Challenges and Strategies of Inter-Disciplinary Research and Development: Lessons from a Telehealth Project

Wei Zhou, Andy Li, Rashina Hoda, Chris Bain
Faculty of Information Technology
Monash University
Melbourne, Australia
e-mail: {wei.zhou2, andy.li, rashina.hoda, chris.a.bain}@monash.edu

Sam Georgy
Video Call Service,
Health Direct Australia,
Sydney, Australia
e-mail: sam.georgy@healthdirect.org.au

Teresa O'Brien, Mahima Kalla, Olivia Metcalf, Wendy Chapman
Centre for Digital Transformation of Health
University of Melbourne
Melbourne, Australia
e-mail: {teresa.obrien, mahima.kalla, olivia.metcalf, wendy.chapman}@unimelb.edu.au

Peter Poon
Supportive and Palliative Care
Monash Health
Melbourne, Australia
e-mail: peter.poon@monash.edu

Abstract—The rapid rise of telehealth has revolutionized healthcare access, particularly for those in rural and under-served areas. This paper presents the interdisciplinary research and development of a telehealth project aimed at enhancing the experience of palliative care patients. The project, spanning three years, involved multiple stakeholders, including software engineering researchers, healthcare researchers, clinical experts, a telehealth industry partner, and a government entity. We address the core challenges encountered during the project, particularly in managing interdisciplinary collaboration, and share strategies that we found useful to enable valuable, human-centered outcomes.

Keywords-Telehealth; Interdisciplinary; Palliative care; Research and Development (R&D).

I. INTRODUCTION

Interdisciplinary team science [1] is becoming increasingly critical for addressing complex challenges that demand input from multiple disciplines. In domains like digital health, where technology, healthcare, and user experience converge, the integration of diverse expertise drives innovation and enables the development of comprehensive, user-centered solutions. A prominent example is telehealth [2], which is part of connected health [3], and has emerged as an essential component of healthcare delivery, particularly in remote areas and especially during and after the COVID-19 pandemic. This modality enables improved accessibility and equity across diverse populations [4]. Its effective implementation, however, requires overcoming challenges related to technology design, clinical integration, and user experience [5].

In a three-year project aimed at enhancing telehealth led by software engineering, an interdisciplinary team of software engineering researchers, healthcare researchers, clinical experts, a telehealth industry partner, and a government entity brought together a wealth of diverse expertise and experiences. Co-design and evaluation with end-users – patients, carers, and healthcare practitioners – provided critical focus and direction. The experience included several challenges in aligning different disciplinary perspectives [6]. This paper presents an overview of the interdisciplinary challenges encountered during the project and the strategies employed to address them. It emphasizes the importance of team-building, co-design methodologies, and an agile research and development approach to facilitating successful interdisciplinary collaboration [7]. By addressing structural and communication barriers inherent in interdisciplinary work, the project highlights how interdisciplinary teams can effectively co-create innovative solutions in complex and rapidly evolving areas.

The rest of this paper is organized as follows. In Section II, we describe the challenges faced during interdisciplinary R&D, such as differences in terminology, conflicting stakeholder interests, and recruitment issues. Section III outlines the strategies used to overcome these challenges, including team-building, co-design with users, and an agile R&D approach. Section IV concludes with a summary of findings and suggests future steps for improving interdisciplinary projects in digital health.

II. CHALLENGES IN INTER-DISCIPLINARY R&D

A. Differences in Terminologies and Protocols

A significant challenge in interdisciplinary projects is the discrepancy in terminologies, protocols, and conceptual frameworks between the healthcare and technology sectors. These can lead to miscommunication, misunderstandings, and delays in project timelines. For example, healthcare professionals and software developers may use different definitions for "evaluation", leading to confusion about the outcomes of certain stages in the project. Similarly, terms such as "development" and "implementation" and even "co-design", albeit more subtle, can mean different things in the two disciplines.

B. Conflicting Interests and Expectations Across Stakeholders

Interdisciplinary projects often involve stakeholders with diverse and sometimes conflicting goals. Researchers may prioritize scientific contributions, while industry partners focus on product viability and market potential. This conflict of interest

can create tension in decision-making processes, requiring careful negotiation and alignment of objectives.

C. Participant Recruitment Challenges

We faced significant recruitment challenges due to: many potential participants not meeting the inclusion criteria or clinical gate-keeping, patients having limited access to or familiarity with digital tools, ethical complexity of obtaining informed consent from palliative care patients, and busy clinician schedules [8]. The COVID-19 pandemic exacerbated existing challenges, particularly in the recruitment of representative participants for co-design and evaluation. Unprecedented burdens on the healthcare ecosystem meant participating in research projects was not a priority.

D. Covering the Full R&D Lifecycle

The project covered the full R&D lifecycle – from ideation and co-design with patients, clincians, and carers to iterative software design, development, and evaluation – which required expertise from multiple disciplines. This complexity often leads to coordination overheads, where ensuring all team members were aligned in their efforts and one activity successfully feeding into the other was non-trivial.

III. STRATEGIES FOR INTERDISCIPLINARY R&D

Several strategies informed by agile principles [7] and the specific demands of the project were implemented:

A. Team-Building and Open Communication

Building trust and ensuring open communication were critical to overcoming the challenges of interdisciplinary collaboration. The project utilized team-building exercises, including regular meetings and end-of-year retrospectives, to foster a sense of alignment and shared purpose among stakeholders. Reflexive discussions, where team members were encouraged to share their concerns and suggestions, were held regularly to maintain transparency and address emerging issues.

B. Co-Design with End-Users

Conducting co-design with end-users, such as patients, carers, and clinicians, allowed the team to avoid a "technology push" approach and instead apply a human-centred approach with a focus on addressing real-world telehealth challenges. By involving end-users in the design process, the team ensured that the solutions developed were relevant and practical for potential deployment in clinical settings. Technology options were considered around end-user needs and workflows, assessed for feasibility and technical compatibility with the industry partner's platform, and developed accordingly, signifying a "technology pull" approach.

C. Agile R&D Approach

The team adopted an agile R&D approach through iterative cycles of *co-design*, *prototyping*, and *evaluation*, which allowed for flexibility in response to changing circumstances, such as the pandemic's impact on recruitment. This iterative

process enabled the team to incorporate feedback from end-users and stakeholders continuously, ensuring that the solutions evolved to meet emerging needs [7].

D. Working Closely with Industry Partners

Collaboration with industry partners, such as Healthdirect Australia and Monash Health, ensured that the project maintained a focus on real-world applications. These stakeholders provided invaluable insights into the market potential of telehealth solutions, guiding the R&D process toward outcomes that were scientifically robust and commercially viable.

IV. CONCLUSION AND FUTURE WORK

The strategies employed in this project led to several key outcomes, including improved communication and collaboration between healthcare and technology professionals that lasted throughout the project. The team's interdisciplinary approach fostered innovation by bringing together diverse perspectives, ultimately leading to the development of telehealth software enhancements that were clinically relevant and technologically aligned with the industry partner's widely adopted technical platform.

Our experiences from the "enhancing telehealth" project demonstrates the importance of interdisciplinary collaboration in digital health R&D. By building a cohesive team, co-designing with end-users, and adopting agile methodologies, the project successfully navigated the challenges of inter-disciplinary collaboration. Future projects in the digital health space should continue to prioritize interdisciplinary approaches to ensure that innovations are both scientifically rigorous and practically applicable.

REFERENCES

[1] D. Stokols, K. L. Hall, B. K. Taylor, and R. P. Moser, "The science of team science: Overview of the field and introduction to the supplement," *American journal of preventive medicine*, vol. 35, no. 2, S77–S89, 2008.

[2] E. R. Dorsey and E. J. Topol, "State of telehealth," *New England journal of medicine*, vol. 375, no. 2, pp. 154–161, 2016.

[3] S. T. MacMahon and I. Richardson, "Pathways, technology and the patient—connected health through the lifecycle," *Frontiers in Digital Health*, vol. 5, p. 1 057 518, 2023.

[4] E. Monaghesh and A. Hajizadeh, "The role of telehealth during covid-19 outbreak: A systematic review based on current evidence," *BMC public health*, vol. 20, pp. 1–9, 2020.

[5] S. N. Gajarawala and J. N. Pelkowski, "Telehealth benefits and barriers," *The Journal for Nurse Practitioners*, vol. 17, no. 2, pp. 218–221, 2021.

[6] J. K. Tebes and N. D. Thai, "Interdisciplinary team science and the public: Steps toward a participatory team science.," *American Psychologist*, vol. 73, no. 4, p. 549, 2018.

[7] R. Hoda, N. Salleh, and J. Grundy, "The rise and evolution of agile software development," *IEEE software*, vol. 35, no. 5, pp. 58–63, 2018.

[8] W. Zhou *et al.*, "Recruiting participants in digital health - lessons from a telehealth enhancement project," in *Workshop on* *Addressing Challenges in Recruiting Participants, IEEE Symposium on Visual Languages and Human-Centric Computing*, Liverpool, UK, 2024, pp. 1–7.