Design Science

Design and assistive technology: a tinder match waiting to happen

Hana Phillips [1,2], Gianni Renda[1] and Rachael McDonald[2]

[1]*School of Design and Architecture, Swinburne University of Technology, Melbourne, VIC, Australia*
[2]*MedTechVic Hub, Swinburne University of Technology, Melbourne, VIC, Australia*

Abstract

Assistive technology (AT) is any artefact that enables participation in activities usually limited by disability. Frequently, AT suffers from poor design engagement and utilisation. Moreover, up to 30% of all AT is abandoned within a year, negatively impacting users. This presents an ongoing challenge for occupational therapists (OTs) who work with assistive technologies. A literature review was conducted using a Preferred Reporting Items for Systematic Reviews and Meta-Analysis protocol to understand this issue and its implications for the design community. This study explores current themes of AT abandonment and the role of OT within the lens of design thinking. Studies, including design intervention in AT, were subsequently highlighted. This led to comparing this literature with more traditional health literature, exploring the potential enablers and barriers for design in engaging with AT. This evidenced the benefits of collaboration between design and OT disciplines to improve the product and reduce abandonment issues.

Keywords: Design for assistive technology, Design for disability, Abandonment of assistive technology, Interdisciplinary practice, Occupational Therapy, Design Practice, Design Thinking

1. Introduction

The advent of the United Nations Convention on the Rights of Persons with Disabilities has generally resulted in positive social change for people with a disability. However, ongoing inequalities within the design and provision of assistive technology (AT) result in growing concern surrounding persons with lived experience of disabilities (PWLED) within our community (Johnson 2020; Russo & Wooley 2020; World Health Organization (WHO) 2022). For example, while universal, inclusive and equitable design practices have resulted in social change, particularly in built and digital environments, there are inherent complexities in designing physical products for daily living for all (Mankoff, Hayes & Kasnitz 2010; Oswal 2019; Aflatoony & Kolarić 2022; WHO 2022). Subsequently, these products may not accommodate the spectrum of accessibility without further modification, resulting in an ongoing need for AT (Mankoff *et al.* 2010; Aflatoony & Kolarić 2022; WHO 2022).

The primary objective of AT is to facilitate participation, promoting independence and engagement in meaningful activities of daily living (Larsson Ranada & Lidström 2019), and is crucial to the personal well-being of the user (Gramstad, Storli & Hamran 2014). The promise of AT is enormous; however, a poor fit

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Corresponding author
Hana Phillips
hphillips@swin.edu.au

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between the user, their environment and the AT (and subsequent service delivery) – or the AT quality – has significant repercussions on the individuals' life and ability to participate in meaningful occupation (Sugawara *et al.* 2018; WHO 2022). These issues surrounding alignment between individuals, their occupation, environment and AT use are well documented, and reflected in models of practice, such as the human activity assistive technology model (Cook & Hussey 2002), which was developed to support practice surrounding AT, including evaluation of AT systems (Cook & Hussey 2002; Lenker & Paquet 2003)

Literature indicates high rates of abandonment of AT, and even though inconsistent, the abandonment rate is estimated to be approximately 30% within the first year of use (Johnston *et al.* 2014). The reasoning for this was generally reduced to a combination of four categories: user-related, environmental-related, device and service delivery barriers (Waldron & Layton 2008; Larsson Ranada & Lidström 2019).

Accordingly, like many issues in the healthcare sector, AT abandonment fulfils many of the criteria associated with wicked problems (Buchanan 1992; Valentine *et al.* 2017). Correspondingly, design and its methodologies are uniquely placed to re-interpret the issue and collaborate with both user and health professionals to find increased functional and aesthetically appropriate solutions faced by users of the AT (De Couvreur & Goossens 2011; Lynn, Armstrong & Martin 2016). While this space presents an opportunity for design practitioners, healthcare professionals – particularly occupational therapists (OTs) – are inextricably linked to the rigid medical systems and processes surrounding assistive technologies (Mcgrath *et al.* 2017; WHO 2022). Subsequently, they may act as gatekeepers or advocates in this space, impacting design practice and its potential (Barbara & Curtin 2008; Mcgrath *et al.* 2017).

There is increasing interest in interdisciplinary collaboration, particularly using design methodologies within AT (De Couvreur *et al.* 2013; Harris 2017; Aflatoony & Jin Lee 2020). However, there are systemic challenges for the AT industry in engaging with design methodology in a systematic or consistent manner, prompting a comparison between literature that utilises a design approach in contrast to more traditional backgrounds. While the scope of this research is intentionally narrow to build a thorough understanding of the practical implications for design within the field of AT, however, the lessons learned may be transferred to other health spaces, giving context for engaging with healthcare professionals.

This paper explores current practices surrounding AT abandonment, identifying the gaps and how design may assist in filling these spaces. Further, it plans to provide an understanding of the context of practice to aid design practitioners in navigating this complex and territorial space. This will be achieved by exploring three interconnecting points:

1. the current issues surrounding AT abandonment;
2. how this space appears within design literature;
3. how the issues surrounding AT abandonment may relate to design practice now and in the future.

2. Background

2.1. Assistive technology

To understand the issues surrounding the abandonment of AT, it is essential to consider how the field has matured, moving from a paternalistic reductionist

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framework to where it sits today; holistic and allowing for responsiveness to different populations (Zallio & Ohashi 2022). While there are several definitions of AT in use within different contexts, the current definition as per the WHO is:

> … the application of organised knowledge and skills related to assistive products, including systems and services. Assistive technology is a subset of health technology.
>
> An assistive product is any external product (including devices, equipment, instruments or software), especially produced or generally available, the primary purpose of which is to maintain or improve an individual's functioning and independence, and thereby promote their well-being. Assistive products are also used to prevent impairments and secondary health conditions. (WHO 2022)

This definition covers a broad space that includes individual artefacts, service delivery and systems. When reflecting on previous definitions of AT in different contexts and how they have changed over time, there is a notable move from AT as a specific artefact and subsequent service delivery to a more complex term. This includes the surrounding social systems and the social and built environment to support meaningful engagement and participation in activities of daily living (Bauer, Elsaesser & Arthanat 2011; Zallio & Ohashi 2022). This expansion of the terminology surrounding AT reflects the shifts in healthcare practice and paradigms, moving from the paternalistic medical model to the holistic and client-centred biopsychosocial and social models of care (Bauer *et al.* 2011; Zallio & Ohashi 2022).

Considering the above definition, the WHO believes access to appropriate AT is a human right. Note that AT enables individuals to exercise their rights to participate in meaningful activities of daily living (WHO 2022). This prompts the reflection that if access to appropriate AT is a human right, why is there an ongoing issue of abandonment of AT in the community (Cruz *et al.* 2016)?

2.2. The role of OT in assistive technology

OT is an allied health profession interested in enabling individuals to participate in meaningful activities of daily living in a holistic and goal-directed manner (Creek 2006). This is done by working with an individual to improve skills or modifying the environment or task to support meaningful engagement (Rogers 2005). Through task or environmental modification, OTs frequently utilise AT to support the individual (Rogers 2005; Cruz *et al.* 2016). Subsequently, OTs are interested in improving adherence to AT (Waldron & Layton 2008). OTs predominantly work within complex AT in the assessment, trial and prescription and may act as an advocate or gatekeepers for change within this space (Barbara & Curtin 2008; Mcgrath *et al.* 2017). While there is no doubt regarding the role of PWLED in AT, it is crucial to understand the existing dialogues within this space, considering the systems and resources available to support or undermine any novel work (Ramos *et al.* 2020; Nakarada-Kordic *et al.* 2021). Subsequently, this paper will focus on OTs when examining the abandonment of AT.

3. Methods

As this is an area of interest for both design and OT, tools from both professional paradigms were chosen to ensure that the literature's evaluation was rigorous and

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valid in both contexts. In identifying literature, this review followed the preferred reporting items for systematic reviews and meta-analysis (PRISMA) protocol to look at abandonment cases with AT, specifically around the four areas discussed in the previous section. The PRISMA protocol was initially developed in 2009 to address issues surrounding transparency in the methods and results of the meta-analysis (Tao *et al.* 2011) and is one of the more frequently cited methods in biomedical research (Sarkis-Onofre *et al.* 2021). This method is commonly used to guide the search for literature in a structured, systematic and reproducible method (Welch *et al.* 2012). As this research straddles health and design literature, a robust method ensures validity and reduces bias. The process follows the PRISMA flow (Figure 1) and the PRISMA checklist (Welch *et al.* 2012).

This research was initiated within an interdisciplinary context, with contributions from both design and OT. While the authors were interested in the contribution of design, including design terms at this stage proved limiting when specifying how design in collaboration with OT could reduce AT abandonment. As a result, several searches were conducted using the Boolean term AND, and combined using the Boolean term OR to ensure that all aspects of this issue were covered (Figure 2). These terms were determined through initial scoping research.

Databases were selected to cover various literature, including grey literature. The research included Scopus, Web of Science, CINAHL, Ovid and EBSCOhost. Articles that were duplicates, languages other than English or published before

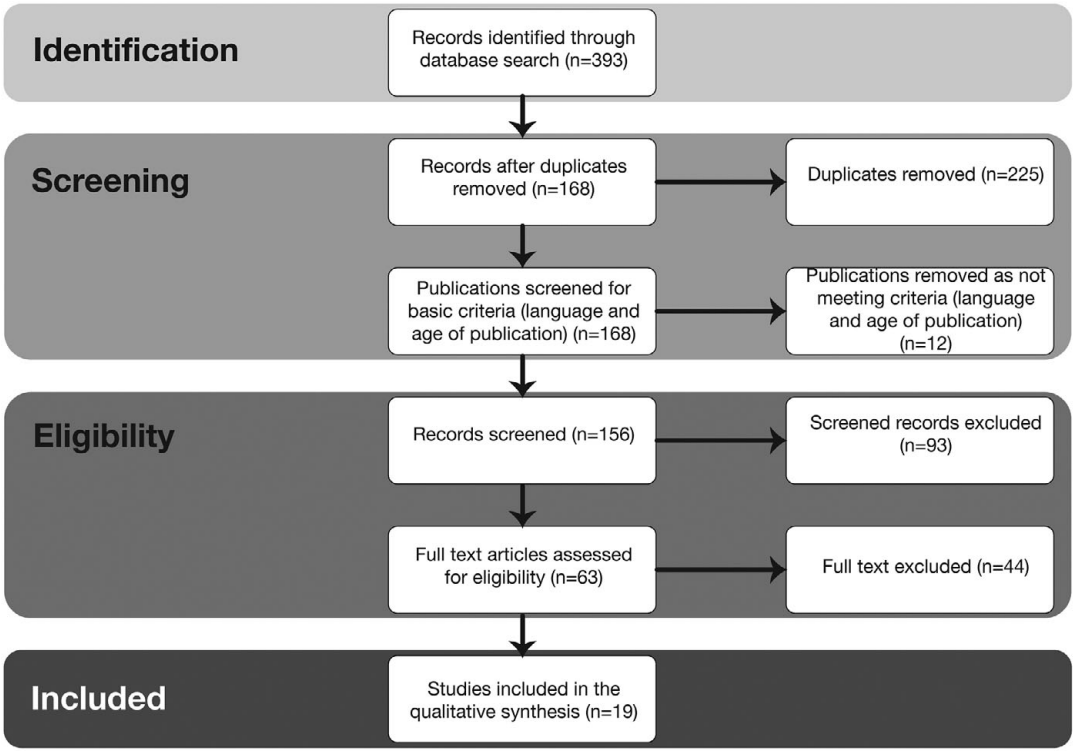

Figure 1. PRISMA flow diagram (author generated).

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2002 were excluded. References were stored and managed through the RAYYAN QRCI tool (Khabsa *et al.* 2016).

Inclusion criteria included the article focusing on AT and abandonment of some form. As OT is inextricably linked to AT prescription, results must include any article discussing allied health or OT's role in AT abandonment. Subsequently, exclusion criteria were any reference that did not discuss AT and abandonment in some depth or excluded OT from the discussion. Second, articles discussing new tools for assessment for AT specific to OTs and literature that excluded participation in activities of daily living (i.e., focussed on prosthetics and functional electrical stimulation) were excluded as they were not relevant to understanding the current issues about the abandonment of AT.

Data were extracted through a synthesis matrix to identify patterns and key themes over disparate articles (Clark & Buckley 2017). The initial themes identified were taken from the initial search terms, and the following themes were derived from the findings and emerging themes in the literature. The articles based on design methods at this stage strongly contrasted the traditional health literature, which was further investigated.

4. Results

While there were limited references that met both the inclusion criteria and reference the space for design methods, there is trending interest in this space. Of the screened records, both references that appeared only in the design-specific search and the combined references (as per Figure 2) show an overall increase in the number of publications meeting the search criteria (please see Figure 3) – demonstrating increasing interest both generally and within the design in this area. However, as shown by the literature, there is a disconnect between literature involving OT and the design community (Wagenfeld, Reynolds & Amiri 2017).

Of the initial documents identified, 225 were removed before screening as they were duplicates. Before the screening, 12 papers were removed for not meeting inclusion criteria, including recent publication (n = 9) and being in the English language (n = 3). The remaining 156 articles were screened through titles and abstracts. Subsequently, 63 full-text articles remained and were assessed for eligibility. Of these, 19 articles met all criteria.

Twelve of the identified articles noted design as either a factor of abandonment or having a potential role of design in AT abandonment in the future. Three articles engaged AT abandonment using a design method (user-centred design) (Lynn *et al.* 2016; Merino *et al.* 2017b; Rasmussen, Stewart & Janes 2022). This led to understanding the literature comparatively, illustrating the relationship between literature that amalgamates design practice with AT and traditional healthcare approaches (Table 1). However, while these texts utilised design methods, some did not engage with researchers from a design background.

Identifying the contrasting methods led to uncovering several themes surrounding barriers to AT use, consistent throughout all papers. These included user-related, environmental and service delivery barriers, consistent with the literature (Federici & Borsci 2016; Lynn *et al.* 2016; Lorenzini, Hämäläinen & Wittich 2021). However, another recurrent theme is the underlying issue of complexity around the abandonment of AT, particularly when considering the need for impact not only on artefacts and services but also on the overarching

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OR	OR		OR
Combination 1: **(A) AND (B) AND (C)**	**Combination 2:** **(A) AND (B) AND (C) AND (D)**		**Combination 3:** **(A) AND (B) AND (D)**
Search Terms A	**Search Terms B**	**Search Terms C**	**Search Terms D**
"Adaptive aid*" OR "Adaptive techno*" OR "Assistive techno*" OR "Assistive device"	"Disuse" OR "Abandonment" OR "Misuse" OR "Rejection"	"Occupational therapy" OR "Occupational therapist" OR "Occupational therap*"	"Design" OR "User-Centred" OR "Human-Centred" OR "Participatory Design" OR "Emotional Design" OR "Design Management" OR "Co-design"

Figure 2. Search terms used, and combination of search terms with Booleans (author generated).

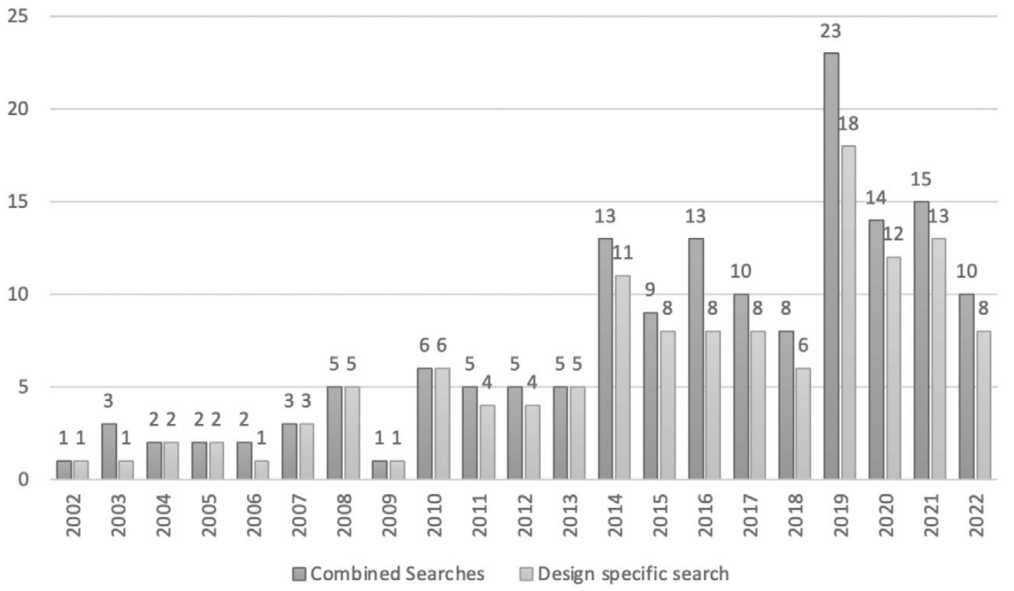

Figure 3. Total references screened in combined search and references screened from combination three by year (author generated).

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Table 1. Methodologies of papers (author generated)

Publication			Paradigm of method			Role of design	
Authors	Year	Audience	Healthcare	Design	Interdisciplinary	Present	Future
Rasmussen *et al.*	2022	Health		•	•	•	•
Lorenzini *et al.*	2021	Health	•			•	
Li *et al.*	2021	Design	•		•	•	•
Arthanat *et al.*	2020	Health	•				
Davin	2020	Health	•			•	
Sugawara *et al.*	2018	Health	•			•	
Merino *et al.*	2018	Design		•	•	•	•
Cruz *et al.*	2016	Health	•				
Federici & Borsci	2016	Health	•			•	•
Federici *et al.*	2016	Health	•			•	
Lynn *et al.*	2016	Health		•	•	•	•
Johnston *et al.*	2014	Health	•			•	
Van Schyndel *et al.*	2014	Health	•				
Verdonck *et al.*	2011	Health	•				
Waldron & Layton	2008	Health	•			•	
Verza *et al.*	2006	Health	•		•	•	•
Dijcks *et al.*	2006	Health	•			•	
Wiart *et al.*	2003	Health	•				
Kittel *et al.*	2002	Health	•			•	

systems and environments and the heterogeneous nature of the population (Waldron & Layton 2008; Federici & Borsci 2016; Li *et al.* 2021). These issues denote the abandonment of AT as a wicked problem that would benefit the input of design (Federici & Borsci 2016; Valentine *et al.* 2017; Li *et al.* 2021). Barriers to AT use will now be discussed before reviewing the place of design within this area, both currently and in the future.

5. Discussion

5.1. Barriers to the use of assistive technology

5.1.1. User-related barriers

Healthcare literature references personal barriers that include anything directly related to the user (Federici & Borsci 2016; Lorenzini *et al.* 2021). Examples include the physical aspects of AT (too heavy to use or otherwise uncomfortable) (Sugawara *et al.* 2018; Davin 2020), difficulties in utilisation (Wiart *et al.* 2003; Dijcks *et al.* 2006; Lorenzini *et al.* 2021), increased feelings of stigma and social isolation due to the appearance of AT (Johnston *et al.* 2014; Van Schyndel *et al.* 2014; Li *et al.* 2021) and cognitive barriers, for example, being too fatiguing to

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sustain use (Kittel, Di Marco & Stewart 2002; Cruz *et al.* 2016). Within both health and design literature, there is consensus that engaging primary stakeholders, including the end-user and their prescribing therapist, throughout the process will improve outcomes in AT (Lynn *et al.* 2016; Aflatoony & Kolarić 2022). Increasingly, methods such as user-centred design and co-design may facilitate the approach to these issues (Lynn *et al.* 2016; Rasmussen *et al.* 2022).

5.1.2. Environmental barriers

Another contributor to the abandonment of AT within healthcare literature is environmental factors (Cruz *et al.* 2016; Federici & Borsci 2016). The healthcare ideal of environment differs from design paradigms to include all aspects external to the user that may impact their function (De Jesus Alves & Matsukura 2016; Federici & Borsci 2016). This includes physical, architectural, social, political and support environments (Cook & Hussey 2002; Cruz *et al.* 2016; Sugawara *et al.* 2018). Much of the data on environmental factors focused on mobility AT, explicitly concerning weight, size and manoeuvrability in different areas limiting access (Cruz *et al.* 2016; Davin 2020). Interestingly, social and political supports were indicated as much – if not more – of a barrier as physical and architectural constraints (Van Schyndel *et al.* 2014; Sugawara *et al.* 2018; Li *et al.* 2021). Examples include service delivery and costing systems engaged when AT is prescribed (Federici, Meloni & Borsci 2016; Steel *et al.* 2017; Arthanat *et al.* 2020).

5.1.3. Service delivery barriers

Finally, user engagement and service delivery were significant factors throughout the literature on AT abandonment (Johnston *et al.* 2014; Federici *et al.* 2016). They noted a breakdown in service delivery at any stage likely ended in the abandonment of AT (Gramstad *et al.* 2014). When working with users and AT, OTs utilise advanced skills to assess AT and ensure a fit (Mcgrath *et al.* 2017; Steel *et al.* 2017). However, due to societal structures – such as policy and funding for assessment, trial and review of AT – these needs were not always met, creating a breakdown in service (Waldron & Layton 2008; Johnston *et al.* 2014). While OTs strive to work within the person-centred care paradigm, time and financial constraints frequently impinge on delivery, reducing their ability to fully meet all needs (Verdonck, Chard & Nolan 2011; Gramstad *et al.* 2014). This significant issue directly links to the abandonment of AT, directly affecting users with unmet needs (Gramstad *et al.* 2014; Rasmussen *et al.* 2022).

5.1.4. The current position of design within assistive technology

This literature review demonstrates a disconnect between design and OT; however, this does not mean design is wholly disengaged (Santos & Silveira 2021). There is increasing evidence of design methods being utilised within AT, with examples within the literature including using technology for music making with older adults (Macritchie *et al.* 2022), wireless power wheelchair charging (Philips *et al.* 2022), personalised assistive technologies (Aflatoony & Jin Lee 2020; Aflatoony & Kolarić 2022), modification of mobility aids (Wilkinson & De Angeli 2014) and tools for stroke rehabilitation (Mawson *et al.* 2014). Increasingly, systematic literature reviews discuss design input within the AT space, noting this as a growing area of interest (Duque *et al.* 2019; Oswal 2019; Santos & Silveira 2021). Further, there is

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increasing interest in approaching the space of AT in design education at a university level, with programmes focusing on specific AT development (Walker & Hobbs 2014). While it is acknowledged that there are challenges for design professionals engaging within this space, with issues around communication, ethics, time and cost (Hook *et al.* 2014; Okimoto *et al.* 2018; Duque *et al.* 2019; Ramos *et al.* 2020; Nakarada-Kordic *et al.* 2021), the consensus appears to be that the use of design principles is beneficial (Wilkinson & De Angeli 2014; Santos & Silveira 2021). However, issues surrounding silos of practice need to be addressed for lasting impact (Maclachlan *et al.* 2018).

5.2. Design practice and a fragmented system

The fragmentation of practice surrounding AT is not limited to design endeavours (Maclachlan *et al.* 2018). However, the disconnect between design and OT highlights that while both approaches inhabit the same spectrum, they are separated by practice paradigms and regulatory barriers (Wagenfeld *et al.* 2017; Nakarada-Kordic *et al.* 2021). Subsequently, it is impossible to create sustainable change without addressing this disconnect (Federici *et al.* 2016; Maclachlan *et al.* 2018). However, it is notable that in cases that highlight interdisciplinary practice between design and OT, positive AT outcomes have been achieved (De Couvreur *et al.* 2013; Hobbs, Walker & Layton 2019). Accordingly, despite this fragmentation, design practitioners working in interdisciplinary practice have the potential for significant impact throughout the AT continuum, per the critical areas set by the WHO's (2022) Global Report on Assistive Technology (Figure 4). These key components may act as a framework for initiating interdisciplinary practice to explore the wicked problem of AT. For illustrative purposes, these key components have been related to the four performance measures of the Balanced Scorecard (Kaplan 1992; Choy, Kuys & Renda 2020), which has historically been successfully implemented within healthcare (Bohm *et al.* 2021; Betto *et al.* 2022) including understanding issues in AT (Hemphill *et al.* 2019). While these examples are suggestions only, they are intended to guide design practice for impact within these spaces and will now be discussed individually.

5.2.1. Component One: products and design for AT

The WHO note that the production of AT is a significant component of improving access and reduction of abandonment (Brown *et al.* 2020; WHO 2022). However, AT design, including production and execution, was identified throughout the literature as another reason for abandonment (Van Schyndel *et al.* 2014; De Jesus Alves & Matsukura 2016). This presents two opportunities for design practitioners; first, to improve the design, execution and production of AT and second, to use collaborative design paradigms to improve AT outcomes.

As one of the main objectives of AT is to reduce stigma through active participation in meaningful occupation, it is counterintuitive that the artefacts themselves are stigmatising in their appearance or function (Van Schyndel *et al.* 2014; Li *et al.* 2021). Both health and design literature noted the physical appearance of AT, in conjunction with perceived quality and utility, are significant factors demonstrated in the abandonment of AT (Mullaney *et al.* 2012; Renda & Kuys 2013; Chen 2020). Already, design practitioners have implemented design strategies accounting for emotional and aesthetic responses within AT with good effect

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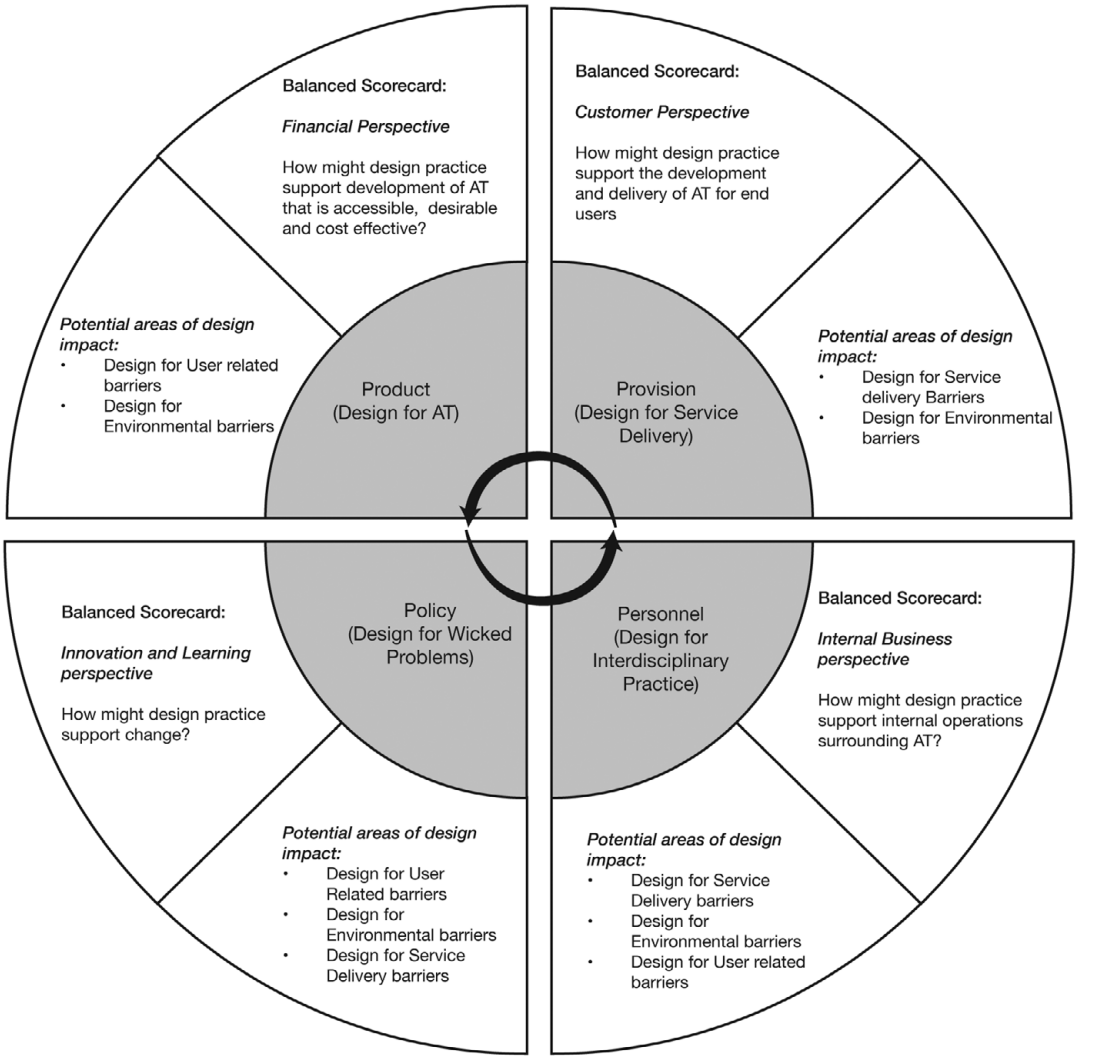

Figure 4. Potential for design impact within the critical components for the improvement of assistive technology, with areas of impact from literature and example from the Balanced Scorecard (author generated).

(Mullaney *et al.* 2012; Chen 2020). Subsequently, design methods may assist in mediating the variance in the quality of AT in both large- and small-scale production, particularly within the space of DIY AT. With advances in 3D printing and on-demand manufacturing, more tailored solutions can be provided, minimising cost issues related to economies of scale and reducing the stigma surrounding prominent DIY AT (Hook *et al.* 2014; Walsh *et al.* 2015; Slegers *et al.* 2020).

Another factor that resulted in AT abandonment was the lack of user engagement (Johnston *et al.* 2014; Cruz *et al.* 2016). For example, health literature predominantly focused on the users' experience with AT within the final stages of trailing new equipment. However, a significant barrier in AT use was where AT did not meet user needs once implemented (Gramstad *et al.* 2014). For example,

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premature wear and breakages (Sugawara *et al.* 2018), poor social acceptability (Li *et al.* 2021) and function (Johnston *et al.* 2014) all lead to abandonment. Conversely, there is increasing evidence that collaborative design methods that engage the user throughout the development and design process may significantly improve the utility of AT (De Couvreur 2016; Lynn *et al.* 2016; Aflatoony & Kolarić 2022). While there has only been limited testing within this space, there are documented benefits and demand for more collaboration with the user in reducing the abandonment of AT (Federici & Borsci 2016; Oswal 2019; Li *et al.* 2021). It raises the question: Can there be a reduction in AT abandonment, improving quality of life and engagement for the user group if all stakeholders collaborate using design methods such as user-centred design?

5.2.2. Component Two: provision and design for service delivery

The second component to improve AT outcomes, as the WHO outlines, is the provision of AT (Elsaesser *et al.* 2022; Menich 2022; WHO 2022). Service delivery is strongly associated with the abandonment of AT (Federici *et al.* 2016; Larsson Ranada & Lidström 2019); this is another space where design practitioners may have a significant impact. As service delivery of AT is multifactorial with several stakeholders, it is not the sole responsibility of the OT (Verza *et al.* 2006; Waldron & Layton 2008). As a result, miscommunications and difficulties may arise with the engagement of disparate parties, each with their agendas and interpretations, including the socio-political environment of the user (Gramstad *et al.* 2014; Federici *et al.* 2016; Larsson Ranada & Lidström 2019).

An example of design assisting within this space is Merino et al. (2017b), who utilise design management within healthcare – noting that design management directly engages with the artefact or system and the existing relationships and stakeholders. Subsequently, the diagnosis phase is understanding the organisation's specific context and how direct and indirect factors interrupt service (Merino *et al.* 2017b). While it may be initially uncomfortable for healthcare professionals to take a step back due to their tacit and deep knowledge in the field, in collaboration with the design team they may assist in diagnosing structural issues within the system. Subsequently, novel approaches can be developed to improve current service models (De Couvreur & Goossens 2011; Wagenfeld *et al.* 2017). While design management will not be the perfect solution to the difficulties noted in AT service delivery, its methods may improve outcomes, aiding the reduction of abandonment of AT within the community.

5.2.3. Component Three: personnel and design with OT

The third component in improving AT outcomes is personnel, which broadly discusses the need for competency and education to support the best outcomes for AT (Smith *et al.* 2018; Scherer 2019; WHO 2022). This directly relates to the role of design practitioners and the consideration of how they approach this space. For example, design professionals actively engage with AT – with demonstrated benefits (such as Duque *et al.* 2019) – but the evidenced siloing of practice indicates a need for interdisciplinary action (Wagenfeld *et al.* 2017). Again, OT as an advocate or gatekeeper is relevant to design practitioners engagement within the process (Barbara & Curtin 2008; Steel *et al.* 2017; Wagenfeld *et al.* 2017). While OTs may struggle to keep abreast with rapidly changing areas, the profession was

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developed to understand the client's unique issues in a complex and systematic way, incorporating knowledge of the user and their environment that may impact function (Mcgrath *et al.* 2017; Steel *et al.* 2017). Through this, OTs are positioned to understand how AT may benefit or challenge the individual and the complex systems surrounding them (Steel *et al.* 2017; Larsson Ranada & Lidström 2019). This presents the opportunity for partnership with design to collaborate with users to understand complex AT issues and explore potential solutions, improving functional outcomes (Lynn *et al.* 2016; Aflatoony & Jin Lee 2020).

While the professions differ significantly, similarities exist, such as emphasising the user (Lynn *et al.* 2016; Merino *et al.* 2017b). In many ways, person-centred care reflects the principles of collaborative design methodologies, where user input is central throughout the process (Docherty 2017; Eklund *et al.* 2019). Person-centred care is one of the predominant paradigms within healthcare, promoting multidisciplinary action between professionals and empowering patients to regain control and autonomy of their health (Eklund *et al.* 2019). While not explicitly stated, several authors noted parallels between health and design paradigms, such as working in a multidisciplinary and client-centred way, emphasising this as a critical factor in reducing AT abandonment (Mawson *et al.* 2014; Lynn *et al.* 2016; Philips *et al.* 2022). This echoes the health literature: patient-centred work improves AT outcomes by understanding the client's needs (Federici *et al.* 2016). By reflecting that both paradigms are on a continuum separated by practice, there is an opportunity for collaboration between disciplines stemming from a shared goal and vision towards a better outcome (Docherty 2017; Wagenfeld *et al.* 2017).

5.2.4. Component Four: policy and design for wicked problems

Policy is the final component to improve AT outcomes (WHO 2022; Hogan *et al.* 2023), representing the most significant potential impact for the design community. As established, the issues surrounding AT abandonment are complex, non-linear, systemic and not necessarily solvable (Merino *et al.* 2017b; Maclachlan *et al.* 2018). These factors noted throughout the healthcare literature align with the elements identifying wicked problems (Buchanan 1992). Viewing the abandonment of AT as a wicked problem presents an opportunity for the design community, who are well trained to work with wicked problems and, consequently, uniquely skilled in exploring these spaces (Buchanan 1992; Cooney *et al.* 2018). The benefice of the different approaches of design paradigms was evident within the literature. While authors acknowledge both abandonment of AT – and the role of OT within this – they focus on exploring the issue at hand and possible solutions (Lynn *et al.* 2016; Merino *et al.* 2017a; Philips *et al.* 2022). The focus on a solution space has linked to the understanding that the abandonment of AT is a wicked problem and subsequently impacts practice methods (Kullman 2016). Consequently, articles using design-based paradigms and philosophies noted the issue's complexities and discussed how design methods assist those specific case studies (Lynn *et al.* 2016; Merino *et al.* 2017a; Merino *et al.* 2017b).

While current literature focuses on impact at the individual and community level, the design opportunities may easily be extrapolated for impact at a systemic and policy level (Docherty 2017; Valentine *et al.* 2017), for example, designs engagement with traditional and non-traditional stakeholders to explore current

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and future possibilities (De Couvreur & Goossens 2011; Merino *et al.* 2017b). Furthermore, designers utilise skills such as prototyping and fabrication of AT and system-level planning to create a more user-centred approach (Merino *et al.* 2017b; Rasmussen *et al.* 2022). These skills in working in complex areas at a systemic or policy level while incorporating skills in working within an interdisciplinary team differentiate design professionals going forward (Merino *et al.* 2017b, Rasmussen *et al.* 2022).

6. Conclusion

This paper has focused on the narrow scope of AT abandonment and the overarching components to improve AT outcomes as supplied by the WHO (2022); the discussed examples may be used as broader examples of how design practice may be initiated in health practice. The benefits of design methods such as participatory design and design management have already been utilised within AT, demonstrating the utility of design and its unique perspective to engage in this complex area. However, the OT's role should not be understated. The unique perspective and understanding of AT within this workforce will be valuable in collaboration with design.

Nonetheless, as denoted by the literature, siloing of work between health and design has resulted in unsustainable change. This paper has identified this as a key issue and presented a possible way forward for design practitioners in initiating collaborative practice. This can be used to understand the challenges of engaging with AT and health to improve communication and navigate this complex space.

This is only an initial discussion of the potential for design to impact the abandonment of AT. Subsequently, there is a need for further study of the role design may have in collaboration with healthcare professionals such as OTs and AT users to improve AT outcomes in the future.

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