23 million for digital health projects, including shared care records and patient apps, while the Health Service Executive (HSE) has been integrating DMH

solutions since 2018, expanding services like video-enabled psychology support and free digital CBT under the *Sharing the Vision* policy (Pulse IT News, 2024; EMHIC, 2024). With Ireland ranking among the highest in Europe for mental health challenges (Hyland et al., 2022) and long waiting times for traditional services, AI powered chatbots provide an accessible and scalable solution. While Mental health chatbots provide quick, accessible, and tailored psychological assistance, these technologies also introduce challenges such as privacy concerns, ethical considerations and the necessity for human supervision (Kretzschmar et al., 2019).

The success of DMHIs depends on a stakeholder-centered approach that involves co-production with users, clinical integration, and structured engagement models like I-STEM to support adoption and sustainability (Edbrooke-Childs et al., 2025). Effective chatbot development requires aligning user needs, clinical validation, and technical capabilities (Panch et al., 2023; Potts et al., 2021). Bond et al. (2023) advocate for evidence-based systems thinking and interdisciplinary collaboration—such as ‘channel switching’—to better link digital and face-to-face care. However, a lack of transdisciplinary co-creation, particularly in integrating psychology, AI, linguistics, and ethics, can lead to tools that miss the needs of diverse users, especially youth (Frolova & Bernikova, 2023). The role of AI in mental health entrepreneurship also remains underexplored, underscoring the need for collaboration between startups, clinicians, policymakers, and technologists to build a responsible and inclusive DMH ecosystem.

1.3. Scope of the Study

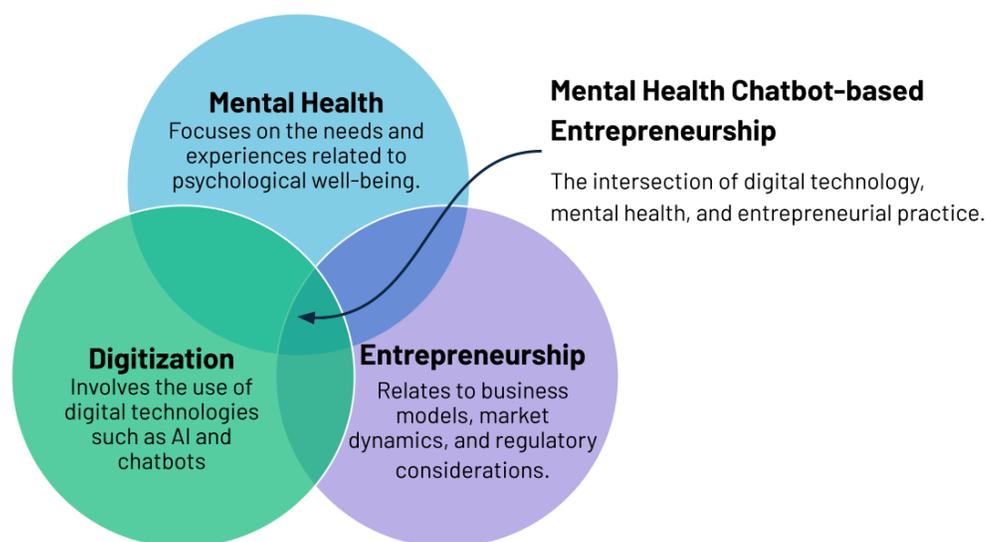


Figure 1: Transdisciplinary interaction of mental health, digitization and entrepreneurship

This study explores the evolving landscape of digital entrepreneurship in mental health as described in figure 1, investigating the opportunities and challenges of digital entrepreneurship in the development of AI-powered mental health chatbots for Ireland. The study was guided by the question: **What are the key opportunities and challenges of digital entrepreneurship in the development of mental health chatbots for youth in Ireland, and how can collaboration among stakeholders drive innovation in this space?**

The guiding question facilitated transdisciplinary engagement for the sustainable transition of health systems. As part of the Transdisciplinary Field Research Training (TFRT) in the TISE Master's programme, the study integrates diverse perspectives from academia, industry, and practice to provide a socio-technical analysis of chatbot-driven mental health entrepreneurship in the Irish healthcare landscape.

The scope includes:

- Investigating system-level factors (e.g., policy, regulation, culture, and funding) that influence innovation in youth-focused DMH.
- Exploring the design, implementation, and sustainability of business models for AI-powered mental health chatbots.
- Mapping stakeholder perspectives across academia, industry, and policy through a survey and co-creation workshop, focusing on adoption barriers, ethical concerns, and future innovation pathways.
- Applying systems-thinking tools, including the Innovation System Framework and causal loop diagrams, to understand interdependencies and feedback dynamics across the mental health innovation ecosystem.
- Generating Socially Robust Orientations (SoROs) by collaboratively identifying actionable strategies and stakeholder-informed pathways for ethical and sustainable innovation.

The study does not aim to evaluate existing chatbot technologies or deliver generalizable findings. Instead, it offers an exploratory, participatory approach to strategic scenario-building and roadmap development—grounded in Ireland's context, yet applicable to broader conversations on responsible DMH innovation.

2. System Analysis

2.1. Youth Mental Health in Ireland: Emerging Digital Realities

2.1.1. Understanding the Mental Health Landscape

The World Health Organization (WHO) (2005) defined mental health as a state of well-being where individuals acknowledge their abilities and can effectively manage the usual stresses of daily life. The cost of mental health is very significant to the individual, community and society if not properly and positively cultivated (Rochford et al., 2018). As a matter of fact, despite the achievement of economic development and remarkable digital transformation in Ireland since 2011, public concerns like mental health issues are still one of the most complex and intricate societal problems in this nation. Ireland ranked 3 of 36 countries that has one of the highest rates of mental illness in Europe (Hyland et al., 2022). According to Cullen (2018) demonstrates that in 2016 over 18.5% of the Irish population was diagnosed as having mental illnesses. The most common are disorders such as depression, anxiety, bipolar, schizophrenia and addictions. The Health Service Executive (HSE) expresses the concern that one in four or five Irish citizens will develop mental conditions in his/her lifetime, little is known about the mental health risk and protective factors of young people from the age 12-25 years (HSE, Ireland, 2020).

Youth is the golden time to cultivate the development of positive mental health (Rochford et al., 2018). Mental health services for young people in Ireland are severely lacking, even though mental health concerns are highly prevalent in this age group. McMahon et al. (2019) indicate that significant national involvement and increased resources are essential to overcoming barriers and gaps in Ireland's youth mental health services. According to *My World Survey 2* (Dooley et al., 2019), mental health challenges among young adults in Ireland have increased significantly. The study found that 42% of young adults aged 18-25 years were in the normal range for depression, while 23% were in the severe to very severe range. Anxiety was also a significant concern, with 19% of young adults falling into the very severe category. Additionally, LGBAP (Lesbian, Gay, Bisexual, Asexual, Pansexual) youth were disproportionately affected, reporting higher levels of depression, anxiety, and experiences of discrimination. Financial stress was a key concern, with 37% of young adults experiencing high levels of financial stress, and 58% of females were particularly affected by financial concerns (Dooley et al., 2019). The *My World Survey 2* (Dooley et al., 2019) found that 56% of young adults reported coping well with problems, employing strategies such as talking to friends, listening to music, engaging in

exercise, and getting adequate sleep. The presence of "One Good Adult" support (a trusted adult figure) was a key protective factor, with 76% of young adults reporting having such support. These individuals had lower levels of depression and anxiety and higher levels of self-esteem, resilience, and optimism compared to those without such support.

Regarding social media use, 99% of young adults had at least one social media account, with 96% on Facebook, 89% on Snapchat, 87% on Instagram, and 28% on dating apps. While 30% spent more than 3 hours online daily, those who spent less than 2 hours online reported better coping strategies and higher mental well-being. The study also highlighted concerns about negative online experiences, including cyberbullying and exposure to harmful content, which were linked to increased levels of anxiety and depression (Dooley et al., 2019). While digital platforms offer avenues for support and awareness, they also contribute to challenges such as misinformation, online harassment, and the reinforcement of stigma surrounding mental health.

2.2 The Rise of DMH Tools

2.2.1 Expanding the Role of Technology in Mental Health Care

Cullen & Phillips (2023) highlight DMH to technology-enabled provision of mental health services and supports. It is regarded as an application of digital technologies in mental healthcare that can be used for different purposes, including mental health and well-being promotion and prevention, well-being maintenance or self-care, early intervention or for treating a particular mental health concern through utilizing online video communication technologies (Bond et al., 2023). Prior to the COVID-19 pandemic, digital platforms were already a well-integrated component of the mental health landscape, serving purposes such as providing online information, psychoeducation, and guidance; offering online Cognitive Behavioural Therapy (CBT) programs; and supporting mental health through various apps. Since the emergence of the COVID 19 epidemic, the restrictions led to a significant transition toward delivering client-therapist sessions remotely through video calls and other methods. With the ever-increasing use of digital devices among young people in lower resource settings, the role of technology as a tool for promoting mental health and well-being will become even more significant, especially as gaps in available in-person mental health services remain substantial (Naslund et al., 2019).

A research conducted by Bamijoko-Okungbaye & Idemudia (2020) further explains that effectiveness in the Telemental health field may help reduce the morbidity numbers linked with disorders in Ireland, thus helping patients to improve their well-being without the need for physical consultation with mental experts. Digital innovation plays a crucial role in many aspects of the society, not limited to just the financial and manufacturing industry, but also has actively engaged in the medical field (e.g telemedicine, telemental health). Therefore, it is essential that both public and private health services can innovate and adopt the most up to date technologies to support the provision of mental health well-being.

2.2.2 Emergence of AI-Integrated Chatbots

Nowadays the proliferation of smartphones and the accessibility of digital tools have transformed how individuals engage with mental health support. Applications offering tests, journals, meditation programs, and breathing exercises are increasingly used to cope with mental health challenges. Among these, AI-integrated chatbots have emerged as a prominent innovation. AI chatbots are advanced conversational systems that utilize big data, natural language processing (NLP), and machine learning (ML) to learn, perform various tasks independently or with humans (Caldarini et al., 2022, as cited in Balcombe, 2023).

The evolution of AI chatbots from early models like ELIZA developed in 1966 “to simulate a text-based conversation with a psychotherapist” (Laranjo et al., 2018) to more advanced systems powered by generative pre-trained transformers (e.g., GPT-4) has increased their potential. Their usage is impacting different aspects of our lives, where mental health support is one of the most popular areas (Daley et al., 2020) as they offer a promising solution to address barriers in accessing personalized, immediate, stigma-free, and affordable support. While AI chatbots are not yet a substitute for human professionals, their ability to expand the scope of digital psychological support makes them a valuable component of mental health strategies (Balcombe, 2023).

2.2.3 Chatbots as a Response to Mental Health Stigma

Several studies have been conducted to show the negative consequences of mental health stigma among young people. Rodrigues-Rivas et al. (2022) identified stigma as the primary barrier preventing access to specialized mental health services. Their study is further emphasized by Song et al. (2023) who noted that stigma contributes to the high rates of undetected and untreated mental health cases among young people as it influences people’s health-seeking behavior reducing their

intentions to seek help. Young people are especially vulnerable to mental health stigma, resulting in aggravated mental health conditions and significant negative life outcomes such as an increased risk of suicide and mortality (Rodrigues-Rivas et al., 2022). Song et al. (2023) similarly argue that adolescents' experiences of mental health stigma worsen their mental health conditions and negatively impact different areas of their lives. They further assert that young people who blame individuals with mental illness are more likely to distance themselves from them, which decreases the willingness for those with mental illness to seek help. Another study conducted by Prizeman et al. (2023) found that depressed young people often feel misunderstood, judged, and discriminated against by other people. They argue that this lack of support results in feeling lonely and socially isolated which affects their confidence and self-esteem resulting in secrecy and hesitation to talk about their condition further exacerbating the challenges they face.

Mental health chatbots provide great opportunities to curb the negative consequences of mental health stigma and have people receive the treatment and support they need in time. For instance, Hoffman et al. (2024) have argued that DMHIs can overcome the barrier of help-seeking stigma on psychotherapy for young adults as they provide anonymity and privacy. Their study found that people with high self-stigma toward seeking help from human therapists had more positive attitudes towards AI-delivered therapy as they see it less stigmatizing. These findings align with research by Kosyluk et al. (2024) who found that individuals who avoid being labeled with a mental illness are less likely to seek traditional clinic-based mental health services but are more inclined to use mental health chatbots. Similarly, Kim et al. (2022) examined the role of Mobile Health Applications (MHAs) in overcoming mental health stigma involving college students and found that those with higher levels of stigma toward mental health treatment preferred to use MHAs over in-person mental health services.

There is a growing acceptance of digital health tools that provide privacy, anonymity, and treatment for mental health conditions. As a promising tool for meeting the mental health needs of diverse populations without stigmatization, mental health chatbots present profound opportunities for digital health entrepreneurship.

2.3. Digital Entrepreneurship and the Chatbot Market

2.3.1 Mental Health Innovation through Digital Entrepreneurship

The concept of digital entrepreneurship in the healthcare field has been understood differently from diverse stakeholders. For instance, one might think of it as a digital intervention like mobile apps or virtual reality that help to support the well-being of people (Bond et al., 2023), whilst other might be more focused on the application of artificial intelligence (A.I) (Mulvina et al., 2021). Moreover, moving towards the AI, the natural language processing (NLP) technology, entrepreneurs have shifted their focus on the use of chatbots for typed therapy to allow users to converse about mental health (Fitzpatrick et al., 2017) or employing speech analysis to subtly monitor mood, as well as utilizing algorithms that suggest high-quality responses for psychotherapists to choose from when providing online chat-based cognitive behavioural therapy (CBT) (Salmi et al., 2021). As suggested by Bond et al. (2023), a clear benefit of digital interventions (e.g. apps and chatbots) is that they can have an adjunctive use in therapy provision, and are available 24/7 allowing clients to access support in-between face-to-face therapy sessions and seek support in less sociable hour.

When addressing digital transformation in the healthcare domain, we often look into key innovations, including telemedicine, mHealth, eHealth, and electronic health record systems (Kraus et al., 2021). With the increasing adoption of internet and mobile phone ownership around the world, telehealth has become more feasible for society and entrepreneurial activity relevant to promoting healthcare even with limited resources (Harris et al., 2024). This shift from traditional treatment to DMH solutions, including telemental health, allows individuals to receive remote therapy through apps or online platforms without the need for in-person consultations (Bamijoko-Okungbaye & Idemudia, 2020).

In terms of mapping the typology of mental health chat-bots businesses as per table 1, there is a growing demand for accessible mental health:

Mental Health Business Model	Description
Subscription-Based Model	Subscription-based chatbots generate revenue through recurring fees, providing scalable mental health support (Yuan et al., 2024). Platforms like Woebot and Wysa use this model, offering both basic and advanced mental health tools. In workplace settings, chatbots help manage employee mental health challenges and improve productivity (Yuan et al., 2024).

Freemium Model	The freemium model provides free core services while charging for premium features, making mental health chatbots accessible to a broad audience (Cameron et al., 2017). This approach supports rapid user base growth while monetizing premium features like personalized care or advanced analytics. In workplace settings, chatbots offer free basic mental health resources and charge for enhanced support, making them adaptable for both organizational and individual use (Cameron et al., 2017).
Corporate Wellness Partnerships	The corporate wellness partnership model integrates chatbots into employee wellness programs to address workplace stress, anxiety, and burnout (Yuan et al., 2024). Companies pay for workforce access through B2B agreements, making chatbot services more accessible and cost-effective. Demand for this model continues to grow in workplace settings (Yuan et al., 2024).
Pay-Per-Use Model	The pay-per-use model allows users to pay for individual sessions or interactions with a chatbot, making it ideal for short-term needs or emergencies (Moilanen et al., 2023). This approach caters to users seeking immediate support without long-term commitments. Interaction-driven chatbots using this model provide tailored, on-demand mental health assistance (Moilanen et al., 2023).
Insurance Partnerships	The insurance partnership model allows chatbots to be reimbursed or partially funded by health insurance providers, increasing accessibility for users (Vijayarani & Balamurugan, 2019). When integrated into health insurance plans, chatbots help reduce therapy costs for mild-to-moderate mental health issues. Regulatory frameworks play a key role in making insurance-backed chatbot services feasible, especially in regions with limited mental health infrastructure (Vijayarani & Balamurugan, 2019).
Research and Data Licensing	The research and data licensing model involves selling anonymized user data to research institutions, healthcare organizations, or pharmaceutical companies to analyze mental health trends and enhance interventions (Abd-alrazaq et al., 2019). Chatbots gather user insights that contribute to studies on emotional patterns and therapy outcomes. While this data supports healthcare providers and researchers, strict privacy protections are essential (Abd-alrazaq et al., 2019).
In-App Purchases and Add-Ons	The in-app purchases and add-ons model allows chatbots to offer additional features like guided therapy modules, diagnostic tools, and personalized progress tracking for a one-time fee or subscription upgrade (Rathnayaka et al., 2022). Behavior-based, personalized tools integrated into chatbots enhance user engagement and provide targeted support (Rathnayaka et al., 2022).
Advertising and Sponsorships	The advertising and sponsorship model enables free chatbots to generate revenue through sponsored content and partnerships with wellness brands or organizations (Almeida & Silva, 2022). Chatbots may feature advertisements for self-help books or mindfulness tools, ensuring free access for users while maintaining a steady revenue stream (Almeida & Silva, 2022).
Hybrid Models	The hybrid model combines multiple revenue streams, including subscription fees, corporate wellness partnerships, and data licensing for research institutions (Grové, 2021). Chatbots using this model may offer free basic features, premium subscriptions for personalized support, and anonymized data licensing to universities. Youth-oriented chatbots have successfully implemented this approach by integrating user-based

revenue with institutional support (Grové, 2021).

Table 1: Chatbot based health-business models: (Adapted from Yuan et al., 2024; Cameron et al., 2017; Moilanen et al., 2023; Vijayarani & Balamurugan, 2019; Abd-alrazaq et al., 2019; Rathnayaka et al., 2022; Almeida & Silva, 2022; Grové, 2021).

2.3.2 Business Models and Local Success Stories

The AI-powered mental health chatbot market is growing rapidly due to increased awareness of mental health issues and advances in AI. In 2023, the global AI in mental health market was valued at approximately USD 1.13 billion and is expected to grow at a compound annual growth rate (CAGR) of 24.10% from 2024 to 2030 (Grandview Research, 2023). Another report estimated the market size at USD 0.92 billion in 2023, with a projected CAGR of 32.1% from 2024 to 2033 (Market.us, 2023). Focusing on chatbots specifically, the market size was estimated at USD 1.3 billion in 2023 and is expected to reach around USD 2.2 billion by 2033, with a CAGR of 5.6% during this period (Market.us, 2023). These trends highlight the growing reliance on AI-powered tools to meet the increasing demand for mental health support. Speaking of Ireland, entrepreneurship has shown resilience and steady growth, with the Total Early-Stage Entrepreneurial Activity (TEA) rate at 12.5% in 2021, reflecting a robust ecosystem (GEM Ireland, 2021). Government initiatives, particularly by Enterprise Ireland, have played a significant role in supporting startups through funding, mentorship, and other resources (Enterprise Ireland, n.d.).

Ireland's government provides significant support for startups, particularly in the health tech sector, through funding programs, incubators, and mentorship, enabling innovation and international scalability (Enterprise Ireland, n.d.). Ireland's entrepreneurial landscape is vibrant, with key advancements in mental health solutions like AI-driven chatbots. Strong government support and ongoing innovation indicate a promising future for this sector.

The Irish government focuses on addressing mental health issues among youth, LGBTI+ individuals, vulnerable children, and those affected by trauma or crisis. Key populations of concern include young people facing mental health challenges, individuals experiencing bereavement or isolation, and those in acute crises. AI can enhance support for these groups by offering tailored interventions, improving accessibility, and augmenting crisis management services (Health Service Executive, 2022)

Aspect	Woebot Health	SilverCloud by Amwell
Company Background	Founded in 2017 by Dr. Alison Darcy. AI-powered chatbot providing CBT via conversational text. Irish founder with Dublin-based engineering hub. (Gain, 2021; Harvard Business School Digital Initiative, 2023; Ohnouna, 2023)	Founded in 2012 as a spin-out from Trinity College Dublin. Provides structured digital CBT programs with clinical oversight. Acquired by Amwell in 2021. (Trinity College Dublin, 2022; Darmody, 2021)
Business Model & Revenue Strategies	Started as direct-to-consumer, now shifting to B2B with healthcare providers and insurers. Freemium model initially; exploring reimbursable clinical products. (Harvard Business School Digital Initiative, 2023; MobiHealthNews, 2023; Woebot Health, 2023)	B2B model targeting health systems, employers, and insurers. Licensed to HSE, NHS, and global clients as part of mental health services. (Darmody, 2021; MemorialCare Innovation Fund, 2019)
Market Entry in Ireland	Available in Ireland via global app store distribution. Has an Irish presence but not formally integrated with the HSE. (Gain, 2021; Harvard Business School Digital Initiative, 2023)	Fully integrated into the HSE's national digital mental health service. Referred by GPs and psychologists. SilverCloud by Amwell, 2021; Amwell, 2024)
Funding and Investment	Raised over \$114M, including a \$90M Series B in 2021. Strategic investments from Bayer and global VCs. (Darcy, 2023; Gain, 2021; Globe Newswire, 2018; Harvard Business School Digital Initiative, 2023a, 2023b)	Raised ~\$30M before being acquired by Amwell. Series B led by health system venture funds. (Darmody, 2021 SilverCloud by Amwell, 2021)
Technological Innovations	AI-based relational agent using NLP to simulate human-like empathy. Testing LLM integration under clinical trials. (Harvard Business School Digital Initiative, 2023; Darcy et al., 2021)	Structured online CBT modules with interactive tools. Supported self-help model with human coaches. Integration with health records. (MemorialCare Innovation Fund, 2019)
Regulatory Considerations	FDA Breakthrough Device Designation for postpartum depression tool. GDPR and HIPAA compliant. (Woebot Health, 2021a, 2021b)	CE marked; used by NHS and HSE. Operates under clinical governance rather than FDA-style approval. Fully GDPR compliant. (SilverCloud® by Amwell®, n.d.)
User Adoption & Engagement	1.5M+ global users. High short-term engagement through daily chatbot conversations. Emotional bond formation reported. (NJ Spotlight News, 2023; Harvard Business School Digital Initiative)	1M+ global users; 12,000+ in Ireland. High satisfaction and completion rates. Users average 6-8 weeks of engagement. (Amwell®, 2024).
Challenges	Challenges in monetization, engagement retention, crisis management via AI, and regulatory navigation. (Gain, 2021; Harvard Business School Digital Initiative, 2023)	Adherence drop-offs; integration into clinical workflows; expanding to diverse patient needs and new markets. (Bell, 2025)

Successes	Created a therapeutic chatbot with strong user bonding. Clinical trials show significant impact. Influential in digital mental health innovation (Harvard Business School Digital Initiative, 2023; MobiHealthNews, 2023)	Clinically validated outcomes, high satisfaction, and integration into national systems. Successful acquisition and international partnerships. (Bell, 2025; MemorialCare Innovation Fund, 2019)
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Table 2: Comparative Profile of Woebot Health and SilverCloud by Amwell

The above two key examples (table 2) of Ireland’s leadership in DMH are Woebot Health and SilverCloud by Amwell. Woebot demonstrates some use-case scenarios of DMH work in Ireland. Woebot, though not yet integrated into the Irish health system, operates globally with a Dublin-based tech hub. In contrast, SilverCloud, a spinout from Trinity College Dublin, is fully embedded in the HSE’s DMH services, offering structured CBT with clinical support. These two case-studies highlight innovation—bringing together government, academia, and industry—demonstrating the power of multistakeholder collaboration in scaling DMH solutions.

2.3.3 Competitor Landscape, Market Gaps, and Future Potential

The Table 3 (see below) compares key competitors in DMH, highlighting their target audiences, features, strengths, and challenges. While each platform caters to specific needs—ranging from rural communities to corporate clients—common challenges include scalability, diverse mental health needs and context in Ireland.

Competitor	Target	Key Features	Industry	Strengths	Challenges
ChatPal	Rural and underserved communities	Multilingual support, self-help tools, and information on mental well-being.	Community & NGO-based Health	Strong focus on rural communities; cost-effective; accessible.	Limited scalability to urban or diverse audiences.
Woebot	General population, especially young adults.	CBT-based conversational AI, 24/7 support, mood tracking.	Digital Therapeutics	Well-known globally; Irish origin; highly interactive.	Limited ability to handle complex mental health needs.
SilverCloud	Adults with mild to moderate mental health needs.	Guided CBT programs, accessible 24/7, referral-based.	Healthcare & Mental Wellness	Evidence-based approach; integrated into HSE offerings.	Requires GP or mental health team referral to access.

Wysa	Youth and corporate clients.	AI-powered emotional support, mindfulness exercises, and journaling tools.	Corporate Well-being & Wellness	Focus on holistic well-being; strong user engagement.	May lack cultural specificity for Ireland.
Turn2Me	Youth (12-17) and adults.	Free online counseling, group support, and peer forums.	Community & NGO-based Health	Strong community-building features; youth-friendly.	Requires human counselors for effectiveness; limited chatbot capabilities.
Tess	Corporate clients and individuals.	Psychoeducation, referrals, emotional guidance through AI chat.	Corporate Well-being & Wellness	Tailored for corporate well-being; proactive support.	Limited focus on youth or underserved demographics.
My Mental Health Plan	General population with self-help needs.	Online tool for personalized mental health advice and planning.	Public Health	Backed by HSE; user-friendly interface for self-care plans.	Early stages of adoption; requires wider awareness.

Table 3. *Competitor Analysis of Mental Health Chatbots in Ireland*

Balaskas et al., (2023) examined young adults’ daily perspectives on usage of apps. The study focused on apps considered science-backed based on published evidence for their effectiveness in managing anxiety, specifically their ability to reduce anxiety symptoms. Three apps were selected and reviewed for the study: Sanvello, Wysa, and Woebot. All of them are AI embedded applications, helping with stress, anxiety, and depression management. Wysa and Woebot both use evidence-based techniques, including cognitive behavioral therapy (CBT), dialectical behavior therapy (DBT), meditation exercises, and journaling prompts, to address common mental health concerns. Wysa further employs facial recognition algorithms to interpret human emotions (Victor, 2022). Studies demonstrated varied user experiences (Balaskas et al., 2023). Positive feedback often highlighted convenience, privacy, and availability. Conversely, criticisms included limited emotional understanding, text-heavy interfaces, and difficulty expressing complex emotions through typed messages. These limitations pointed to the need for continuous development and personalization in chatbot design to ensure long-term engagement.

Although many mental health chatbots exist, few studies have studied the involvement of user groups and, even fewer researches done involving a broader range of stakeholders, including mental

health professionals, academia in the co-design process. One of such limited examples is the study conducted as a part of the "ChatPal" project, which aimed to develop and test a chatbot to promote mental wellbeing in rural areas across Europe (Potts et al., 2021). The research studied the potential of co-designing a chatbot for mental wellbeing with user groups through workshops across several European contexts such as Northern Ireland, Ireland, Sweden, Finland, and Scotland. As a result of these workshops participants preferred a chatbot with a female or gender-neutral persona, around 30 years old, with positive personality traits. The outcome of the research also emphasized the importance of the chatbot's ability to establish rapport, understand, and connect with users. Features like regular check-ins to track emotional states over time, reflecting on previous conversations, and providing space to share thoughts and feelings were seen as valuable. Additionally, many participants recommended integrating gamification to enhance user engagement and retention, a common challenge with digital health interventions (Milne-Ives et al., 2024). In terms of safety, participants suggested that the chatbot should have keyword triggers to direct users to external resources in case of crisis situations. Potts et al. (2021, p.661) emphasized the importance of responsible chatbot design, balancing "what users want and say they need, what professionals advocate and what AI does".

Another study, under the same "ChatPal" project (Potts, et al., 2021), examined young people's perceptions of a developed and co-designed mental health chatbot "ChatPal". ChatPal, unlike two popular mental health chatbots Woebot and Wysa, focuses on positive psychology rather than therapy. Key findings of the research highlighted the chatbot's 24/7 availability and anonymity as its strengths, enabling users to seek support without fear of stigma. Despite these advantages, youth's main concerns once again were about the chatbot's impersonal and overly text-heavy interaction, lacking the emotional support that a human therapist provides. Additionally, the chatbot's assumption that users can identify and articulate their emotional needs was seen as a barrier for some. Participants valued the potential of a blended service model, combining chatbots with human oversight, to enhance trust, effectiveness, and user adherence. These insights reveal that while chatbots can be valuable tools for mental health support, their impact can be significantly enhanced through thoughtful design and integration with professional care.

Despite their benefits, mental health chatbots raise ethical concerns, particularly around anthropomorphism and trust (Bond et al., 2023). While chatbots, like those that offer psychotherapy, provide a form of pseudo-empathy, they lack true human understanding and care. This raises the question of whether anthropomorphism should be avoided or minimized in mental health chatbots.

Although chatbots can disclose their limitations, users may still humanize them, leading to higher expectations (Bond et al., 2023).

Moreover, the advice and recommendations from chatbots may be over-trusted, as users may perceive the humanized dialogue as more authoritative. Unlike web search engines, where users have more control over information selection, chatbots can give potentially harmful medical advice. The challenge lies in quality assurance, as it is difficult to pre-assess every possible conversation given the large number of dialogue permutations. Nevertheless, mental health chatbots are gaining traction. For instance, Wysa has been integrated into the National Health Service (NHS) as part of its online mental health support (Victor, 2022). The ChatPal chatbot tried to address these ethical concerns by avoiding over-anthropomorphizing, disclosing its limitations upfront, offering referrals to human support, ensuring expert-designed dialogue scripts, and limiting its AI capabilities to prevent harmful responses. This approach helps balance technology and human support in mental health care.

Despite the growing adoption of mental health chatbots, research on them remains fragmented across disciplines. In a recent integrative review that highlights how mental health chatbots are studied separately in computer science and medicine, limiting cross-disciplinary understanding. Reviewing 534 papers, the study found that computer science emphasizes LLMs and response metrics, while medicine focuses on rule-based agents and health outcomes. The review identifies key gaps in transparency, ethics, and cultural adaptation. It calls for collaborative development of conversational agents across disciplines (Cho et al., 2023) to ensure high effectiveness and functionality.

2.4. Regulatory and Ethical Considerations for Mental Health Chatbots

2.4.1. European Regulatory Framework

The regulatory landscape in Europe considerably influences the development and deployment of AI-powered mental health chatbots. Central to this is the General Data Protection Regulation governing the processing of personal data, including sensitive health information that forms the backbone of these technologies. GDPR requires explicit consent from users, with the requirement that they must be fully informed about how their data is processed. This is particularly challenging for mental health chatbots, which often work in dynamic real-time environments and are usually based on data-intensive machine learning models. Large datasets work best for such models, while the GDPR

requires data minimization—that is, collecting only the bare minimum necessary (Regulation (EU) 2016/679, 2016). What's more, the GDPR sets high standards for data storage and transmission, further complicating the adaptiveness of chatbots. The question is whether this continuous updating and refinement of models by machine learning systems raises serious questions about how well users can understand or consent to those processes.

Making things a bit more complicated, the proposed EU AI Act tried to categorize those AI systems into risk categories based on their impact (Regulation (EU) 2024/1689, 2024). Mental health chatbots will most likely fall directly into the "high-risk" category since they psychologize users. This consequently places very strict requirements for transparency, risk management, and human oversight on such applications. The developers will need to make their systems interpretable, which is usually totally against the development of state-of-the-art machine learning systems. The need to keep only that which provides detailed documentation, continuous monitoring of risk, and when needed human intervention strongly increases resource burdens on the developer. These requirements on one hand reflect substantial steps towards accountability but on the same hand may be operationally and economically highly challenging.

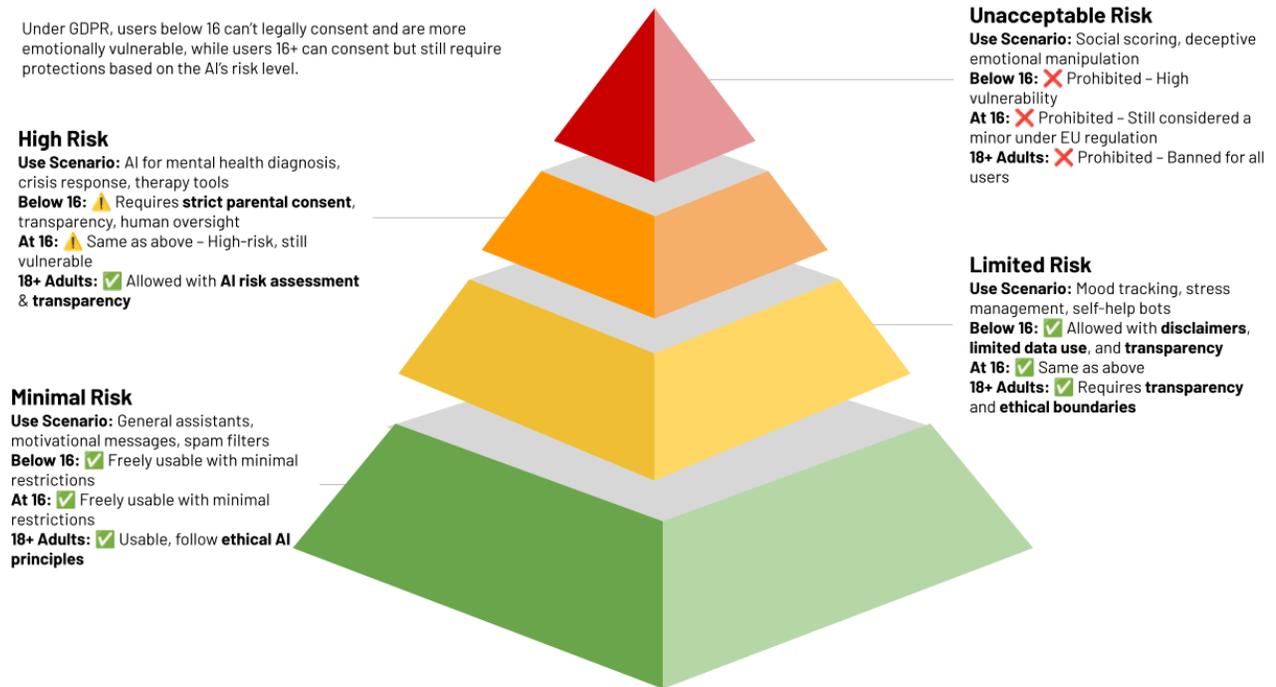


Figure 2: Risk classification of Mental Health Chatbot as per the EU AI Act

Apart from the GDPR and the AI Act, the Medical Device Regulation applies to the mental health chatbots for diagnostic and therapeutic functionalities. This latter law treats such bots as a medical device in nature; hence, a clinical evaluation requirement is compulsory, akin to traditional medical instruments. EN Testing is one indispensable part that should prove their efficiency, safety, and reliability. On the other hand, MDR requires detailed technical documentation prior to deployment and certification; generally, this entails long periods for approval (Nehme et al., 2024). Developers are considering these regulatory demands together with rapid innovation for mental health crises. The combination of GDPR, the EU AI Act, and MDR provides a complex and multifaceted regulatory landscape that calls on developers to adopt methods and approaches that are multidisciplinary in nature, including legal, technical, and medical. The complicated system behind this underlines how complex it is to balance compliance while still maintaining technological advancement and user trust.

2.4.2. Ethical Issues: Trust, Bias, and Validation

While regulations bring about a legal framework for protection, ethical issues related to AI-powered mental health chatbots remain paramount. There is great concern about data privacy, seeing as these tools are very sensitive to health information obtained from already vulnerable populations. Ethical designs in AI underline the idea that, beyond the call to meet compliance requirements under GDPR, developers need to actually build in safeguards for protection of user trust and confidence. Any mismanagement regarding data or inability to guarantee privacy will lead to grave breaches of trust, ultimately undermining user confidence and consequently damaging adoption (Asha et al., 2024).

Informed consent is another cornerstone of ethical AI. The users need to have full understanding and knowledge regarding the capabilities, limitations, and associated risks, especially while differentiating AI-driven recommendations from human expertise (Iserson, 2024). Ethical issues also relate to clinical validation. Though an upsurge of mental health chatbots is evident, most have not been studied in detail to validate their efficacy and are hence questioned for trustworthiness in handling complex mental health issues. Tools giving unverified advice risk misleading users or exacerbating mental health conditions, and robust testing and validation are needed before deployment.

Another factor complicating the ethical deployment of mental health chatbots is bias within AI algorithms. A chatbot trained on a non-representative dataset could potentially disadvantage

underrepresented groups, such as those from minority cultural or ethnic backgrounds. The solution to this lies in a diverse and inclusive dataset, with continuous audits of algorithmic performance to avoid systemic biases in mental health outcomes (Mancini et al., 2024). AI deployment best practices in the sphere of digital health, but especially in regard to the mental health of the youth, are truly oriented toward how those challenges can be addressed by design and implementation of ethical strategies. Youth populations remain particularly vulnerable and require extra measures concerning privacy, consent, and access. For instance, clear and age-appropriate consent mechanisms could help make sure that minors and their guardians understand the implications entailed by the use of tools. Policies regarding the use of data and functionality of chatbots have to be fully transparent; this is how trust among younger users is maintained.

Collaboration with mental health professionals at the development level is a necessary practice. In co-designing the AI systems with clinicians, the developers make certain that these chatbots are clinically validated and evidence-based. Critical points are also identified where human intervention is necessary, so that one does not only depend on AI for dealing with high-risk or crisis situations. Incorporating human-in-the-loop systems, users in acute distress would be directed to qualified professionals, hence safeguarding them from further harm (Balcombe, 2023). In developing chatbots, continuous improvements facilitated through user feedback mechanisms stand out as best practices. A chatbot should allow users to flag issues in its performance and suggest areas of improvement that become iteratively updated to counter emerging ethical challenges. Beyond this, additional safety nets dealing with harmful interactivity—detection of self-injurious tendencies and responding with offers to intervene—need to form necessary parts of tool development where young people's use comes into play.

2.5. The Big Picture: Chatbot-based DMH Entrepreneurship

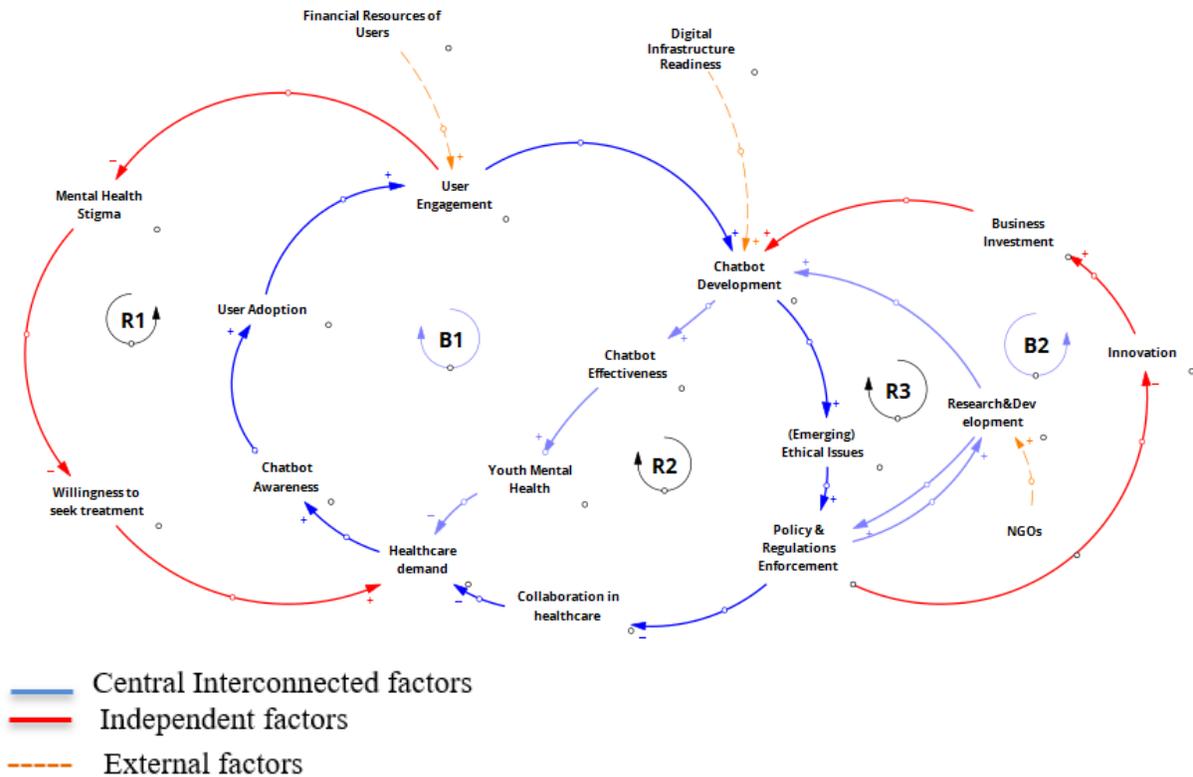
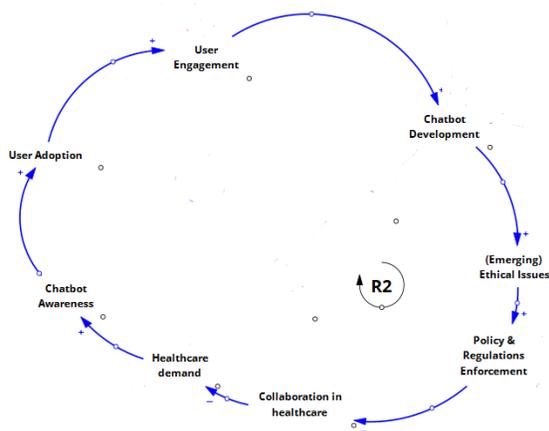


Figure 3. Preliminary Youth Mental Health Chatbot Ecosystem

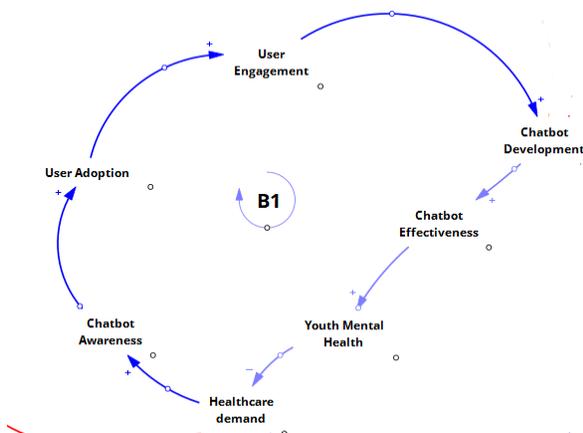
A causal loop diagram (CLD) was plotted on the Vensim platform to illustrate the interrelationships among key variables as discussed in the system analysis. This CLD represents the findings from the desk review and shows the interconnected factors influencing the adoption and development of chatbots for youth mental health support. It visualizes the feedback loops that shape key dynamics in the system, including social, technological, and economic elements.

For the CLD we used a simpler color scheme focused on basic systemic relationships without industry-specific depth. It serves as a theoretical foundation, mapping out core system mechanics (blue) and external, independent considerations (red), the latter still being crucial but not being deeply embedded in the chatbot's core development. The diagram consists of both reinforcing (R) and balancing (B) loops. Each loop is detailed below to illustrate how these interactions shape outcomes in chatbot development, user engagement, and mental health improvement.



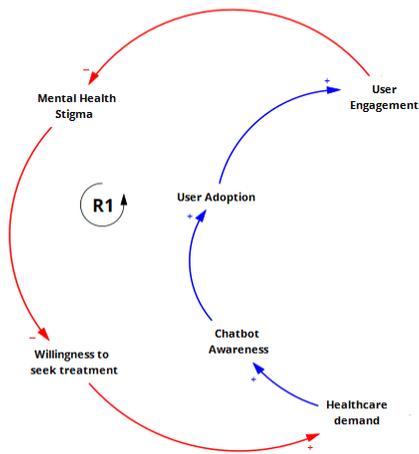
Feedback Loop 1 (R2).

This loop highlights how the growth of mental health chatbots can accelerate through continuous feedback. With the chatbot development stricter policy regulations arise constraining healthcare collaboration. However, as healthcare demand grows, the need for chatbot increases, thus fueling further development. These dynamics can either slow progress or, if managed well, push for more solutions that strengthen the system and sustain growth over time.



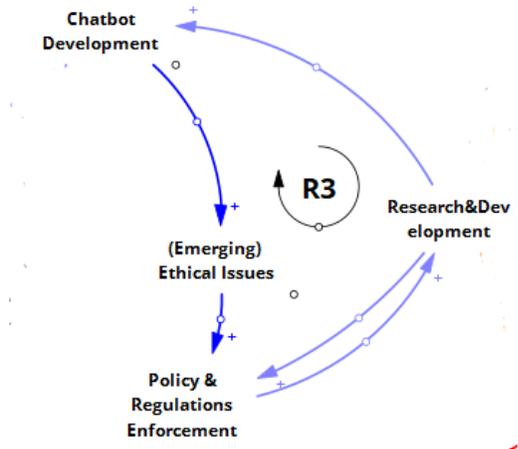
Feedback Loop 2 (B1).

This loop highlights how the growth of mental health chatbots can accelerate through continuous feedback. With the chatbot development stricter policy regulations arise constraining healthcare collaboration. However, as healthcare demand grows, the need for chatbot increases, thus fueling further development. These dynamics can either slow progress or, if managed well, push for more solutions that strengthen the system and sustain growth over time.



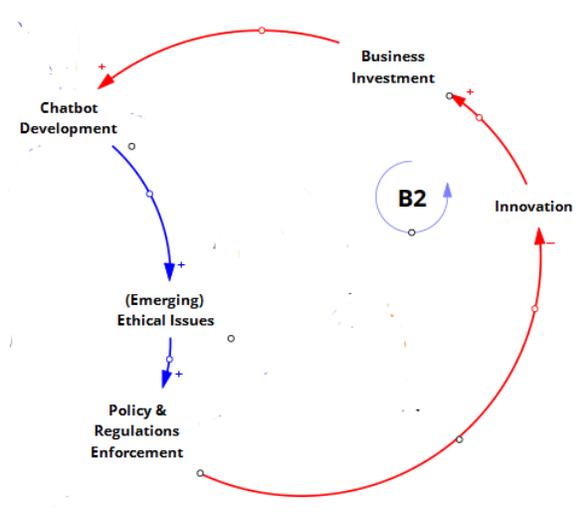
Mental health stigma discourages individuals from seeking treatment, limiting the adoption of mental health services, including chatbots. However, chatbots offer a discreet alternative, and increased awareness can encourage their use, helping to normalize mental health support. As adoption rises, stigma decreases, making people more willing to seek help. This boosts demand for chatbots, fostering continuous growth and innovation in DMH solutions.

Feedback loop 3 (R1)



This loop highlights how policies and regulations shape chatbot development by addressing ethical concerns. Increased (stricter) regulations push for more research to ensure that chatbots align with ethical and legal standards. This encourages more R&D to refine chatbots that comply with regulations. However, as chatbots advance, new risks are likely to emerge, prompting the introduction of additional or amendment of current policies and regulations. This cycle ensures that chatbot development remains responsible and aligned with evolving ethical standards, preventing unchecked growth while maintaining public trust.

Feedback loop 4 (R3).



Feedback Loop 5 (B2).

This balancing loop represents how policies and regulations stifle innovation and business investment in mental health chatbot entrepreneurship. Businesses must endure high compliance costs to meet these regulations which reduce the profitability, making them unattractive to investors. The lack of funding and investment results in a decline in chatbot development and a decrease in ethical concerns, reducing the need for further policies and regulations. The separation of policy effects on innovation and R&D (in the previous loop) is significant since policies guide R&D by fostering ethical and scientifically sound solutions, while their impact on innovation can be restrictive, potentially limiting creative freedom.

3. Methodology

3.1. Collaboration & Capacity Building

The study adopted a multi-method, transdisciplinary research design to explore the opportunities and challenges of DMH entrepreneurship in Ireland, with a particular focus on AI-powered mental health chatbots. The research process was grounded in a collaborative, with a capacity-building orientation in system sciences dedicated for transdisciplinary action. Using a broad brief on digitization, healthcare and entrepreneurship- the research team co-developed a problem scenario based on individual motivation and disciplinary perspectives. The collaborative process led to the formulation of the guiding research question and specifying the scope of this research.

3.2. Defining System Boundaries & System Analysis

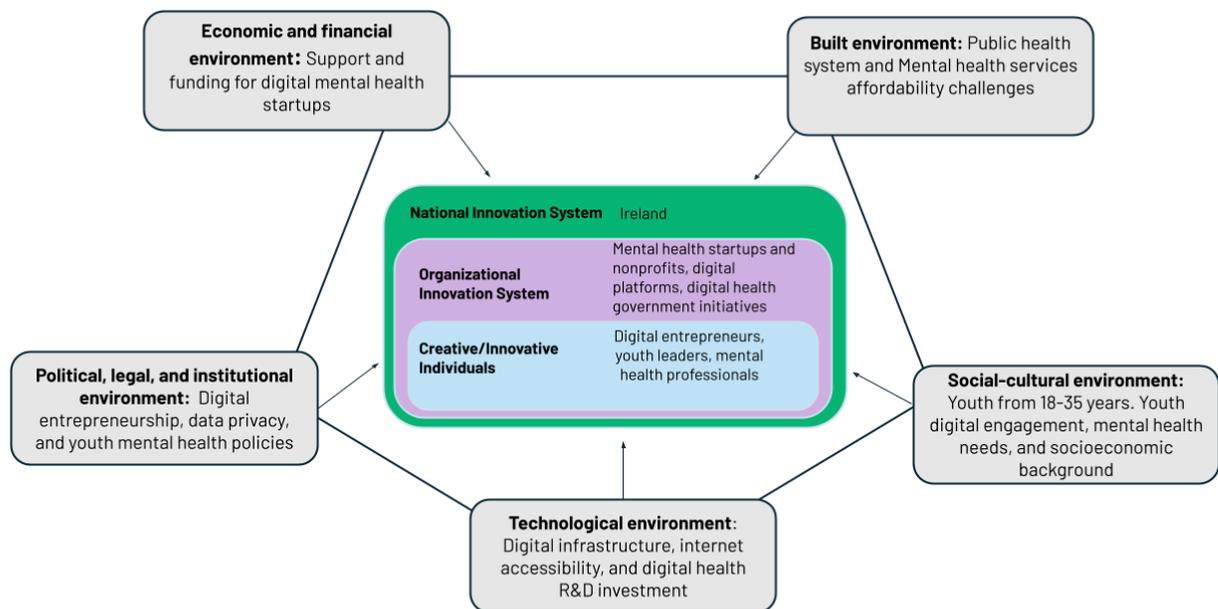


Figure 4: System boundaries- adapted from Innovation System Framework

In order to define the system boundaries for this transdisciplinary research, we adopted the Innovation System Framework (Satalkina & Steiner, 2020). Figure 3, helped us map the internal dynamics and external influences shaping mental health entrepreneurship in Ireland. Internally, we considered three levels: (1) the national innovation system, including legal frameworks, policy, and

culture; (2) organizational innovation systems, such as health startups, nonprofits, digital platforms, and government initiatives; and (3) individual actors, including youth leaders, entrepreneurs, and mental health professionals. Externally, we accounted for factors such as policy and regulation, economic and technological infrastructure, societal attitudes, and the built environment.

We carried out a system analysis using secondary sources as part of literature review. To show how key elements are connected, we created a Causal Loop Diagram (CLD) using Vensim software (see Figure 3). Version 1 of the CLD came from the literature and helped us focus the research and plan next steps (see Section 3.3). Later, we updated it to Version 2 by adding insights from the stakeholder survey and co-creation workshop. This helped us map feedback loops, explore future scenarios, and identify intervention opportunities.

3.3. Research Design & Theoretical Framework

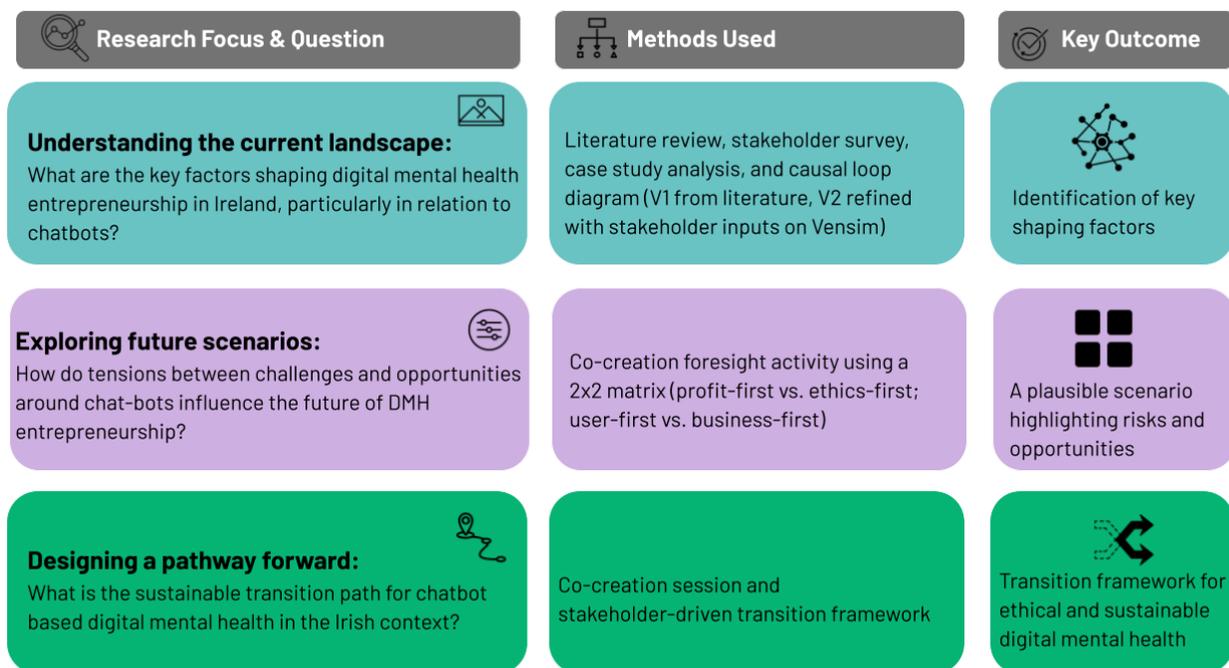


Figure 5: Research Design & Theoretical Framework

We used the **Three Horizon Framework** (Sharpe, 2013) as a guiding structure for this transdisciplinary research defining a research framework. The framework enabled us to approach the development of DMH entrepreneurship from multiple perspectives, supporting development of this scholarship, triangulating diverse methods and tools with a focus on outcomes as detailed in figure 5.

Across three horizons, our framework assessed and shaped the future of DMH. Horizon 1 involved a literature review, stakeholder surveys, and case studies to map current challenges like user engagement and system integration. Horizon 2 used a foresight 2x2 matrix (ethics vs. profit, user vs. business) to explore future scenarios with key stakeholders. Horizon 3 focused on co-creation and roadmap development, aligning academia, industry, and government to enable sustainable and ethical DMH innovation.

3.4. Stakeholder Mapping & Engagement

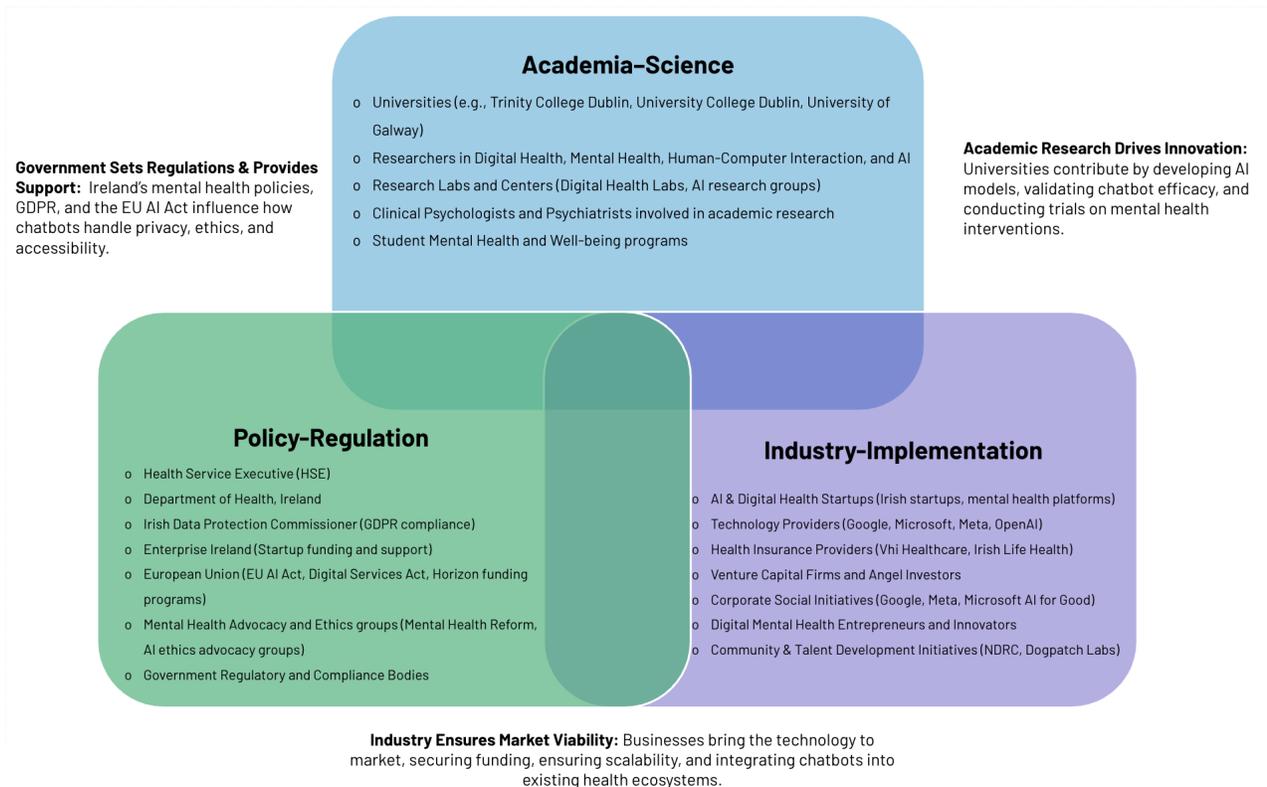


Figure 6: Stakeholder Mapping

We used a stakeholder mapping process based on the Triple Helix model for identifying key stakeholders, institutions etc as detailed in figure 6. The research team looked out for individuals, reviewing university profiles and LinkedIn accounts to locate individuals engaged in digital health, entrepreneurship, AI ethics for stakeholder engagement. A purposive sampling approach was used, and invitations were sent via LinkedIn and email, including a project overview, survey link, and co-creation workshop note. The participants were provided with additional briefings on need-basis.

A total of 10 unique participants contributed to the study through a survey (8 participants) and a co-creation workshop (7 participants), with 6 individuals participating in both. Participants came from academia, industry, and innovation sectors, bringing expertise in public and mental health, AI, ethics, entrepreneurship, and youth engagement. The group reflected and represented perspectives from academia-science, industry-practice, and policy-regulation.

#	Triple Helix Category	Survey	Workshop	Primary Area of Expertise	Involved in Chatbots	Familiarity level
1	Academia-Science	✓		Digital Health (Behavioural Change, Self-care), Qualitative Research	To some extent	Familiar
2	Academia-Science	✓	✓	AI & Machine Learning, Ethics & Responsible AI	To some extent	Familiar
3	Academia-Science	✓	✓	AI & Machine Learning, Public Health & Mental Health, Youth Engagement	No	Very familiar
4	Industry-Practice	✓	✓	Digital Health Entrepreneurship, Public Health & Mental Health, Regulation	To some extent	Moderately familiar
5	Industry-Practice	✓	✓	AI & Machine Learning, Digital Health Entrepreneurship, Youth Engagement, Ethics	No	Familiar
6	Industry-Practice	✓		Public Health & Mental Health, Business Strategy & Investment	No	Slightly familiar
7	Industry-Practice		✓	Digital Health Entrepreneurship, AI in Mental Health	-	-
8	Policy-Regulation	✓	✓	Business Strategy & Investment	No	Slightly familiar
9	Policy-Regulation		✓	Healthcare Innovation, AI Integration, Digital Biomarkers, Implementation Science	-	-
10	Policy-Regulation	✓		Public Health & Mental Health, Ethics & Responsible AI	No	Very familiar

Table 4: Stakeholder-Participant Profiles

3.5. Knowledge Integration

For knowledge integration- we used the research framework to integrate findings across different methods as per three research questions with sub-themes. The survey informed further development of interventions for the workshop segment. The survey data was analyzed using descriptive statistics for closed-ended responses and manual thematic analysis for open-ended inputs. The CLD, developed on Vensim, visualized system-level interactions and feedback loops based on both literature and participant insights- version 2. The co-creation workshop was transcribed and analyzed thematically, using a framework structured around the study's three guiding questions. Quotes and themes were clustered to extract patterns and refine the final roadmap.

While the study was exploratory and intentionally small-scale, it brought together diverse, informed voices across sectors. The findings reflect a snapshot of perspectives rather than a comprehensive sector-wide analysis, and the mixed-method approach helped ensure depth and triangulation.

3.6. Ethical Considerations

This was a low-risk, non-interventional study. The Google Forms survey included an embedded consent statement covering research purpose, data use, and GDPR compliance. During the Zoom-based co-creation workshop, verbal consent was obtained for recording, and participants were reminded of the report's goals. Data was securely stored and access was limited. No formal ethics review was required due to the exploratory nature of the study. For analysis, the names of the stakeholders were anonymised for reporting purposes to ensure anonymity.

4. Analysis

4.1. H1: Understanding & Informing Chatbot-based Mental Health Entrepreneurship

This section focuses on validating and incorporating feedback to assess the current state of DMH chatbots. Based on these insights, the **causal loop diagram** developed earlier was adapted to provide a more comprehensive approach stakeholder feedback- DMH entrepreneurship, reflecting the interconnections between various influencing factors. This ensures a deeper understanding of the current landscape and sets the stage for further exploration in the following horizons. New CLD integrates other key elements like market demand, affordability, and profitability, highlighting the connection between user behavior and business outcomes. In addition, it reflects stakeholders' concerns about economic barriers, emphasizing the need for affordability to ensure equitable access to chatbot technologies.

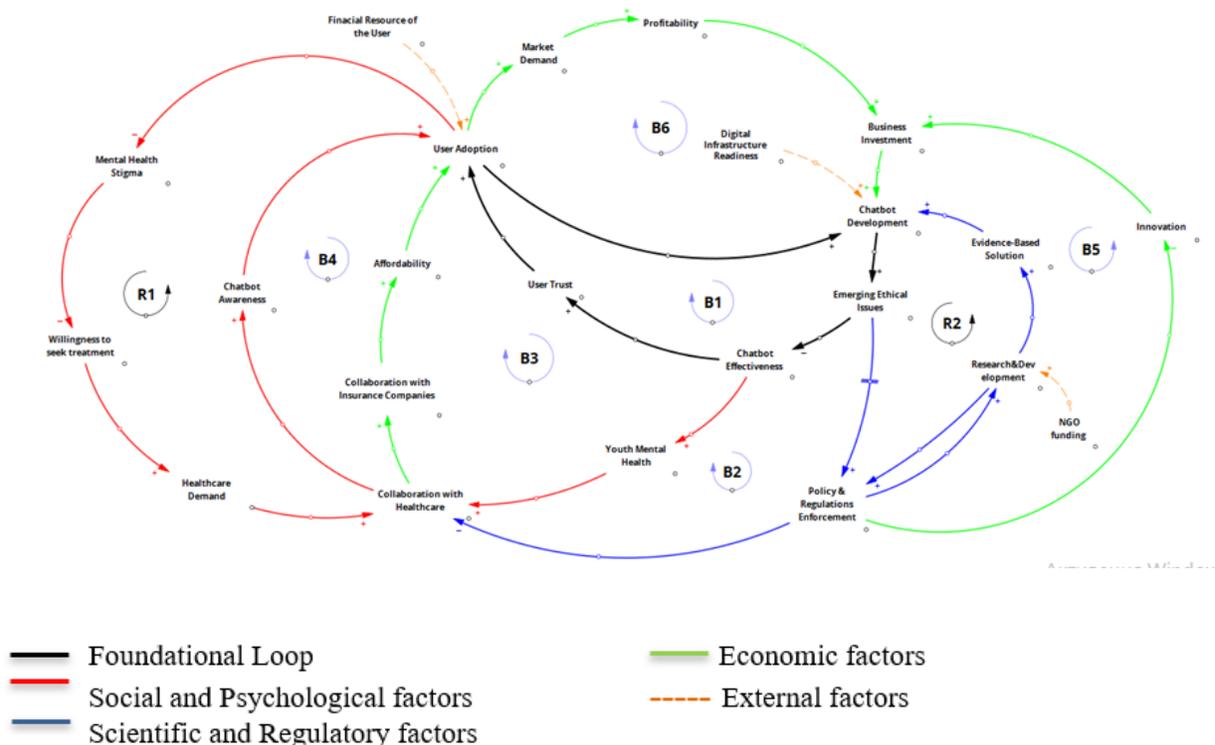
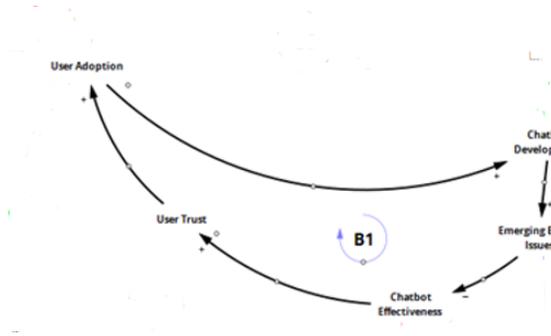


Figure 7. Refined Youth Mental Health Chatbot Ecosystem

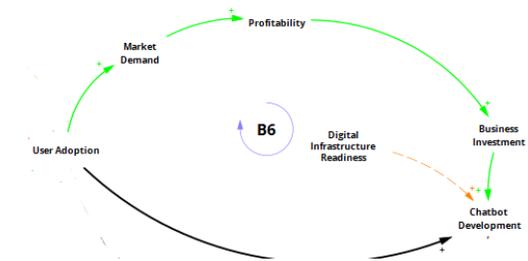
Another notable change in the diagram is the increased presence of balancing loops, primarily influenced by the integration of emerging ethical issues. These issues now act as a central stabilizing force across the system, whether addressing user adoption, development, or business investment, ensuring that growth in one area does not lead to negative outcomes, such as misuse or breaches of trust. This highlights a common recognition of the ethical responsibilities tied to technological advancement, especially in sensitive fields like mental health.

Feedback Loop (B1)



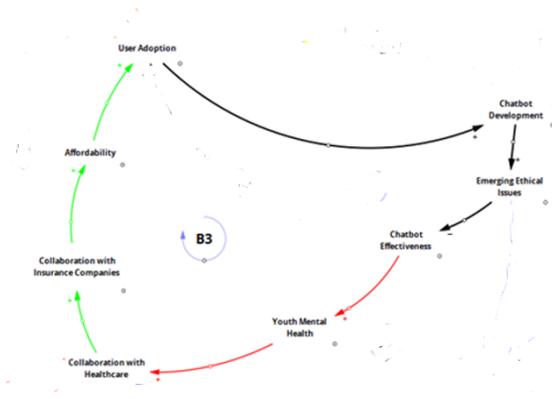
B1 is a central balancing loop, marked by black arrows, that serves as the foundation for the system, with other loops connecting back to this core, highlighting the ongoing need for ethical oversight. Stakeholders emphasized the need for regulatory alignment, transparency, and fail-safes, especially given the unpredictability of LLMs. This loop underscores the importance of ethical oversight and accountability in ensuring responsible, sustainable chatbot integration.

Feedback Loop (B6)



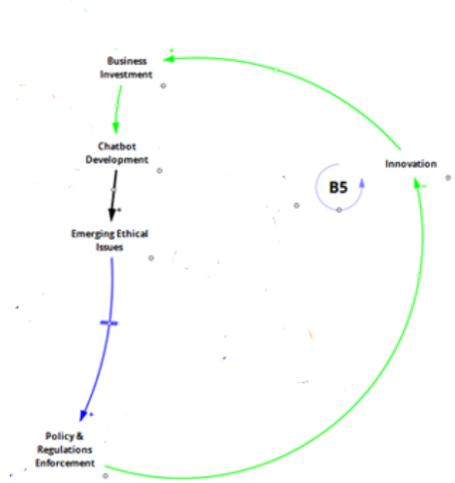
This loop (B6) captures the reinforcing relationship between increased user adoption and market demand, which in turn drives profitability and attracts business investment into chatbot development. Importantly, it integrates stakeholders' concerns about economic barriers by emphasizing that sustained user adoption and thus long-term profitability depends on ensuring chatbot solutions remain affordable and accessible across diverse user groups.

Feedback Loop (B3)



This loop reflects the stakeholders' argument that collaboration with insurance companies influences chatbot affordability and, consequently, adoption among young people. However, for insurance companies to engage, healthcare providers must first be on board, as they serve as intermediaries between the technology and its users. Stakeholders noted that healthcare professionals may resist innovations that disrupt clinical routines or add complexity to patient care which highlights the need for chatbot solutions that are easy to integrate and align with clinician workflows, making it easier to gain the support of healthcare providers and, in turn, influence insurance companies and the affordability of chatbots.

Feedback Loop (B5)



This balancing loop, previously reflected in the preliminary system, is emphasized due to the health tech industry's traditionally conservative nature that is driven by concerns around security, regulation, and trust, translating into slow adoption as highlighted by stakeholders. This points to the importance of designing for incremental trust-building and regulatory alignment, as slow adoption due to ethical and regulatory issues directly impacts further business investment and chatbot development.

Note: Other loops remain unchanged and can be referred to in the Preliminary Youth Mental Health Chatbot Ecosystem (Image 4)

Overall, the idea of building these two diagrams serving complementary roles, is mainly to illustrate the evolving understanding of system dynamics in DMH, integrating both scholarly research and practical experiences to create a more robust and dynamic analysis, where the first offers a theoretical baseline, while the second incorporates real-world insights.

Developing both causal loop diagrams was a complex and iterative process that challenged us to think critically about system dynamics and the relationships between different factors. The initial diagram, built from a theoretical foundation, required careful consideration of how to represent core interactions accurately. One of the main challenges was finding the right terminology, choosing words that captured the nuances of each element while ensuring the relationships made logical and practical sense.

The second diagram, shaped by stakeholder feedback, was even more demanding. Integrating diverse perspectives meant constantly revisiting and refining connections, as new elements were introduced and others were adjusted or removed. The process was far from linear; we often found ourselves going back and forth, testing how each new addition affected the system as a whole and whether it stayed true to the real-world experiences shared during the workshop. A particularly difficult aspect was ensuring that every loop, especially the balancing loops accurately reflected the intended dynamics without becoming overly complex or ambiguous. We also grappled with how to visually and conceptually integrate ethical concerns in a way that highlighted their central importance without overshadowing other crucial factors. In fact, working with the CLDs was as much about the process of negotiation and iteration as it was about the final outcome.

4.2. H3: Envisioning the Future of AI Mental Health Chatbots

This section presents how stakeholders co-created and analyzed future scenarios for AI-powered DMH chatbots through a structured foresight activity. It aimed to explore tensions between ethical innovation and market-driven goals.

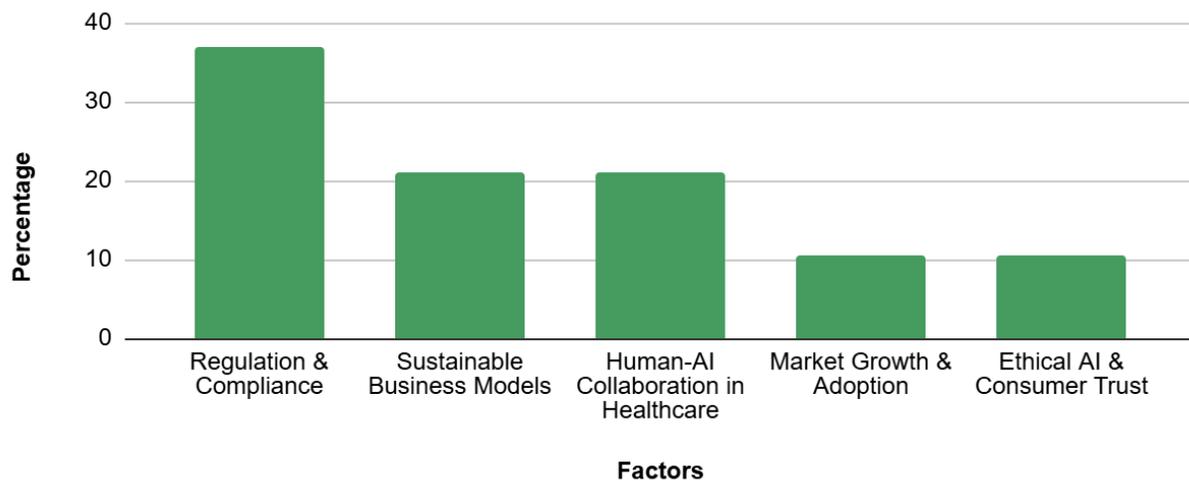


Figure 8: Factors that will have the biggest impact on the future of AI-powered mental health chatbots (n=8), based on stakeholder pre-survey

In the survey done prior to the workshop, when stakeholders were asked which factors would most impact the future of AI-powered mental health chatbots, the majority identified regulation and compliance (87.5%) as the most significant, followed by sustainable business models and human-AI collaboration (both at 50%) as depicted in figure 7. In response to a second question on the biggest challenges to scaling these technologies, participants cited market acceptance, funding, and technology integration, alongside concerns around ethics, trust, and user experience.

The insights from the pre-survey informed the creation of a 2x2 scenario matrix, structured around two key tensions: ethics-first vs. profit-first and user-first vs. business-first. This matrix was used during the workshop to guide group discussions across four strategic futures for AI-powered mental health chatbots. To ground the exercise, participants were introduced to Amelia, a fictional digital entrepreneur (figure 9), through a short video [Video for Workshop.mov](#). Her story prompted reflection on what it would take for DMH entrepreneurship using mental health chatbots.



"Innovation means nothing if it doesn't connect with people's hearts"- Amelia

Dublin, Ireland, 29, Digital Entrepreneur & Mental Health Advocate

💡 **Mission:** Create an emotionally intelligent, accessible chatbot that supports youth mental health.

🎯 **Goals**

- Build compassionate, intuitive mental health tech
- Center youth voices in design
- Ensure ethical, secure, and inclusive access

🤝 **Collaborates With:** 👨‍💻 Developers 🧠 Therapists & Mental Health Experts 🗣️ Youth Groups 🏛️ Policymakers

⚡ **Challenges**

- Balancing tech speed with emotional nuance
- Building trust & privacy
- Scaling without losing soul

Driven by: Empathy, co-creation, and a belief that digital tools can truly care.

Figure 9: Persona of the Ireland-based DMH Entrepreneur

Each quadrant represented a different strategic orientation as scenarios (S)- figure 10 allowing participants to explore the tensions between commercial viability, clinical trust, ethical integrity, and personalization at scale. The discussions that followed revealed deep insights into the priorities and dilemmas shaping DMH entrepreneurship.

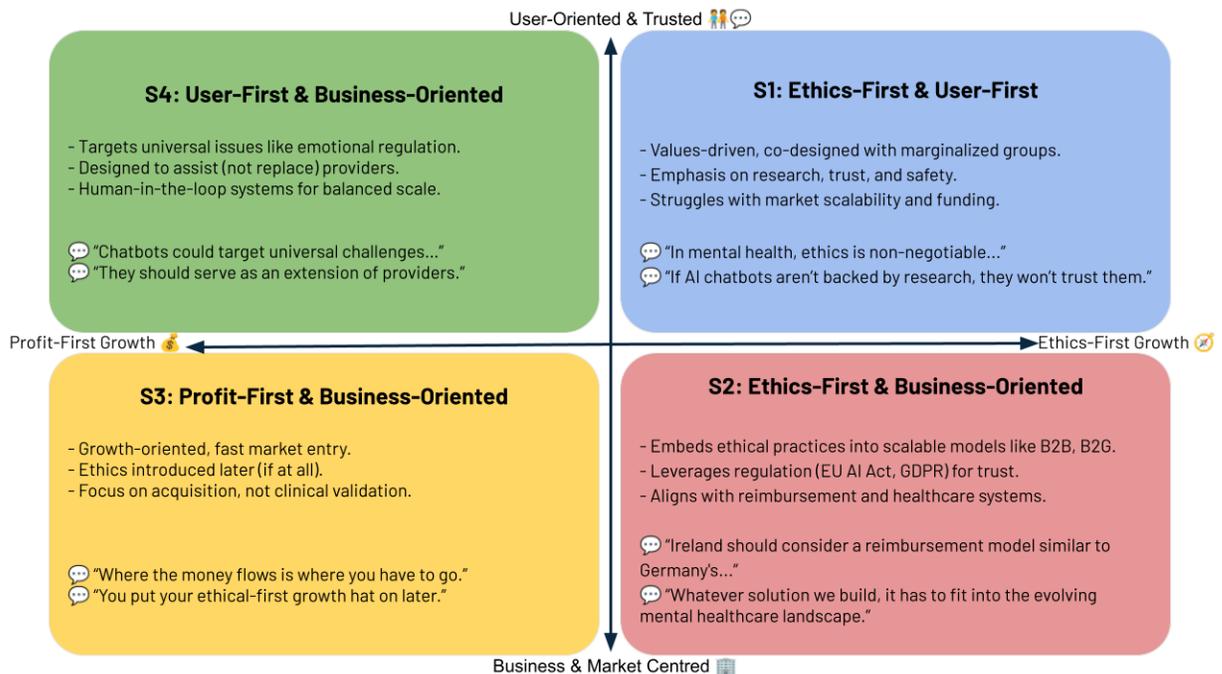


Figure 10: 2x2 Matrix for Scenario Mapping

S1: Ethics-First & User-First

This quadrant reflected the most idealistic and values-driven vision: chatbots that are grounded in ethical AI principles and co-designed with users—especially youth and marginalized populations. Participants saw this approach as foundational for long-term trust, particularly in sensitive domains like mental health. Several stressed the importance of building credible, research-backed tools.

“In mental health, ethics is non-negotiable. Unlike other industries, profit cannot come at the expense of ethical considerations.” – Stakeholder

“Young people are highly attuned to misinformation. If AI chatbots aren’t backed by research and clear evidence, they won’t trust them.” – Stakeholder

While this scenario was seen as desirable, challenges related to sustainability and early-stage funding were raised. Participants noted that while this model builds trust, it may be difficult to attract investors without a clear path to growth or market fit.

S2: Ethics-First & Business-Oriented

Seen as a viable long-term path, this quadrant offered a model grounded in compliance, clinical effectiveness, and business integration. Stakeholders emphasized the importance of embedding ethical practices into scalable business models from the beginning, especially when working with healthcare systems.

“Ireland should consider a reimbursement model similar to Germany’s, where digital therapeutics are covered as part of public healthcare.” – Stakeholder

“Whatever solution we build, it has to fit into the evolving mental healthcare landscape.” – Stakeholder

This quadrant aligned closely with B2B, B2G, and B2B2C models, such as working with insurers, employers, and government to expand access while ensuring economic sustainability. Regulation, such as the EU AI Act and GDPR, was seen not as a barrier but a necessary structure for safe innovation.

S3: Profit-First & Business-Oriented

This quadrant prioritized business growth and scalability—placing chatbots in competitive digital health markets without necessarily foregrounding ethical considerations at the outset was observed. Some stakeholders described this as a “realistic starting point” for ventures looking to gain initial traction.

“Where the money flows is where you have to go. If you ignore that, you’re running a charity, not a sustainable business.” – Stakeholder

“You go where the money goes, but after that, you put your ethical-first growth hat on.” – Stakeholder

Participants acknowledged that targeting specific problems, such as loneliness or relationship distress, performs better in user acquisition than generic mental health tools. However, stakeholders cautioned against allowing market pressure to override clinical safety, highlighting the long-term risk of undermining trust and regulatory approval.

S4: User-First & Business-Oriented

This quadrant emerged as a pragmatic hybrid, aiming to solve real user problems while maintaining business viability. Instead of segmenting by identity or diagnosis, some stakeholders proposed a problem-based design approach, targeting universal challenges such as emotional regulation that cut across user groups.

“Instead of segmenting users into categories, chatbots could target universal challenges like emotional regulation, which cuts across different user groups.” – Stakeholder

“AI chatbots should serve as an extension of providers, not a replacement.” – Stakeholder

This model was seen as well-suited for human-in-the-loop systems, where chatbots support but do not replace clinicians—handling triage, follow-up, or appointment scheduling. By combining personalization with broader applicability, this quadrant offered flexibility without sacrificing ethics or user engagement.

SF: Final Scenario

Given the diversity of perspectives from the stakeholders—from technologists and clinicians to entrepreneurs and researchers—a contingency-based approach emerged as the most suitable framework for exploring business models in AI-powered DMH. The discussions revealed a clear tension: while some participants emphasized the need to prioritize ethical, human-centered design from the outset, others emphasized the pragmatic necessity of securing market traction and funding early in the entrepreneurial journey. Despite these differing views, there was strong consensus around certain non-negotiables—particularly the importance of regulatory compliance, evidence-based interventions, and ethical integrity. At the same time, key strategic decisions such as target users, business models (B2G, B2B2C, or B2C), and technological integration were seen as context-dependent and open to adaptation. In this approach, some parts—like ethical integrity, safety, and regulations—stay fixed, while others—like business models, target groups, and mental health focus—can change. Using the insights from these four scenarios, we arrived at a contingency framework for allowing chat-bot based mental health entrepreneurship, which provides foundational pillars, identification of variable factors, and pathways for scaling and ensuring financial viability.

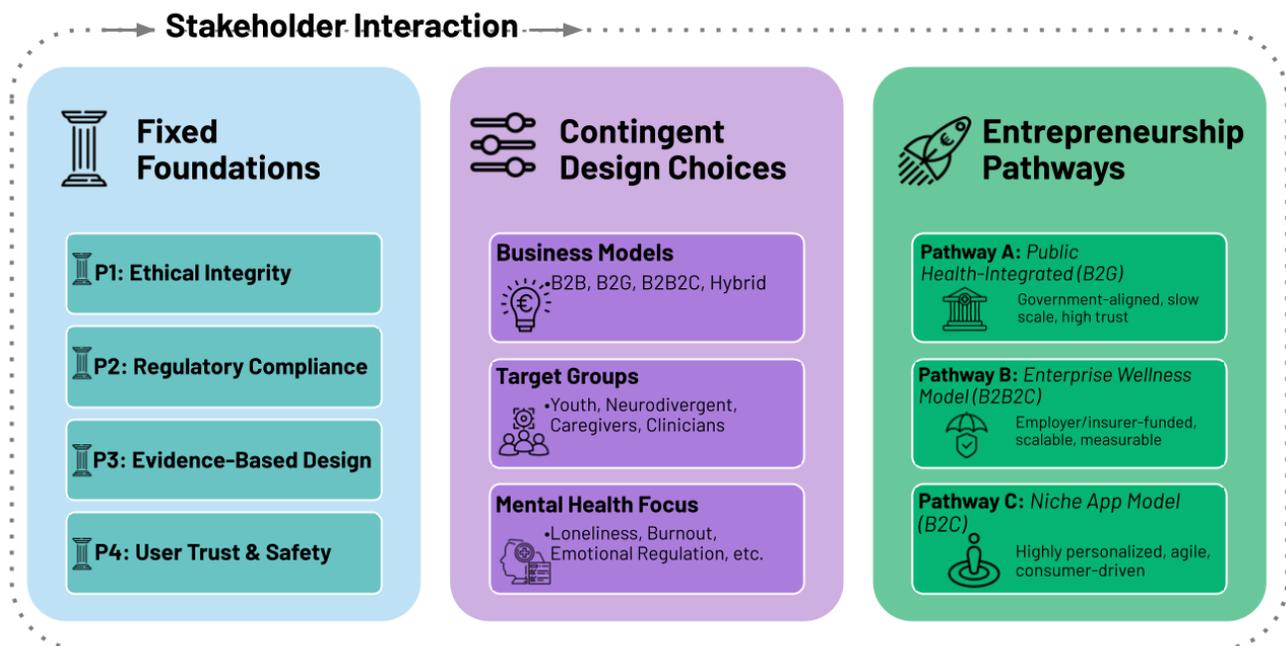


Figure 11: Final Scenario of Contingency Framework for Chatbot-Based DMH Entrepreneurship

Figure 11, outlines final scenario of Contingency Framework for Chatbot-Based DMH Entrepreneurship and key components including:

- **Fixed Foundations** (left): Non-negotiables like ethics, regulation, evidence-based design, and user trust.
- **Contingent Design Choices** (center): Vary by context—business models (B2G, B2B2C, B2C), target users, and mental health focus areas.
- **Entrepreneurial Pathways** (right): Three pathways grounded in these foundations, reflecting real-world tensions and stakeholder input.

Stakeholders emphasized the importance of innovative partnerships and collaboration—especially among AI developers, healthcare providers, and policymakers—as key to overcoming challenges and unlocking opportunities in mental health chatbot entrepreneurship.

In light of this, the initial research question:

"What are the key opportunities and challenges of digital entrepreneurship in the development of mental health chatbots for youth in Ireland?"

was refined to:

"What are the key factors serving as opportunities and challenges for digital entrepreneurship in the development of mental health chatbots for youth in Ireland, and how can collaboration among stakeholders drive innovation in this space?"

This revision highlights the central role of transdisciplinary cooperation in advancing responsible and impactful AI solutions.

4.3. Horizon 2: Transitioning Toward a Sustainable DMH Ecosystem

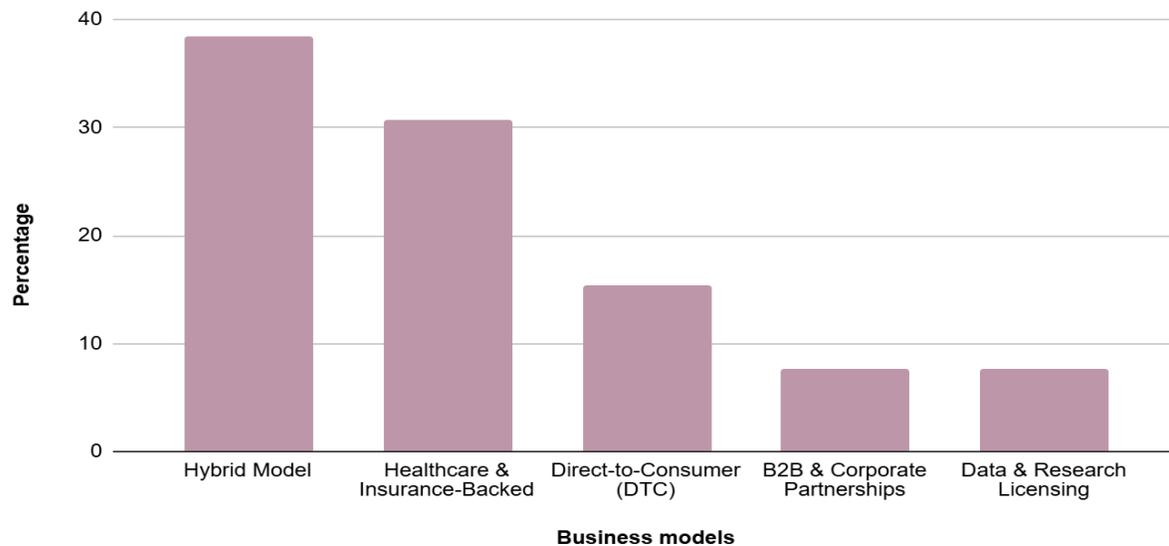


Figure 12: Most sustainable business models for AI-powered chatbots (n=8), based on stakeholder pre-survey

In the pre-workshop survey, the stakeholders were asked about the biggest investment opportunities and the most important steps for creating a sustainable AI-driven mental health industry, as depicted in Figure 12. The findings indicated that the biggest investment opportunity lies in integrating AI-driven mental health features into existing platforms that already have large-scale adoption, ensuring seamless, stigma-free adoption. Additionally, there was an emphasis on underserved markets, care navigation, and enhancing existing tools to make them more personalized and adaptable.

Regarding the steps for creating a sustainable AI-driven mental health industry, innovative partnerships were viewed as essential, alongside proving clinical and financial impact and ensuring the inclusion of lived experiences in the development and evaluation process. Participants also highlighted the need for clear policy guidelines and funding to ensure safety, positive treatment outcomes, and the long-term success of AI-powered mental health solutions.

STORYBOARD: A JOURNEY TO BUILD AN INNOVATIVE MENTAL HEALTH CHATBOT



Figure 13: From Idea to Impact- Amelia's Chatbot Storyboard for Identifying Interventions

This final workshop segment, informed by the survey, featured an animated video following Amelia's, journey as depicted in the above story-board figure 13 as a short video [Video for Workshop.mov](#) . This narrative set the stage for co-creating a shared roadmap of interventions for action across five ecological domains. Stakeholders were asked to identify key changes and share actionable inputs across five categories using sticky notes- identifying interventions for sustainable mental health entrepreneurship with chatbots.

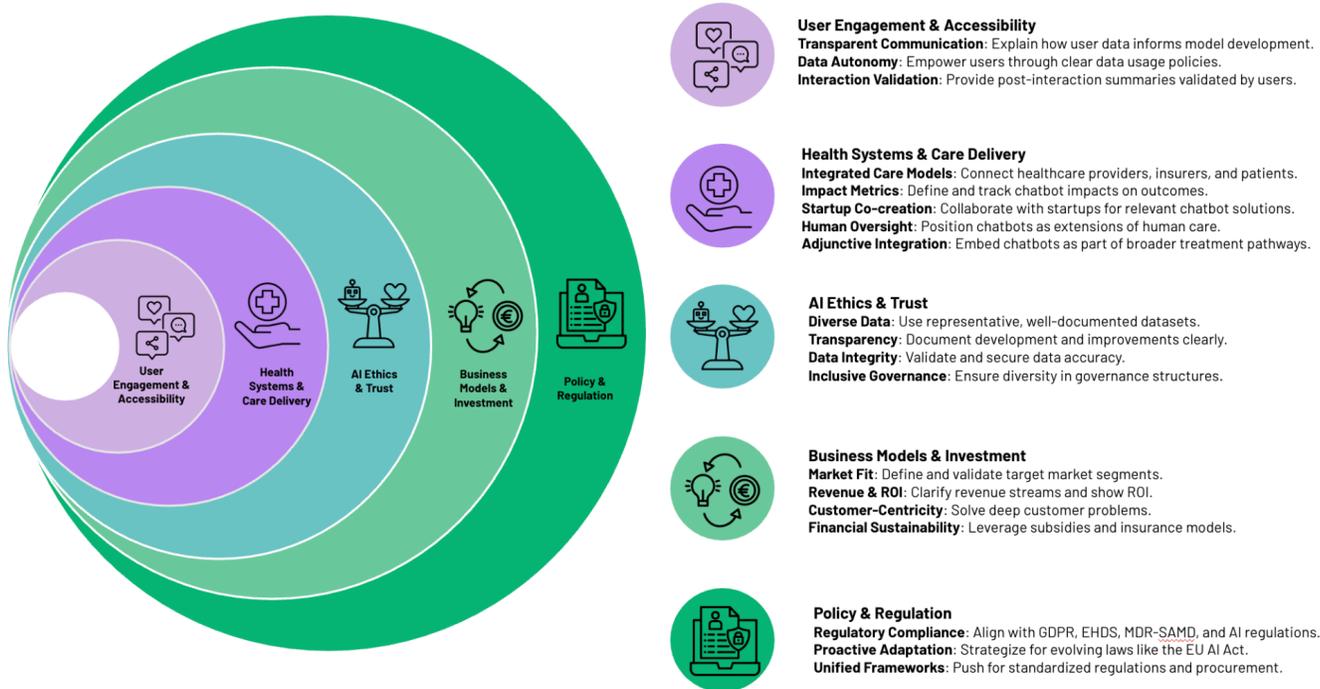


Figure 14: Mapping of Interventions at Socio-technical ecological levels for DMH Entrepreneurship

4.3.1. User Engagement & Accessibility

- **Transparency in Communication:** Clearly establish how user data is utilized in model development. As discussed by stakeholders, *“understanding how my data is being used to inform model development in clear, accessible language is crucial,”* leading to increased user trust and informed participation.
- **Data Autonomy:** Develop comprehensive data autonomy policies empowering users. A stakeholder highlighted the need for *“clear policies regarding data usage, ensuring they have autonomy and choices about their data,”* leading to stronger user empowerment and engagement.
- **Interaction Validation:** Provide concise post-interaction summaries validated by users. Stakeholders shared the importance of offering *“concise summaries enabling users to validate accuracy, enhancing transparency and trust,”* resulting in improved user confidence and chatbot reliability.

4.3.2. Health Systems & Care Delivery

- **Integrated Care Models:** Build systems integrating healthcare providers, insurers, and patients. Stakeholders suggested *“facilitating integrated solutions connecting healthcare providers, insurers, and patients,”* leading to streamlined processes, improved coordination, and enhanced patient experiences.
- **Impact Metrics:** Clearly define and measure chatbot impacts on healthcare outcomes. Stakeholders emphasized the necessity to *“define and measure the chatbot’s impact on improving healthcare goals—accessibility, patient outcomes, and pathway management,”* enabling continuous improvement, accountability, and evidence-based deployment.
- **Startup Co-creation:** Strategically partner with startups to co-create relevant chatbot solutions. Stakeholders advised to *“collaborate closely with startups to co-create chatbot solutions addressing healthcare needs,”* resulting in solutions that are highly relevant and practically applicable.
- **Human Oversight:** Ensure chatbots act as extensions, not replacements, of healthcare providers. Stakeholders discussed the importance of chatbots serving as *“extensions of providers rather than replacements,”* maintaining essential human interaction and ethical use.
- **Adjunctive Integration:** Position chatbots within comprehensive care pathways as supportive adjuncts. Stakeholders recommended integrating *“chatbots as supportive tools within broader treatment pathways,”* leading to enhanced care quality by complementing human-delivered services.

4.3.3. AI Ethics & Trust

- **Diverse Data:** Employ diverse, representative datasets with clear documentation. Stakeholders underscored the use of *“diverse datasets to ensure transparency and mitigate biases,”* resulting in reduced biases and fairer chatbot interactions.
- **Transparency:** Clearly document chatbot model development and iterative improvements. Stakeholders highlighted the importance of *“clearly communicating chatbot’s development—populations, data sources, iterative improvements,”* fostering accountability and trust.
- **Data Integrity:** Enforce stringent validation procedures ensuring data accuracy and integrity, leading to enhanced chatbot reliability and effectiveness.

- **Inclusive Governance:** Foster diversity within AI governance structures for balanced oversight and ethical management, resulting in fair and equitable AI decision-making.

4.3.4. Business Models & Investment

- **Market Fit:** Accurately define market segments and validate product-market fit. Stakeholders noted, *“a business model must clearly identify market and product-market fit,”* ensuring targeted resource use and higher adoption rates.
- **Revenue & ROI:** Identify clear revenue streams and demonstrate return on investment through operational efficiencies. Stakeholders suggested to *“identify clear revenue streams and demonstrate ROI through efficiencies,”* leading to sustainable financial operations and scalability.
- **Customer-Centricity:** Solve significant customer problems through in-depth understanding. Stakeholders emphasized the need to *“be customer-obsessed; deeply understand customer problems before developing solutions,”* resulting in higher customer satisfaction and sustained engagement.
- **Financial Sustainability:** Explore leveraging mental health subsidies and insurance coverage to enhance financial accessibility. Stakeholders recommended exploring *“mental health subsidies and insurance coverage to create sustainable models,”* broadening accessibility and affordability.

4.3.5. Policy & Regulation

- **Regulatory Compliance:** Maintain compliance with key legislation such as GDPR, EHDS, MDR-SAMD, and AI regulations. Stakeholders advised adherence to *“critical legislation already in place: GDPR, EHDS, MDR-SAMD, and AI regulations,”* leading to reduced legal risk and enhanced ethical trustworthiness.
- **Proactive Adaptation:** Prepare strategically for upcoming regulatory implementations, including GDPR and the EU AI Act. Stakeholders highlighted the necessity to *“anticipate GDPR and EU AI Act, maintaining flexibility for regulatory changes,”* ensuring adaptability and ongoing compliance.
- **Unified Frameworks:** Advocate for standardized regulatory frameworks and procurement processes. Stakeholders proposed establishing *“unified regulatory frameworks to streamline adoption,”* resulting in reduced fragmentation, consistency, and ease of market entry.

5. Discussion

5.1. Patterns, Contradictions, and Gaps in the Findings

The research findings outline alignment with existing literature and notable contradictions between expectations and realities of DMH entrepreneurship. A recurring theme is that there is a realization of AI-powered chatbots as a promising yet underleveraged solution to address youth mental health in Ireland. The pre-workshop survey found that stakeholders identified policy regulation, cooperation between chatbot designers and mental health specialists, as well as sustainable business models as the key factors that will shape the success of DMH tools. Similarly, the workshop discussions reinforced the idea that while AI chatbots hold potential, challenges related to ethical concerns, user trust, and regulatory compliance remain significant. This is echoed by Cullen & Phillips (2023) who position DMH tools as extensions of conventional therapy rather than standalone replacements. AI-based platforms such as Woebot and Wysa have demonstrated some efficacy in psychoeducation and symptom relief, but their clinical validation remains an unresolved challenge. As highlighted in prior research, ensuring AI chatbots meet safety, accuracy, and ethical standards is a formidable obstacle.

However, a sharp contradiction surfaced in the workshop discussions regarding commercial viability versus ethical responsibility. Some stakeholders advocated for rapid market entry to secure financial sustainability, whereas others argued that ethical safeguards must be the primary concern in mental health innovation. This reflects a broader dilemma identified in the literature: balancing profitability with patient-centric care (Cullen & Phillips, 2023).

Another striking contradiction lies in user adoption and engagement. The survey responses expressed optimism about AI-driven solutions, particularly in addressing accessibility gaps among underserved youth. Yet, in the workshop, participants voiced skepticism—concerns centered on user engagement, cultural adaptability, and the practical effectiveness of digital interventions. This apprehension aligns with Prizeman et al. (2023), who found that youth users often struggle to connect with automated systems due to the absence of human emotional nuance. This expectation-reality gap is crucial: while entrepreneurs view AI chatbots as scalable interventions, long-term engagement remains uncertain, necessitating continuous refinement, personalization, and integration with human-led services.

Finally, our findings expose a gap in regulatory clarity. The literature emphasizes the role of the General Data Protection Regulation (GDPR) and the EU AI Act in shaping AI-driven mental health solutions. Yet, survey and workshop participants highlighted ongoing struggles in navigating these frameworks, particularly in relation to data privacy, transparency, and liability concerns. This ambiguity obstructs the scaling of mental health chatbots, hampering their seamless integration into formal healthcare structures. Nehme et al. (2024) argue that chatbots categorized as "high-risk AI systems" under the EU AI Act face prolonged and costly compliance processes, which could stifle innovation rather than foster it.

5.2. Economic Implications

Sustaining AI-driven mental health solutions requires robust financial models. Survey respondents overwhelmingly favored hybrid business models—ones that integrate freemium access, corporate partnerships, and insurance-backed reimbursements—as the most viable pathways for long-term success. This aligns with research identifying corporate wellness collaborations, insurance funding, and public mental health initiatives as essential revenue sources (Cullen & Phillips, 2023). Nonetheless, workshop discussions revealed deep concerns regarding the limitations of direct-to-consumer (D2C) models. Many young users, particularly those from low-income backgrounds, may not be willing or able to pay for AI-driven mental health apps. This challenge is reflected in Market.us (2023), which notes that while the AI mental health chatbot sector is growing, retention rates for subscription-based models remain discouragingly low. Consequently, the future likely lies in business-to-business (B2B) and business-to-government (B2G) models, where chatbot services are embedded within healthcare systems, insurers, or educational institutions rather than relying solely on individual subscriptions.

Another financial hurdle is the high cost of compliance and clinical validation. Investors hesitate to fund startups that lack regulatory approval or demonstrable clinical impact—a sentiment echoed in the workshop. This finding aligns with Woebot Health's \$90 million investment surge, largely attributed to its partnerships with healthcare providers and clinical trial validation (Woebot Health, 2021). For Irish startups, establishing credibility within the healthcare sector will be pivotal in attracting investment and achieving scalability.

5.3. Technological Implications

The findings confirm that AI-driven chatbots must evolve to accommodate the complex, individualized needs of young users. The literature review identifies AI-powered tools such as Wysa and Woebot, which employ cognitive-behavioral therapy (CBT) and natural language processing (NLP) to engage users (Balcombe, 2023). Yet, our workshop participants expressed concerns about their cultural adaptability, emotional intelligence, and ability to provide nuanced support. These criticisms reinforce research findings that AI chatbots struggle to replicate the empathetic, human-like interactions necessary for effective mental health support.

A promising solution that emerged in our workshop discussions is the "human-in-the-loop" model, where AI chatbots complement rather than replace human mental health professionals. This approach is already being tested in the UK's National Health Service (NHS), where chatbots handle initial screenings while escalating high-risk cases to human therapists (Victor, 2022). By embedding human oversight, personalized interventions, and AI-driven adaptability, chatbot developers can improve trust, safety, and real-world effectiveness.

5.4. Regulatory Implications

The regulatory landscape presents a double-edged sword for DMH entrepreneurs. Survey results indicated that regulatory compliance is a primary concern, particularly regarding data security, AI transparency, and ethical oversight. The literature review reinforces this concern, pointing to GDPR's stringent data protection laws and the EU AI Act's classification of chatbots as "high-risk AI systems" (Regulation (EU) 2024/1689, 2024). While these policies are designed to protect users, they also increase compliance costs and slow down product innovation, a frustration echoed in the workshop discussions.

However, some workshop participants argued that regulation, if structured properly, could be an enabler rather than a barrier. A model example is Germany's DiGA framework, which provides a structured reimbursement pathway for government-approved digital therapeutics (Nehme et al., 2024). If Ireland were to implement a similar structured framework, it could foster investor confidence and accelerate adoption within public healthcare.

6. Limitations and Future Research

Although findings from our study present valuable insights into the challenges and opportunities within mental health chatbot entrepreneurship in Ireland, several limitations must be acknowledged, highlighting the need for further research in key areas.

The study engaged key stakeholders from academia and practice but did not include the end-users, policymakers, and investors. The absence of end users limited our understanding of user's engagement with mental health chatbots, their accessibility issues and personal experiences, all of which directly influence adoption of these tools and would need to be addressed for adoption rates to go higher. The lack of participation from policymakers and investors means that our study does not fully capture the decision-making factors that influence regulatory approvals and financial support for chatbot entrepreneurs. The investors could have provided critical insights into the financial and market viability of DMH chatbots in Ireland while the policy makers could have helped us understand how they assess safety, data privacy, and clinical validity. Their input would have strengthened our understanding of how entrepreneurs can align their strategies with regulatory requirements and investment priorities. Future research should prioritize engaging a more diverse group of stakeholders, including end users, policy makers and investors to obtain a well-rounded perspective on the DMH ecosystem and address potential barriers to successful mental health chatbot businesses.

Furthermore, the study does not address the long-term effectiveness of AI-driven mental health chatbots, which is crucial for assessing their business sustainability, growth, and investor confidence. Long-term effectiveness could also influence the integration of mental health chatbots into healthcare systems and insurance models, thereby increasing accessibility for a wider population. Future research should implement longitudinal studies to track usage patterns and long term clinical outcomes to determine whether these tools deliver positive effects beyond the initial period of use and whether continued engagement leads to sustained mental health benefits over months or years.

The study also explores Ireland's current regulatory landscape, but regulatory frameworks governing AI in healthcare are continuously evolving, and chatbot developers must navigate these complex legal requirements. The study does not fully account for the potential impact of future regulatory changes, particularly those that will be introduced in the coming years. Future research should focus on understanding how emerging compliance requirements will shape the development

and deployment of mental health chatbots in Ireland and how entrepreneurs can continually align their chatbots with evolving regulatory expectations.

Finally, the study discusses various potential business models for mental health chatbots but does not empirically validate them. It lacks real-world case studies and financial performance data to determine the viability of these models in practice. Since the financial sustainability of chatbot startups depends on securing reliable revenue streams, future research should focus on conducting financial assessments and pilot programs to evaluate the profitability and scalability of different business models within the Irish market, particularly the hybrid model, as well as business-to-business and business-to-government models, which are expected to offer more scalable and sustainable pathways for chatbot services. Research should also explore investment trends and user willingness to pay, as these are crucial for ensuring long-term success.

7. Learnings & Reflection

The TFRT focused on digital health and entrepreneurship, particularly in the context of mental health chatbots. The training aimed to help the co-researchers understand stakeholder involvement and use system science methodologies for structured problem-solving using a real-world scenario aided with capacity building in understanding and implementing transdisciplinary research. As a group, we worked on defining the boundaries of the research and aligning our motivations. Given the diverse background of group members, academic nature of the project, and negotiation and shared goal-setting. We were able to establish a common understanding of the research focus through discussion.

We examined how academia and practitioners interact with each other in mental health entrepreneurship. For understanding the system better, we mapped connections, feedback loops, and cause-effect relationships. These helped in understanding key themes for sustainable development, which was supported by academic research as well as primary data collected with participants. Given the background of the team and the stakeholders, working in a multidisciplinary team required overcoming differences in expertise, perspectives, and expectations internally as a group. We managed these challenges through structured dialogue and active negotiation. The Triple Helix Model was used to analyze stakeholder roles, ensuring all viewpoints were considered for incorporating stakeholder perspectives and having a structure, which helped us in thinking about the interactions between stakeholders, and at the same time it constrained us to think beyond the structure.

We looked into multiple case studies, and we particularly explored Woebot, a youth-focused chatbot using CBT, and SilverCloud, a digital CBT platform in Ireland's healthcare system for detailed review. These case studies helped us understand user adoption, business feasibility, and ethical concerns. The discussions emphasized the importance of user trust and engagement in chatbot success. We used Causal Loop Diagrams (CLDs) in Vensim to visualize system interactions and dependencies. Stakeholder mapping using the Triple Helix Model provided clarity on different actors in DMH. For the co-creation workshop, we used a future foresight model, the Three Horizons Model, to structure our thinking into the current landscape, challenges, and future opportunities as we focused on thinking about future scenarios.

The training reinforced the importance of transdisciplinary collaboration in problem-solving. We learned that systems science tools help structure complex challenges, and stakeholder engagement is crucial in designing ethical and viable solutions. This made it interesting for us to collaborate and think about this in the context of mental health chatbots. These learnings could be applied in academic research, policy discussions, and entrepreneurial ventures. Future work should explore policy engagement, AI ethics in mental health, and improving chatbot-human interactions. The training provided a solid foundation for further exploration in digital health entrepreneurship.

8. Conclusion

This research has explored the future of digital entrepreneurship and mental health chatbots in Ireland, emphasizing the key opportunities and challenges that shape their development and adoption. By integrating insights from literature, survey findings, and co-creation workshop, this study highlights the critical role of a transdisciplinary approach in ensuring the scalability, ethical integrity, and regulatory compliance of AI-driven mental health solutions. In addition, the literature review established a strong theoretical foundation, outlining the growing mental health crisis among young people in Ireland and the potential of AI-powered chatbots to address accessibility barriers. Existing studies emphasize that mental health chatbots offer immediate, stigma-free, and scalable support (Hoffman et al., 2024; Kosyluk et al., 2024). However, concerns persist regarding their clinical effectiveness, ethical implications, and regulatory challenges (Bond et al., 2023; Nehme et al., 2024). The review further identified gaps in stakeholder collaboration, with limited co-development efforts involving mental health professionals, policymakers and users-factors that influence adoption and long-term engagement. To identify key challenges and opportunities in DMH entrepreneurship, this

study employed a mixed-method approach, combining a pre-survey and a stakeholder workshop. The survey results highlighted three primary determinants shaping the future of AI-powered mental health chatbots: (1) policy regulations and compliance, (2) collaboration between chatbot developers and mental health practitioners and (3) the viability of sustainable business models. As findings suggested, respondents identified hybrid financial models—particularly those integrating corporate partnerships and insurance-backed reimbursements as the most promising pathways for scalability. However, challenges such as user trust, clinical validation, and regulatory uncertainty emerged as barriers to widespread adoption. While some participants advocated for rapid market entry to secure financial sustainability, others underscored the need for rigorous ethical safeguards before deployment. A key insight was that mental health chatbots should not function as standalone interventions but rather as integrated tools within Ireland’s mental healthcare ecosystem. The “human-in-the-loop” model, in which AI chatbots assist mental health professionals rather than replace them, emerged as a widely supported approach to enhance trust, effectiveness, and clinical oversight. Furthermore, discussions addressed the necessity of aligning chatbot development with regulatory frameworks such as GDPR and the EU AI Act to ensure compliance and public trust. From a broader perspective, the study illustrates the importance of balancing technological innovation with regulatory, ethical, and business considerations. Stakeholders emphasise that sustainable growth in this sector requires structured policy interventions, industry-academic collaborations, and investment in clinically validated AI solutions. In point of fact, future research should focus on longitudinal studies assessing chatbot effectiveness in real-world settings, as well as policy frameworks that support ethical AI entrepreneurship in mental health. Ultimately, the success of DMH entrepreneurship in Ireland hinges on a transdisciplinary approach that integrates the perspectives of AI developers, mental health professionals, policymakers and business leaders. By fostering collaboration, ensuring ethical compliance, and developing sustainable business models, Ireland can position itself as a leader in AI-driven mental health innovation while safeguarding user well-being and public trust.

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Annexure

Survey Form

Stakeholder Pre-Survey: Future of Digital Entrepreneurship & Mental Health Chatbots in Ireland

Thank you for participating in this pre-survey ahead of our online workshop on **digital entrepreneurship in the context of mental health chatbots for youth in Ireland**. This survey aims to gather insights from different stakeholders on the **business opportunities, challenges, and market trends** shaping the future of AI-powered mental health solutions.

Your responses will help **prioritize key discussion topics** during the workshop, ensuring we focus on the most pressing uncertainties and high-impact strategies. The survey should take approximately **3-5 minutes** to complete.

* Indicates required question

1. *We are conducting this survey to gather insights for the upcoming stakeholder workshop on AI-powered mental health chatbots. Your responses will be used for research and discussion purposes during the workshop. Participation is voluntary, and you may withdraw at any time. All responses will be stored securely and handled in compliance with GDPR regulations. By proceeding, you confirm that you have read and understood this information and consent to participate.* *

Mark only one oval.

- I consent to participate in this survey and for my responses to be used for research and discussion purposes.
- I do not consent

2. Name

3. Which sector do you represent?

Mark only one oval.

- Industry (Startups, AI/Tech companies, healthcare providers, investors)
- Government & Public Sector (Health agencies, policymakers, regulators)
- Academia & Research (Universities, research institutions, think tanks)
- NGOs & Advocacy (Nonprofits, mental health organizations, youth-focused initiatives)
- Other: _____

4. Primary Area of Work/Expertise

Tick all that apply.

- AI & Machine Learning
- Digital Health Entrepreneurship
- Public Health & Mental Health
- Business Strategy & Investment
- Regulation & Compliance
- Youth Engagement
- Ethics & Responsible AI
- Other: _____

5. Have you been directly involved in the development, deployment, or business strategy of AI-driven mental health chatbots?

Mark only one oval.

- Yes
- No
- To some extent

6. How familiar are you with AI-powered mental health chatbots?

Mark only one oval.

1 2 3 4 5

Not Very Familiar

7. In your opinion, which factors will have the biggest impact on the future of AI-powered mental health chatbots? (Select up to 3)

Tick all that apply.

-  Regulation & Compliance (GDPR, AI governance, digital health laws)
-  Sustainable Business Models (Monetization strategies: B2B, freemium, insurance partnerships)
-  Market Growth & Adoption (Which regions and sectors will drive chatbot adoption?)
-  Ethical AI & Consumer Trust (Ensuring fairness, transparency, and responsible AI use)
-  Human-AI Collaboration in Healthcare (Will chatbots enhance or replace therapists?)

8. In your opinion, what business model is most sustainable for AI-driven mental health chatbots? (Select up to 2)

Tick all that apply.

-  Direct-to-Consumer (DTC) → Subscription-based or freemium model for individual users
-  B2B & Corporate Partnerships → Employers integrate chatbots into workplace wellness
-  Healthcare & Insurance-Backed → Covered by health insurance & integrated into clinical care
-  Data & Research Licensing → AI firms monetize anonymized mental health data for research
-  Hybrid Model → Combining multiple revenue streams (e.g., freemium + corporate partnerships)
- Other: _____

9. What do you think is the biggest challenge in scaling AI-powered mental health chatbots (e.g., funding, technology, market acceptance)?

10. Where do you see the biggest investment opportunity for AI-powered mental health solutions (e.g., new business models, underserved markets, technology improvements)?

11. What is the most important step required for creating a sustainable, financially viable AI-driven mental health industry (policy, funding, partnerships, or innovation)?

12. Would you like to add any additional comments or suggestions?

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Google Forms

Workshop Concept Note



Concept Note for Co-Creation Workshop: Future of Digital Entrepreneurship & Mental Health Chatbots in Ireland

February 20, 2025 | 7:00 PM CET | [Zoom](#)

About us

We are a group of **MSc student researchers** at the School of Information & Communication Studies at the University College Dublin (UCD) specializing in transition, innovation, and sustainability environments. As part of our **joint master's interdisciplinary program**, we are undertaking a **complexity and system science project** focused on the **opportunities and challenges around digital entrepreneurship for mental health** focusing on chatbots and/or conversational agents.

Team: [David Vuth](#), [Lucy Namakula](#), [Safaa Zaki](#), [Sabira Ataibekova](#), [Shivam Shumsher](#).

Context

Digital mental health entrepreneurship in Ireland is gaining traction as a response to the growing mental health needs, emerging digitization, and a focus on entrepreneurship. With Ireland ranking among the **highest in Europe for mental health challenges** (Hyland et al., 2022) and long waiting times for traditional services, AI-powered chatbots provide an accessible, scalable solution. **Woebot, a youth-centric chatbot**, has been designed to provide early interventions using cognitive behavioral therapy (CBT) techniques, making mental health support more immediate and stigma-free. **SilverCloud, which integrates digital CBT** into Ireland's healthcare system, further highlights the role of AI-driven mental health tools in reducing anxiety and depression (Cullen, 2018). However, **low awareness, ethical concerns, and limited integration within the national healthcare framework** pose significant barriers to adoption (Balcombe, 2023). **Regulatory challenges** further complicate the landscape, as mental health chatbots must comply with regulation and policy issues like strict data protection, transparency, and clinical validation (Nehme et al., 2024). Balancing innovation with compliance remains a key challenge for developers and policymakers. Strengthening **consumer engagement**, integrating AI-driven models into public healthcare, and fostering **cross-sector collaboration** between academia, startups, and policymakers will be critical for a sustainable Irish digital mental health ecosystem.

Co-creation Workshop Objectives

The co-creation workshop **explores the future of Digital Entrepreneurship & Mental Health Chatbots in Ireland** and collaborative:

- **Understanding the Complex Landscape**– Validate our research findings from the desk review conducted by us; discuss key insights, and gaps while incorporating your expertise.
- **Identifying Challenges & Opportunities** – Explore key concerns, barriers, and possibilities in achieving the desired impact of chatbot-based mental health entrepreneurship in Ireland.
- **Co-developing a Roadmap** – Define the steps needed to build a sustainable digital mental health ecosystem, identifying what actions can drive meaningful change.

Workshop Agenda

Time	Topic & Activity	Description & Notes
7:00 PM	Introduction to the Workshop	<ul style="list-style-type: none"> - Context: Purpose of the workshop, group reflection - Participant Introduction and expectation setting.
7:10 PM	Understanding the Complex Landscape (Validating Research Findings & Horizon 1 – Current State)	<ul style="list-style-type: none"> - Research Insights: Present findings from the desk review on mental health chatbots in Ireland. - Stakeholder Inputs: Participants provide feedback, validate findings, and highlight gaps. <p>OUTCOME: Inform the current understanding & fill knowledge gaps.</p>
7:20 PM	Identifying Challenges & Opportunities (Exploring Barriers & Possibilities in Chatbot-Based Mental Health Entrepreneurship & Horizon 3 – Future Vision, 10+ years)	<ul style="list-style-type: none"> - Explore uncertainties and possible futures in given scenarios on key drivers of digital mental health entrepreneurship. - Group Discussions: Identify and foresee risks, and opportunities for the future in selected scenarios. <p>OUTCOME: Speculate future scenarios in different contexts.</p>
7:35 PM	Co-Developing a Roadmap (Defining Actions for a Sustainable Digital Mental Health Ecosystem & Horizon 2 – Pathway to Transformation)	<ul style="list-style-type: none"> - Discuss the desired scenario presentations – imagine the best scenario for sustainable digital mental health entrepreneurship. - Stakeholder Co-Creation for Transition: Identify necessary actions in policy, business models, AI ethics, and user engagement. - Backcasting Exercise: Map steps from 2040 → today for an actionable roadmap. <p>OUTCOME: How might we transition toward a sustainable future for mental health entrepreneurship with chatbots?</p>
7:55 PM	Conclusion & Next Steps	<ul style="list-style-type: none"> - Key Takeaways: Summarize insights, challenges, and opportunities. - Stakeholder Reflections: Final thoughts and commitments for future collaboration.

We prioritize informed consent, transparency, confidentiality, and responsible data use in this research. Participants will be fully informed about the purpose of the workshop, and participation is entirely voluntary, with the option to withdraw at any time. All data collected will be anonymized and used solely for reporting purposes. No personal or sensitive information will be shared or published without explicit consent. The study adheres to research ethics guidelines and GDPR, ensuring compliance with data protection and privacy standards.

Photo Documentation



miro | Taster version - Doughnut Design for Business_TISE : Upgrade | Opey Abednego Br. Ayesha | 19 | Present | Share

1. Transformative ideas

Visualise a thriving future economy. Your business is part of it. What are your most ambitious ideas for getting there?

Regenerative Distributive

Sobira Ataibekova

What will you stop doing?

Ideas from activists, local communities, future generations?

Regenerative by design?

Ideas from employees, customers, supply-chain workers?

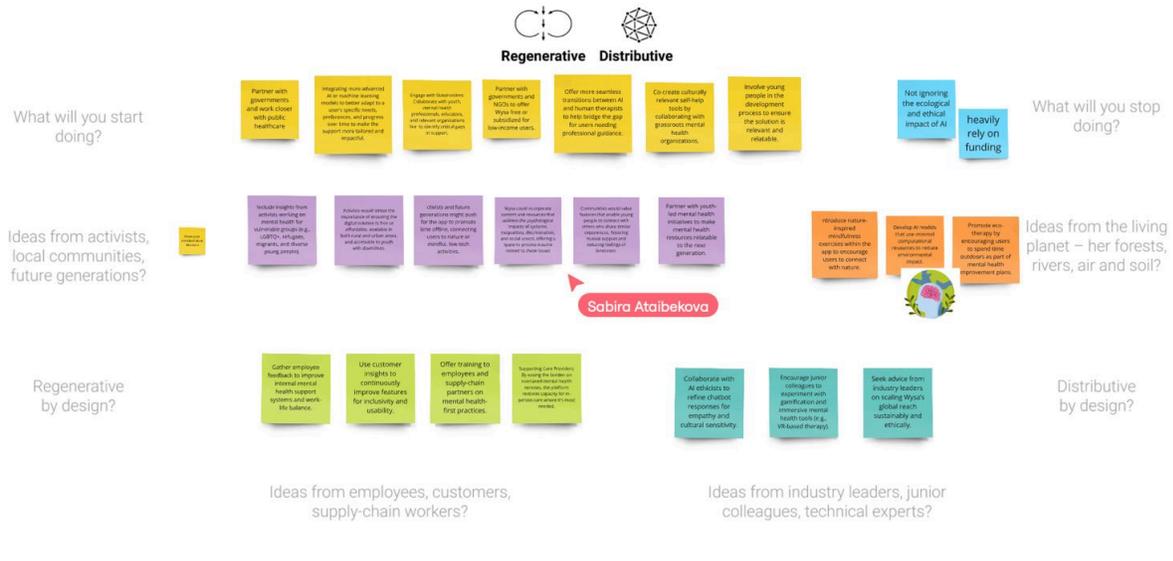
Ideas from industry leaders, junior colleagues, technical experts?

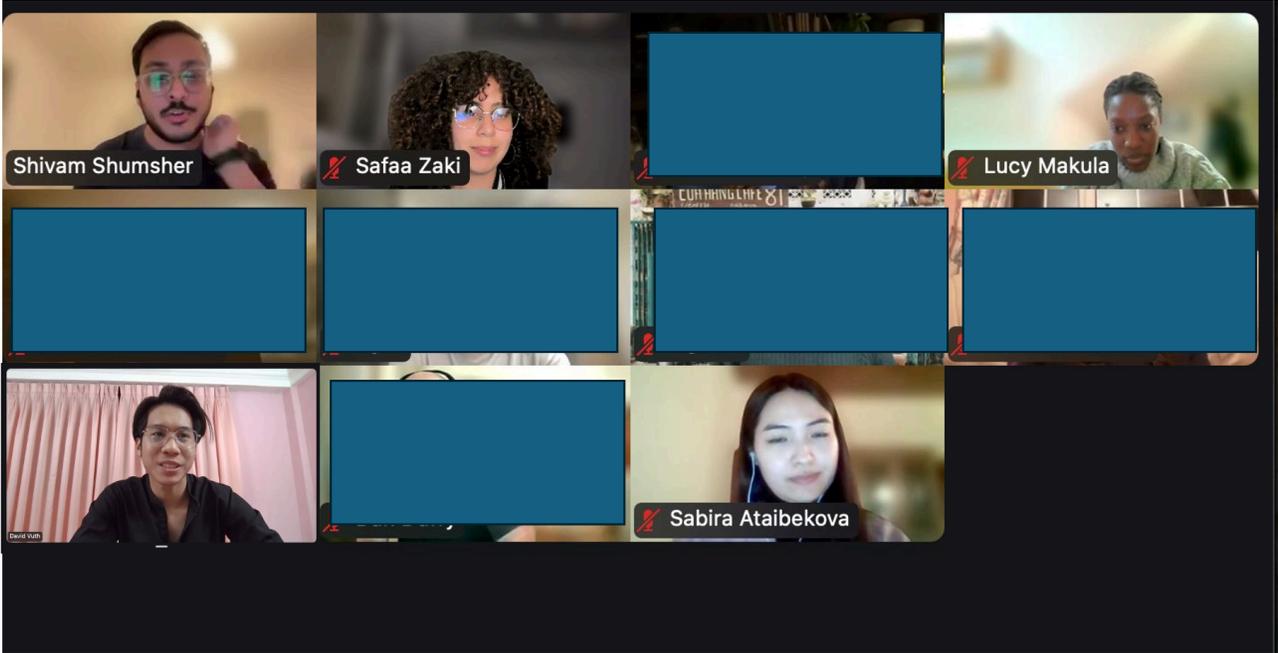
Canvas: Transformative Ideas

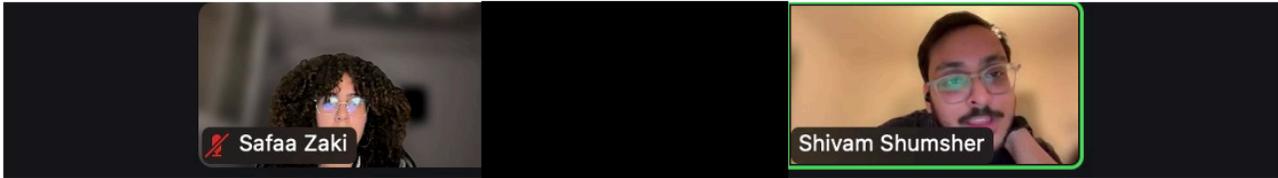
Generate transformative ideas | Explore business...



Visualise a thriving future economy. Your business is part of it. What are your most ambitious ideas for getting there?







TFRT-HORIZON 3&2 12

Horizon 2

Co-developing a Roadmap

How might we transition toward a sustainable future for mental health entrepreneurship with chatbots?

Topic	Time
	10-20 mins

- Step 1: Identify Key Changes.** Think about what needs to change at different levels (policy, funding, trust, regulations, accessibility).
- Step 2: Add Your Inputs.** Write key actions on sticky notes under your category.
- Step 3: Share & Discuss:** Share your inputs to create a **shared roadmap for action.**

Drag and drop sticky notes

User Engagement & Accessibility

What changes are needed to improve user trust, adoption, and accessibility of chatbots for diverse communities?

Sticky notes:

- Identify user needs being across cultures, languages, and disabilities.
- Use user-centered design to understand how and how their role is done. They do not want to be replaced, they want to be supported.
- Building user confidence through transparency and explainability.

Health Systems & Care Delivery

How can health systems integrate AI-powered mental health chatbots to enhance care while ensuring safety, effectiveness, and accessibility?

Sticky notes:

- Integrated healthcare offerings: connecting provider, insurer, patient, member.
- Work with startups building in order to co-create the product.
- Human in loop (chatbot as extensions of doctor/providers not replacement).
- For these needs, consider as part of a comprehensive treatment and safety or advice to enhance care.

AI Ethics & Trust

How should AI chatbot design & ethics improve to make them more transparent, fair, and free of bias?

Sticky notes:

- Bring diverse and transparent documentation.
- Diversity in AI governance at regulatory bodies/companies.
- Ensuring data used is accurate and consensual.

Business Models & Investment

How should business models evolve to ensure long-term financial sustainability while being accessible & ethical?

Sticky notes:

- The art of a business model is to find a market and product-market fit. It's important to understand at this stage if you are targeting mass market consumers or going to the clinical community. For either you need to identify who you intend to target with a chatbot.
- Understand the customer problem and solve it. The problem must be big enough they are willing to pay for it.
- Mental health subsidy coverage.

Policy & Regulation

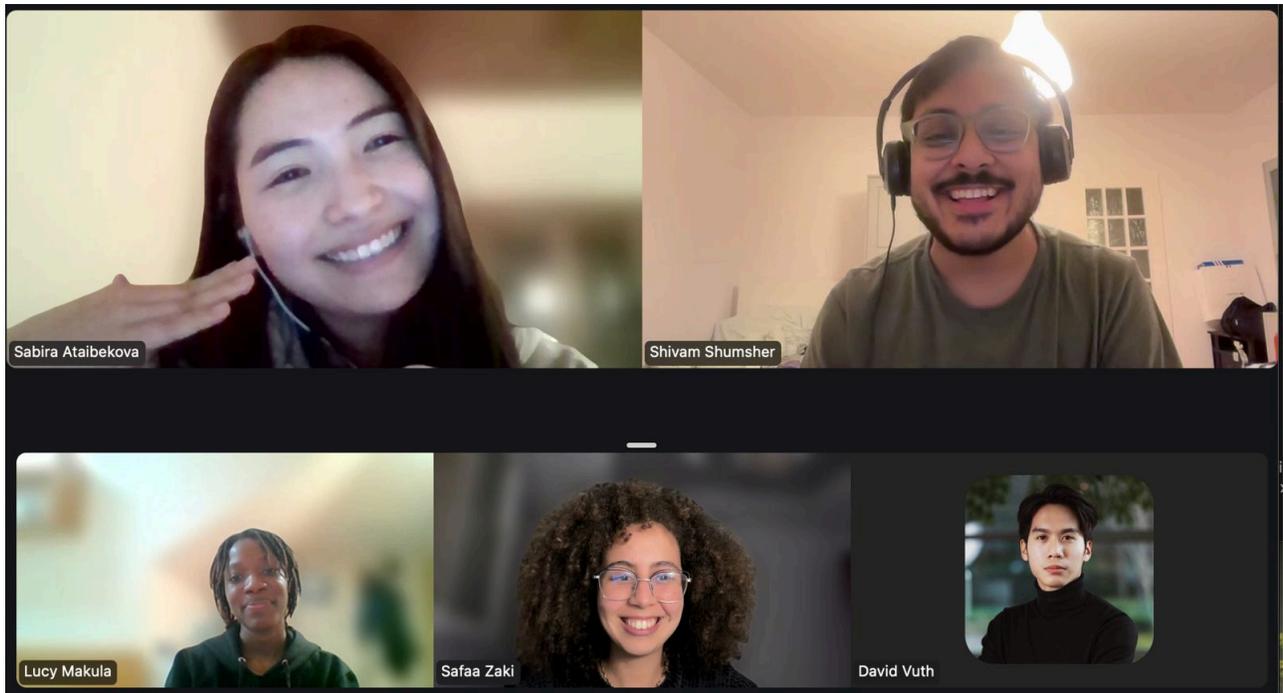
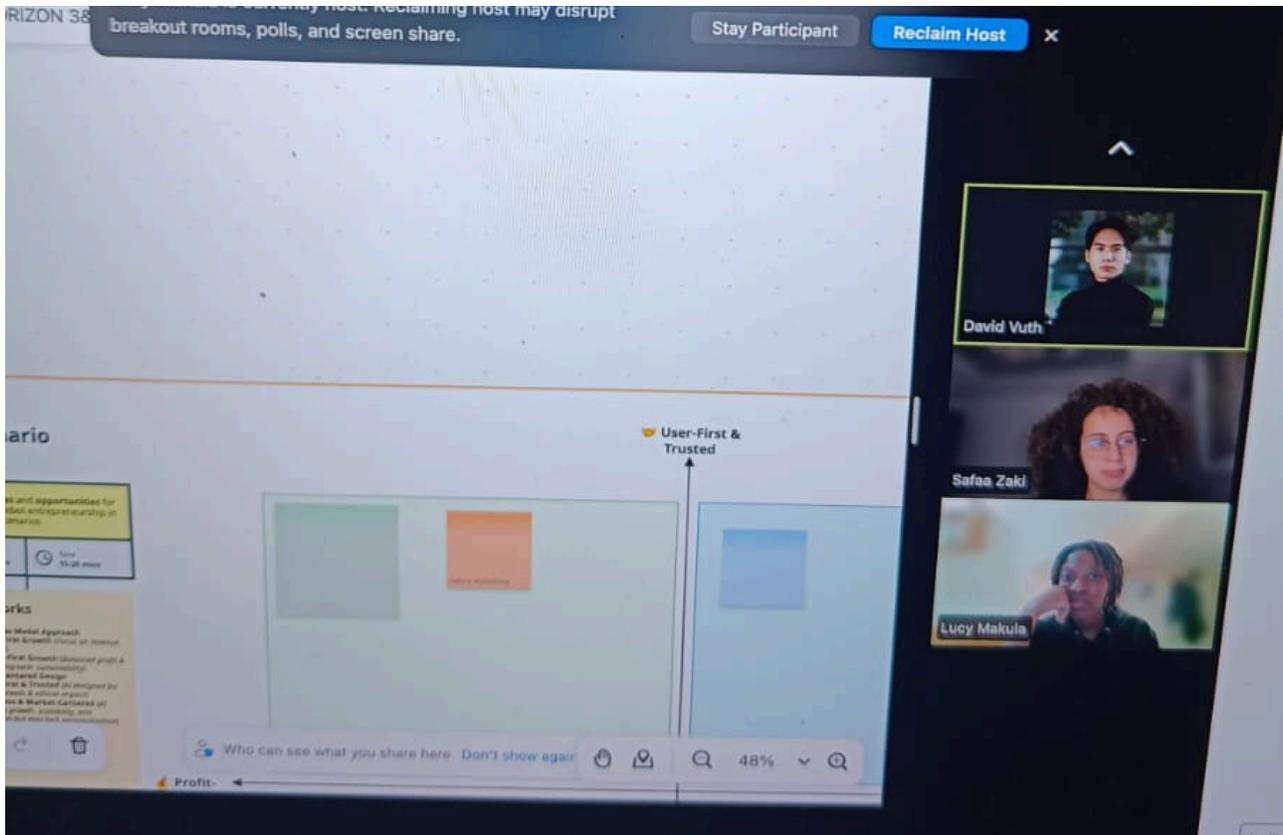
What policy and legal changes are needed to ensure chatbots are safe, ethical, and widely accessible?

Sticky notes:

- There is a comprehensive approach and framework in place, with OIG and AI.
- AI and AI chatbots will be in place in the next 2-3 months. Regulatory bodies will continue to review health requirements.
- Building trust among users and providers.

Who can see what you share here 22%

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Post Workshop

