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Designing Technologies for Humanitarian Entrants to Create a Sense of Home

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Abstract

Understanding and supporting refugees' sense of home is critical to fostering well-being, belonging, and successful resettlement in host societies. However, limited research in the field of Human-Computer Interaction (HCI) has examined how refugees conceptualize home or whether the services provided effectively support them in the process of remaking home. Therefore, this thesis aims to explore how technologies can be designed to foster a sense of home for refugees in the early stages of resettlement. To address this overarching research question, the study employed a mixed-methods approach, and was conducted in three interrelated phases: (1) an exploratory study to investigate the needs, challenges, and perceptions of home among newly arrived refugees; (2) a co-design study to collaboratively identify potential technological solutions and corresponding design considerations; and (3) a field study to evaluate the effectiveness of a developed prototype in supporting refugees' sense of home and to uncover opportunities for future design.

In the first exploratory phase, 12 newly arrived refugees participated in a 5–7 day photo diary study, followed by a semi-structured interview. Through thematic data analysis, it was found that while participants received immediate support upon arrival (first day), initial settlement services (first week), and ongoing assistance (up to twelve months) that met their basic physiological needs, the notion of home remained a complex and unmet domain with multiple challenges that need to be addressed. Significant gaps and design opportunities were identified in long-term support for fostering belonging and a sustained sense of home.

Hence, in the second phase, six co-design workshops were conducted with a total of 15 participants who were from a refugee background. During these sessions, participants engaged in collaborative design activities guided by a series of fill-in-the-blank prompts to envision ideal homes and technologies that could support a sense of home. Grounded in Antonsich's framework of belonging, key factors influencing one's sense of home and belonging under a forced displacement context were identified: cultural identity and memory, life stability and normalcy, security and privacy, resilience and ingenuity, and social connections. The results highlight implications for designing technologies that support the preservation of cultural heritage and memories, as well as the strengthening of family bonds, including the cross-border connections with family members left in home countries.

Building on the findings from Phase 1 which highlighted the widespread accessibility of mobile phones among refugees, often provided as part of initial settlement services; and the design implications identified in Phase 2, the final phase of this research involved the development and evaluation of a gamified, AI-powered image-generating platform for collaborative digital storytelling, named *Culture Link*. Five refugee families with children (23 participants in total) were engaged in a 7–10 day field trial, followed by semi-structured interviews. The findings demonstrated that *Culture Link* effectively facilitated family-centered memory sharing and inter-generational transmission of identity and culture.

Moreover, the platform served as a catalyst for family engagement, thereby contributing meaningfully to the development of a sense of home.

Together, the three phases contribute to the Human-Computer Interaction (HCI) field in three different dimensions: 1) Conceptual Contribution: Providing a situated understanding of the notion of home from the perspectives of refugees, and highlighting the challenges they face in remaking home during early-stage resettlement; 2) Methodological Contribution: Uncovering key considerations for conducting co-design research with vulnerable communities, particularly in contexts of forced migration; 3) Design Contribution: Demonstrating how the design of digital storytelling technologies can foster a sense of home, cultural continuity, and inter-generational engagement among refugee families, and implications for future HCI design.

Declaration by Author

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List of Abbreviations and Symbols

Abbreviations

ABS	Australian Bureau of Statistics
AI	Artificial Intelligence
CHI	ACM Conference on Human Factors in Computing Systems
CSCW	Computer-Supported Cooperative Work
GenAI	Generative Artificial Intelligence
HCI	Human-Computer Interaction
HSP	Humanitarian Settlement Program
ICT	Information and Communication Technology
NGO	Non-Governmental Organisation
NGOs	Non-Governmental Organisations
RQ	Research Question
SETS	Settlement Engagement and Transition Program
UNHCR	United Nations High Commissioner for Refugees
VR	Virtual Reality
<i>etc.</i>	<i>etc.</i>

Chapter 1: Introduction

1.1 Background and Motivation

According to the United Nations High Commissioner for Refugees (UNHCR) [191], a refugee is someone who has escaped war, conflict, violence, or persecution and has crossed an international border in search of safety in another country. By the end of 2024, the latest reporting period, an estimated 123.2 million people worldwide had been forcibly displaced from their homes due to persecution, conflict, violence, human rights violations or events that seriously disrupted public order [187]. This scale of displacement makes resettlement not only a matter of immediate survival and service access, but also a longer-term process of rebuilding identity, continuity, and belonging in a new place. Refugees who are forcibly displaced from their home countries often experience profound trauma [136, 180], the loss of their homes, possessions, jobs [9], and even bereavement [109], along with the ambiguous loss of cultural identity and a sense of home [43]. Following displacement, they continue to face numerous challenges during resettlement, including language barriers [204, 205], housing instability [42, 57, 144], unemployment [105], cultural differences [13], social capitals [11, 14], and limited access to healthcare and other essential resources [145, 170]. These challenges span both practical settlement tasks and less visible psychological and relational work that often persists long after arrival. In response to these challenges, host countries have implemented various measures and support programs to facilitate refugee resettlement and integration. While Iran, Turkey, Colombia, Germany and Uganda, are the top five countries hosting refugees under UNHCR's mandate [188], countries like Australia [186], US [189] and Canada [190] nonetheless play an important role in global refugee resettlement through structured humanitarian programs. In particular, Australia's national policies and settlement schemes offer a unique context for examining how refugees navigate integration, belonging, and the rebuilding of home, that makes it a timely and critical setting for this research. Two key initiatives are the Humanitarian Settlement Program (HSP) [3], and the Settlement Engagement and Transition Program (SETS) [5], that are government-run programs supporting newly arrived humanitarian entrants and other eligible visa holders during the early stages of resettlement. Support under the HSP is delivered through an individualised case management approach [4]. The range of support services include airport reception, short-term accommodation, assistance in securing housing, referrals to mainstream and specialist services, and connections to local community groups and activities [4]. Refugees also receive guidance on English language learning, employment pathways, and access to education and training [4]. In addition, orientation to Australian life which covers the laws, values, and everyday systems, is

a key component of the program [4]. The SETS program, on the other hand, complements the HSP program by providing support to post-arrival refugees who have arrived in Australia independently [5]. It consists of two components: client services, which offer settlement-related information, advice, advocacy, and assistance in accessing mainstream and other relevant services; and community capacity-building services, which aim to enhance social participation, economic opportunities, and overall well-being [5]. Although programs like the HSP offer structured pathways toward independence, they are typically time-bound and primarily oriented around functional integration [40]. This creates a critical tension: official services may help people 'settle', yet feeling 'at home' often requires ongoing meaning-making, relational repair, and identity reconstruction that cannot be completed on a program timeline. The concept of home has been understood as a socio-spatial and psycho-spatial construct, as well as an emotional 'warehouse' that extends beyond physical shelter [60]; it encompasses emotional security, cultural continuity, social connection, and a sense of rootedness in a new environment [113]. For many refugees, it also entails coping with the psychological consequences of displacement, loss, and trauma [155]. Thus, remaking a home in the context of forced displacement is a long and complex process that extends beyond physical settlement. It also involves rebuilding a sense of psychological belonging, which is often disrupted by trauma and the ambiguous loss of identity and home [43]. Ambiguous Loss Theory, developed by Pauline Boss [35], is a psychological and family therapy concept. It identifies two types of loss: (1) physical absence with psychological presence, and (2) physical presence with psychological absence. It refers to losses that are unclear and lack closure. Although the theory originated around absent/present persons, displacement research extends it to non-human attachments, including loss of self, identity, home, and belonging [43, 132]. Previous research has identified remaining service gaps in Australia's settlement programs, including language barriers, employment, housing, and a lack of structural and organizational cultural support, as well as the short-term and fragmented nature of service delivery [74, 96]. Moreover, less material aspects such as connection with the wider community and remaking a sense of belonging remain critical areas for improvement, requiring efforts from both refugee communities and the broader Australian society [74]. The indicators of integration framework by the UK Home Office [2] outlines a structural set of domains that are central to the integration of refugees and migrants. The framework sheds light on the more nuanced dimensions of integration, including social relationships, cultural engagement, safety and stability, all of which are psychological needs closely linked to an individual's evolving experience of belonging [2]. Importantly, these domains help articulate why belonging is not a soft add-on to resettlement, but a core outcome shaped by multiple interacting conditions. Belonging, as theorized by Antonsich [22], is a dual framework: the broader socio-political dynamics that shape inclusion (politics of belonging), and the intimate sense of being at home in a place (place-belongingness). Nabil et al. demonstrated how the decorating practices of Syrian refugees in a refugee camp can enhance well-being, rebuild a sense of home, and restore lost identities and leisure, even in resource-limited and

challenging settings [124]. Artifacts, as carriers of memory and cultural heritage, could help people sustain identity, mitigate cultural barriers, and enable continuity in daily life [111, 184]. However, many refugees lose their material possessions [88].

Within HCI, researchers have studied how technologies can support refugees' integration and resettlement [16, 28, 41, 86, 87, 131]. Prior work shows that ICTs can help refugees access information and services [41, 170]. More recent studies also discuss the potential of emerging technologies, such as extended reality [10, 142]. However, much of this research focuses on single services or specific challenges. Examples include healthcare [170], information seeking [69], food insecurity [171], and interpreting support [41]. Fewer studies examine how newly arrived refugees perceive settlement support as a whole. We also know less about how they understand the role of settlement agencies across the full resettlement journey. In addition, most of these studies primarily focus on the provision of support for refugees' physiological and practical needs. In the context of long-term integration, researchers have highlighted the importance of inclusive and culturally sensitive design [95], as well as the need for social activities and rebuilding social capital [14]. Desjardins et al. [55] argue that in HCI, domestic technologies and smart home topics are overwhelmingly discussed, whereas the exploration of values associated with home have received significantly less attention. Similarly, Sabie et al. [146] explore how immigrants' cultural values and memories are brought to life through the process of sketching the physical spaces of their homes. Going beyond the functional needs, the authors argue to focus on emotional and cultural aspects of homes that are vital for long-term settlement and well-being. Nabil et al. demonstrated how the decorating practices of Syrian refugees in a refugee camp can enhance well-being, rebuild a sense of home, and restore lost identities and leisure, even in resource-limited and challenging settings [124]. Artifacts, as carriers of memory and cultural heritage, could help people sustain identity, mitigate cultural barriers, and enable continuity in daily life [111, 184]. For refugees, many of whom lose their material possessions [88], practices such as making and decorating in their new homes enable them to compensate for the loss and rebuild a sense of home [124]. Despite these valuable contributions, there remains a significant gap in research on the sense of home and belonging for refugees, particularly in how technological interventions can be designed to foster the feeling of being 'at home' within the HCI field.

Storytelling is a well-established practice in HCI with vulnerable communities [68, 151]. Prior work has shown how storytelling enables transmitting culture, reconstructing identity, and rebuilding social capitals in the context of forced displacement [133, 167]. Storytelling empowers refugee youths to process experiences of loss and displacement [68]. In family settings, photo-sharing and interactive media can scaffold these practices [167]. Researchers also highlight the importance of collaborative storytelling. Narratives should be co-created and shared reciprocally, not treated as a one-sided activity [147]. Emerging media further enrich storytelling [73, 154], and recent work suggests that generative artificial intelligence (GenAI) may further facilitate these practices by fostering collaboration and

reciprocity [114]. GenAI can lower skill barriers and invite broader participation by children and novice creators [44, 80, 139, 183]. GenAI has also been explored as a catalyst for family co-creation [101], collaborative arts therapy [112], and community-based storytelling [79], demonstrating its potential to cultivate creativity, engagement, and multi-modal meaning-making across diverse contexts. For migrants and other marginalized populations, AI-mediated tools have also been explored as supports for communication, cultural adaptation, and information-seeking practices [32, 107, 185, 211]. Despite growing interest in storytelling within HCI, there is limited understanding of how intergenerational storytelling and co-created narratives might help refugee families negotiate the ambiguous loss of home and remake home in the host countries.

Aligned with emerging discussions in HCI, this thesis examines a wider range of needs and challenges in refugees’ long-term resettlement, and investigates how technology can support refugees in the early stages of resettlement to develop a sense of home and belonging in Australia.

1.2 Research Questions and Phases

The overarching research question guiding this thesis is: How can technologies be designed to address the needs of newly arrived humanitarian entrants in developing a sense of home? The research is structured into three interrelated phases, each employing distinct methods to deepen understanding and generate actionable design insights.

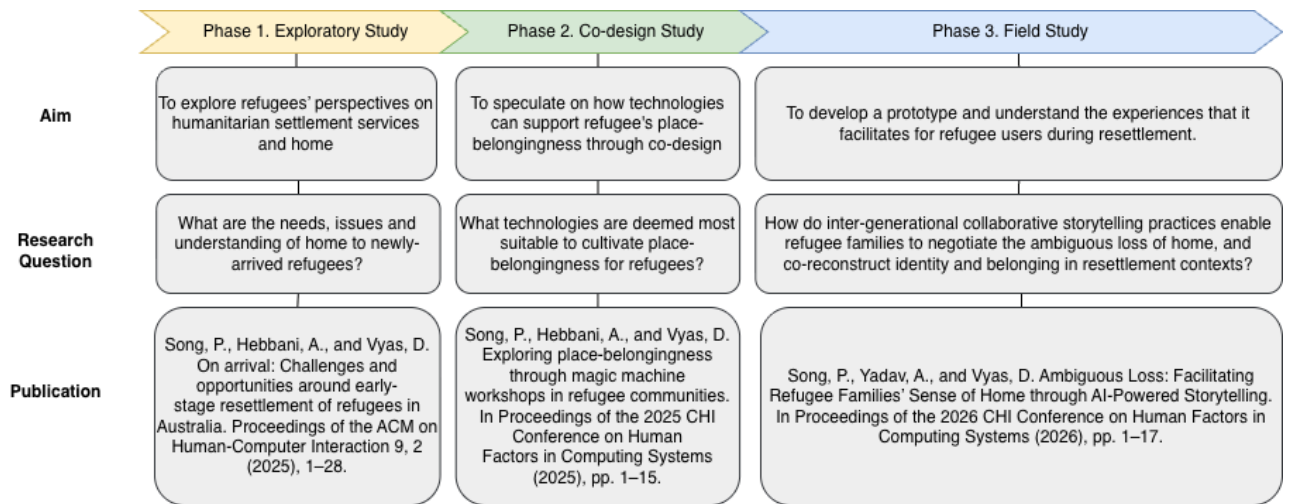


Figure 1: The three phases of this PhD research

Phase 1: Understanding Early-Stage Resettlement Experiences [161] The first phase investigates newly-arrived refugees’ experiences with early-stage resettlement services, with a focus on how these services affect their immediate needs and long-term integration. In collaboration with a refugee service provider, I conducted a two-stage qualitative study with 12 participants using photo diaries and semi-structured interviews. This study revealed systemic gaps in service delivery, the importance of

hospitality and tailored support, and the emotional dimensions of early resettlement. Findings emphasized that beyond the functional provision of shelter and food, refugees also value symbolic gestures of welcome and personal acknowledgment. This phase concluded with design implications to improve service systems and highlighted the need for holistic, culturally responsive support frameworks.

Phase 2: Co-Designing Futures of ‘Home’ with Refugees [160] The second phase of my research turned toward participatory design to explore the notion of place-belongingness, i.e., the subjective sense of being “at home.” Through a series of six co-design workshops with 15 refugees using the speculative “Magic Machine” method, I engaged participants in envisioning technologies that could foster a sense of home. Themes emerging from this phase included cultural identity and memory, life stability, security and privacy, resilience and ingenuity, and social connection. These workshops provided both emotional insights and creative provocations, informing a set of design implications for HCI practitioners working with displaced populations. This phase demonstrated the value of speculative and participatory methods for surfacing the nuanced needs and desires often overlooked in conventional design processes.

Phase 3: Field Trial of an AI-Generated Cultural Storytelling Platform Building upon themes of cultural preservation and social connection identified in Phase 2, the final phase involved designing and deploying a web-based AI image-generation platform to support family storytelling among refugee households. The platform enabled family members to collaboratively upload images, which were then combined using AI to generate shared visual artifacts. A seven-day field trial was conducted with multiple families, who engaged with the tool daily and later participated in follow-up interviews. This phase aimed to evaluate how digital storytelling and creative expression can promote intergenerational bonding, cultural continuity, and negotiate the ambiguous loss of home among refugee families. Early results suggest that co-creation through AI-mediated visuals empowered participants to reconnect with their heritage while adapting to new sociocultural contexts.

This thesis is organised as a staged inquiry into how technologies can support refugees in developing a sense of home during resettlement. Rather than treating home as a stable object or a single design problem, the thesis studies how the conditions of home emerge, shift, and are negotiated across different moments of resettlement. Phase 1 begins by examining newly arrived refugees’ encounters with settlement services and everyday infrastructures. It shows that while initial support often addresses immediate practical needs, a deeper sense of home remains unresolved and is shaped by relational care, housing conditions, autonomy, and everyday experiences of stability. Phase 2 builds on this gap by moving from service provision to the meaning of home itself. Through co-design workshops, it identifies the social, cultural, material, and emotional dimensions through which refugees imagine and reconstruct place-belongingness. Phase 3 then translates these insights into a prototype and field evaluation, examining how AI-supported collaborative storytelling can scaffold intergenerational memory sharing, cultural continuity, and family meaning-making. Across these phases, the thesis

develops an integrated argument: technologies for refugee resettlement should not only provide access to information or services, but also support the evolving practices through which refugees rebuild belonging, continuity, and home over time.

This thesis makes three integrated contributions to Human–Computer Interaction (HCI) research on forced displacement. Empirically, it provides a rare, end-to-end account of how newly arrived humanitarian entrants experience settlement support as a whole rather than as isolated services, revealing how feelings of welcome, safety, autonomy, and home are shaped by the interaction between institutional programs and everyday living conditions. Theoretically, this thesis makes two interrelated contributions to HCI research on forced displacement, home, and belonging. First, it extends the framework of place-belongingness [22] by showing that, for refugees, the feeling of being “at home” is fluid and multifaceted, shaped not only by physical settlement in the host country, but also by material stability, privacy, safety, cultural continuity, social relationships, and memories of both past and present homes. In doing so, the thesis demonstrates that refugees’ sense of home is negotiated between past and present, and between everyday conditions of resettlement and longer-term emotional, cultural, and relational processes of home-making. Second, it extends ambiguous loss theory [36] by conceptualizing home, culture, and identity as forms of unresolved loss after forced displacement. The thesis shows that this loss is experienced intergenerationally, as parents and children may relate differently to homeland, culture, and belonging, and that memory reinterpretation and storytelling can become shared family practices through which such loss is made visible, discussed, and partially renegotiated. Lastly, it contributes a staged set of design implications, suggesting that technologies for refugees should be designed to support phased and evolving needs: from early orientation, communication, safety, and access to services, to longer-term practices of cultural expression, memory preservation, family storytelling, cross-border connection, and intergenerational dialogue. By synthesizing these findings, concepts, and prototype evidence, the thesis offers a coherent agenda for designing technologies that actively support the relational, cultural, and emotional work for refugees’ resettlement, through which a sense of home is continuously rebuilt.

Chapter 2: Literature Review

2.1 Home and Belonging

2.1.1 The Concept of Home and Belonging

Sociology and human geography have long distinguished between space and place. While space refers to a physical setting, place is defined as a space invested with social meaning, attachment, and memory [113]. Among places, “home” is especially significant. It functions not only as material shelter, but as a socio-spatial anchor that supports identity, safety, and family life [47]. The ways people arrange, furnish, and decorate their homes have been shown to communicate personal values, tastes, and commitments, such that the home becomes an expression of selfhood [51, 56]. Housing insecurity is a persistent and widely shared challenge among low socio-economic status (SES) communities. For example, homelessness has been shown to have severe and compounding consequences for an individual’s life, health, and overall well-being [30, 53]. However, homelessness represents only one facet of housing insecurity [97]. People from low SES backgrounds also experience other forms of housing stress, including substandard housing quality, instability in their neighborhoods, and overcrowded living conditions [97]. In the context of displacement, refugees often lose houses, neighborhoods, and everyday places like streets, cafes, and churches/mosques. These spaces carry deep personal and social meaning because they are where daily life, rituals, and identities are formed [178]. Refugees may grieve places that cannot truly be recovered, even if they physically return, because the social and historical fabric of those places has changed. This means belonging is stretched across past and present, and the dream of return is complicated: you cannot return to the past, and the old home has not stood still. The result is a form of unresolved loss: the place remains psychologically present, but is physically inaccessible or altered beyond recognition. This is a form of ambiguous loss [33, 34]. Bunn et al. [43] examine Syrian refugees in Jordan and conceptualize the ambiguous loss of home. They frame home as multidimensional and cyclical rather than a one-time achievement.

Conventional accounts of “home” tend to frame it as a bounded, stable, and fixed location [26]. More recent scholarship, however, argues that home should instead be understood as fluid, negotiated, and sometimes fragmented, particularly in the context of migration [126, 138]. For many migrants, resettlement involves navigating attachments to multiple homes at once, in ways that are relational and negotiated with others rather than singular and territorially fixed [128]. Papastergiadis [128] examines the cultural and socio-political dimensions of migration in a globalized world, arguing that

belonging has become increasingly de-territorialized: less tied to national borders and more rooted in transnational, hybrid, and inter-subjective identities. Ralph et al. [138] further suggest that both mobility and stability matter in shaping a sense of home. Experiences in the country of origin and in the country of resettlement continue to co-exist, and material as well as social anchors, including objects, routines, and relationships, which all reinforce the feeling of belonging. In a similar vein, Tolia-Kelly [184] argues that material artifacts act as connectors to memory and identity, mediating cultural continuity and helping migrants resist feelings of displacement. HCI work on domestic artifacts further shows that household objects can embody care, family intimacy, religious beliefs, traditions, creativity, and culturally situated practices of reuse and adaptation [195]. By contrast, Wernesjö [207] shows that for young refugees in rural Sweden, belonging is built less through material surroundings and more through social ties: friendships, care, and recognition become the primary grounds on which 'home' is felt.

2.1.2 Studies on Home in HCI

Within the field of HCI, Desjardins et al. [55] examined the prevalent themes related to the home, which encompass social routines within the home, ongoing domestic practices, home as a testing ground, smart home technologies, contested values associated with the home, home as a space for interpretation, and speculative visions of the home. Wallace et al. [202] study the role of IoT and sensor-based technologies in creating a sense of home and well-being in residential care settings for patients with dementia, highlighting the importance of designing technologies that not only meet functional needs but also foster emotional comfort and belonging. They also discuss how personal possessions, like artifacts, play a crucial role in maintaining identity and a sense of home [202]. Casey et al. further show that for older adults living independently, home is closely tied to autonomy, dignity, routines, social connection, and everyday self-care, rather than only to clinical support or physical dwelling [?]. Similarly, Lindley et al. [111] conducted research with seven older adults who were going through transitions of moving into their new homes in England. They stated that older adults maintain a sense of continuity in their lives by bringing familiar possessions and routines into their new homes, which helps them preserve their identity and sense of belonging. Creating artifacts for others can also function as a relational practice, where material making supports creative expression, memories, social connection, care, and practical needs [200]. While possessions play a crucial role in establishing a sense of home, serving as physical reminders of one's life course, identity, and legacy, social connections and routines also contribute to the feeling of being "in place," with the new home becoming a site to maintain relationships and continue meaningful activities [111]. Shklovski et al. [94] argue that in the context of transnationalism, home and belonging are not confined to physical places but are instead shaped by the dynamic interactions between people, technology, and multiple geographic locations. Literature on place-making and sustainable making further shows that homes

and living environments are not fixed containers, but are continuously made and remade through everyday material practices, DIY repair, ecological relationships, shared infrastructures, and residents' ongoing efforts to adapt their surroundings to their values and needs [172, 173, 174, 175].

Extending this discourse, Sabie et al. [146] highlights the importance of understanding the cultural and emotional dimensions of home for immigrants. By employing a paper-based home sketching tool to engage 13 Middle Eastern immigrants residing in Canada in the design of their ideal homes, they showed that home design can serve as a powerful tool for reconnecting with cultural identity and fostering a sense of belonging in a new environment [146]. Further, Nabil et al. [124] examined how refugees in the Zaatari camp actively create a sense of home through the decoration and customization of their living spaces. Refugees transform their pre-fabricated shelters with limited resources into personalized spaces that reflect their identities and cultural heritage. This act of decorating serves as an emotional escape from the realities of displacement, allowing refugees to maintain their dignity and pride, also creating a sense of agency and freedom [124]. The study highlights that the sense of home for refugees is deeply connected to the ability to personalize and control one's environment, fostering a sense of identity, dignity, and belonging [124]. Mohseni et al. [120] proposed a research design and plan for developing the scale to measure digitally enhanced place-belongingness, and outlined the structures of the scale including the feeling of being at home, social acceptance, sense of security and mental comfort. These studies provide valuable insights into the notions of home and highlight the need to design technologies for migrants' and refugees' homes beyond the functional level. Our work expands current HCI research on home and belonging by providing a refugee-focused understanding of the diverse dimensions of home. Through co-design with refugees, we will explore these dimensions in-depth, offering technology implications that are informed by the voices of refugees themselves.

2.2 Refugees: Background, Resettlement, and Technologies

2.2.1 Refugees in HCI & CSCW Research

Human–Computer Interaction (HCI) and Computer–Supported Cooperative Work (CSCW) scholars have increasingly studied refugee resettlement as a process shaped by displacement, adaptation, and care. Research has explored diverse challenges refugees encounter, such as cultural barriers, trauma, mistrust, and limited access to social and informational resources—while also designing technological interventions to alleviate these challenges [12, 13, 153]. For example, Talhouk et al. examined electronic food voucher systems for refugees in Lebanon and revealed power and information asymmetries embedded in humanitarian infrastructures [169]. Weibert et al. introduced the concept of

Arrival Literacy, emphasizing the skills needed to navigate bureaucratic and administrative texts as crucial for belonging [206]. Similarly, Fisher et al. [67] developed humanitarian research frameworks that address disrupted education and literacy among young refugees.

HCI researchers have designed technologies to foster education, health, and cultural continuity among refugees. Studies have leveraged digital fabrication [165], making practices [108], and mobile technologies [7] to enhance skill-building and social participation. Lee et al. [104] explored how refugees and asylum seekers in Australia cultivate entrepreneurship through digital tools, highlighting technology’s potential to upskill and empower refugees. Other work has interrogated the barriers to technology adoption, as Sabie et al. [145] documented in Canada, where refugees struggled to access essential digital services. Similarly, Jensen et al. [95] found that while digital platforms can aid integration, they may also amplify exclusion due to literacy and language barriers. Anderson et al.’s analysis of refugee discourse on social media forums shows how these platforms support information seeking, personal storytelling, and the development of a ‘new normal’ during crisis and resettlement [20]. This work highlights that digital technologies can support refugees not only by delivering services but also by enabling narrative exchange, community support, and future-oriented decision-making. Collectively, these studies reflect an ongoing effort within HCI to both identify structural inequities and propose situated technological interventions for refugee inclusion.

2.2.2 Early-Stage Settlement Services and Service Providers

While technology-focused studies have illuminated critical issues around access and inclusion, limited attention has been given to the mediating roles of service providers and non-governmental organizations that directly shape refugees’ resettlement experiences. These organizations function as “mediating institutions” [31], bridging individuals’ private lives and broader social systems by connecting them to housing, education, healthcare, and employment [164]. They foster belonging, appreciation, and integration [90], yet their work remains underexplored in HCI and CSCW.

Research in adjacent disciplines highlights both the contributions and constraints of service providers. Üstübici [193] emphasized their central role in unpacking hospitality and fostering social cohesion, while Ekmekcioglu et al. [62] showed that remote work modes were often impractical for humanitarian social workers operating in low-resource contexts. In Australia, Jewson et al. [96] found that structural, political, and cultural barriers significantly hindered the effectiveness of service provision. McIntosh et al. [116] identified common challenges such as discrimination, policy gaps, and limited resources but noted these insights were predominantly gathered from providers’ perspectives rather than refugees themselves.

From refugees’ perspectives, O’Higgins [127] demonstrated that support is often denied when young refugees fail to conform to expected vulnerability criteria, calling for more participatory and equitable approaches. Across contexts—the UK, New Zealand, the U.S.—early-stage settlement

services encompass material aid, digital resources, and orientation programs that facilitate adaptation [1, 119, 141]. Yet these efforts vary widely, reflecting differing national priorities and capacities.

Drawing on Social Inclusion Theory [203], many HCI scholars have argued that equitable access to information and services is key to social participation [21, 192]. Dahya et al. [52] found that technology education for refugee women promotes agency and integration, while Coles-Kemp and Jensen [49] observed that health, time, and language barriers often outweigh digital literacy concerns. Talhouk et al. [170] further highlighted mobile technologies' role in facilitating healthcare access among Syrian refugee women. Complementary work by Brown and Grinter [41] introduced *Rivrtran*, a translation app supporting mentor–refugee communication through a human-in-the-loop system, illustrating how ICTs can bridge social and linguistic divides. However, most studies focus on discrete services rather than the holistic resettlement landscape. Our research addresses this gap by examining refugees' lived experiences with early-stage settlement services, identifying opportunities for technological and organizational improvement.

2.2.3 Participatory Design with Vulnerable Communities

Participatory Design (PD) provides a foundational methodology for engaging marginalized groups in the co-creation of technologies. Originally developed to democratize workplace innovation [152], PD has since expanded to healthcare [166], education [106], social media [24], and migration contexts [110, 146]. Within refugee research, PD promotes agency and empowerment [59, 92]. For instance, Almohamed et al. [15] engaged refugees in co-designing technologies to rebuild social capital and access community resources, while Duarte et al. [59] demonstrated PD's role in fostering intercultural trust among young forced migrants.

Despite its emancipatory goals, PD is not without risks. Bratteteig and Wagner [37] identified structural power imbalances in participatory urban planning projects, while Gautam and Tatar [75] warned of emotional harm and dependency when engaging vulnerable participants. They advocate asset-based, incremental, and trust-building strategies. Krüger et al. [102] highlighted that within migration contexts, PD is challenged by community heterogeneity, survival pressures, and internal politics—necessitating researchers' active mediation and advocacy roles. As such, design considerations need to be taken into account, especially for participants with vulnerability. Halloluwa et al.'s co-design study with rural Sri Lankan children shows that scaffolding, ice-breaking, native-language interaction, and locally meaningful everyday scenarios are essential when participants are unfamiliar with both digital technologies and participatory design practices [78]. The focus on connection is also reflected in participatory design research with people living on a low income in Australia, which found that getting by during crisis often depends less on standalone financial tools and more on rebuilding connections to people, services, information, and support networks [158].

Speculative and imaginative forms of PD have emerged as promising alternatives to traditional approaches. Bray et al. [39] used speculative toolkits to empower marginalized communities, while Harrington et al. [81, 83] employed speculative design fictions with Black and underserved older adults to envision equitable futures, though participants often struggled to transcend current realities. The “Magic Machine” workshop [19] addresses this by encouraging participants to design “magical” technologies that express personal dreams and challenges, promoting creative ideation without fear of impracticality. This method has proven effective with refugees and older adults [17, 150], and thus informs our participatory engagement approach.

2.2.4 Digital Storytelling in the Refugee Discourse

In HCI, researchers have designed for many challenges around refugee resettlement, including access and information seeking [70, 95], health and well-being [100, 170], education and skills acquisition [46, 71, 122], and language barriers [41]. Alongside these efforts, storytelling has emerged as a vital research approach with refugee communities. Sawhney [151] demonstrated that digital storytelling workshops can empower marginalized refugee youth by fostering creative expression, cultural agency, and civic engagement. Fisher et al. [68] engaged Syrian youth in Za’atari camp through LEGO and storytelling workshops, showing that storytelling functioned not only as a data collection method but also as a cathartic outlet, enabling youth to express traumatic memories of war and camp life alongside moments of hope and care. HCI work on digital participation further shows that design projects with economically marginalised communities can foster digital skills and community participation through activities such as self-reporting, digital storytelling, repair, and repurposing second-hand technologies [179]. Moreover, situated storytelling technologies can help surface the social and emotional values embedded in community spaces, including kinship, companionship, care, wellbeing, and material engagement with place [196].

Storytelling is a meaning-making social practice that recounts events while constructing shared understandings and normative claims within cultural and institutional contexts [135]. It preserves culture, builds social capital, transmits values, and sustains identity while balancing integration in contexts of displacement [133, 167]. Narratives enable refugees to interpret their past, reclaim identity, exercise agency, foster solidarity, and pursue justice [61]. They are not only expressions of suffering but also tools for survival, continuity, and transformation [61]. Through stories, memories of the past intertwine with present experiences, enabling individuals to situate themselves within new cultural and social environments. Strekalova et al. [167] argue that children from refugee backgrounds view family storytelling as essential for cultural continuity, moral development, and language retention. Despite assimilation pressures, they show agency in sustaining and adapting these practices, offering powerful counternarratives to reductive refugee representations.

AI-mediated Communication and Storytelling

In HCI, technologies have been explored to support storytelling through social media [66], virtual reality [73], augmented reality [154], and video platforms [72]. Photographs play a central role in facilitating storytelling [27]. Study shows that photo-sharing platforms, family archives, and interactive media can mediate intergenerational connections and help marginalized groups sustain ties to cultural identity [194]. These systems position technology not only as a repository of memory, but as an active mediator shaping how memories are shared, interpreted, and re-imagined. By centering voice, creativity, and collective reflection, digital storytelling emerges as both a critical pedagogical practice and a transformative strategy for migrant representation [8]. Generative AI has emerged as a powerful tool for digital storytelling and communication, encompassing modalities such as text-to-speech [63, 212], text-to-image [114, 137], speech-to-image [64, 210] and image-to-image [112]. These tools enable diverse forms of visual and narrative co-creation, particularly for users with limited technical or artistic skills. Qin et al. [137] demonstrate how *StoryNode*'s integration of node graph visualization and multimodal generative AI supports moral reflection, productivity, and cross-cultural storytelling, while also highlighting the need for personalization and careful design. Liu et al. [112] show that image-to-image generative AI can be integrated into family expressive arts therapy through multimaterial storymaking, not intended as a replacement for physical materials but as a complementary tool that empowers children, deepens family communication, and enriches therapeutic practice. Martinez et al. [114] examine how text-to-image generative AI reshapes documentary storytelling by shifting representational agency from the photographer's gaze toward community-driven image-making. They speculate that generative AI may offer new opportunities in protecting privacy, decolonizing narratives, and enabling speculative storytelling, it also risks producing emotionally hollow or misleading images [114]. Furthermore, HCI research with under-resourced communities has shown that self-authored visual methods can help reduce researcher-participant power imbalances by giving participants greater control over what aspects of their lives, routines, values, and aspirations they choose to represent [198]. Ethical use therefore requires transparency, critical visual literacy, and community co-design.

For migrants and refugees, AI-mediated communication tools have also been explored in institutional counselling settings [185]. Moreover, Zhang et al. [211] explore how immigrants use an LLM-powered chatbot to read local housing news. While migrants can benefit from AI in accessing and interpreting local information, they argue that the risk that AI interfaces may deepen sense-making gaps between immigrants and locals. Similarly, Lee et al. [107] identify that AI-generated content often creates idealized or stereotypical cultural images, which may clash with lived reality and cause disappointment. At a broader humanitarian scale, Bhatnagar et al. [32] propose an HCI-informed framework for responsible AI adoption, foregrounding inclusivity as a core principle. They argue that AI systems in crisis and displacement contexts must be adaptable to diverse user groups with varying technological literacy, and should be governed through participatory, value-sensitive, and

dignity-preserving practices rather than purely technical optimization [32]. Similarly, Avellan's research emphasizes that AI systems must be designed accessible to users with varied abilities and backgrounds [25]. Such inclusion is critical because non-inclusive systems risk amplifying existing inequities [25]. In contrast, Munn cautions that the wider turn to high-level AI ethics principles has largely been "meaningless, isolated, and toothless," enabling ethics-washing while leaving underlying power structures and material harms intact [123].

Prior HCI work has also emphasized the collaborative dimension of storytelling. By scripting and enacting rituals from both immigrants and non-immigrants, Sabie et al. [147] show that cultural exchange in HCI can be reciprocal rather than one-directional. Rather than casting migrants only as learners, the system enabled participants to share and engage with each other's practices, making belonging a co-created process. This is particularly relevant for refugee families, where parents use storytelling to pass on memories of their homeland, while younger generations reinterpret these narratives in line with their current environments and emerging identities [52]. In this way, storytelling is not a one-way transmission from parent to child but a reciprocal process in which children also influence and reshape family narratives.

Chapter 3: Methodology

3.1 Research Design Overview

This research is informed by Ethnographic [91] and Participatory Design (PD) [163] approaches. I aim to examine how digital technologies can support practices surrounding refugee's resettlement, and in turn exploring belonging and home-making practices in Australia.

3.1.1 Ethnographic Approach

Ethnography in HCI and CSCW is an in-situ, practice oriented approach that examines how people organize everyday life within the environments they inhabit, rather than how those environments are described in abstract terms [91]. It relies on being present in the settings where daily activity unfolds, attending to routine practice, and interpreting how people themselves understand what they are doing. This is consistent with the notion of “thick description,” which is concerned not only with documenting events, but with understanding their situated meanings, values, and negotiations [76]. Ethnographic work in HCI treats the home, workplace, service setting, or community environment as something that is continuously produced through social relationships, material arrangements, movement, atmosphere, and care, rather than as a static container where behavior simply happens [134]. This perspective positions lived space as dynamic and ongoing, and recognizes that stability, comfort, and everyday routines are actively made and maintained.

Contemporary HCI ethnography also challenges the idea of “the field” as a single bounded site or a single clearly defined user group. Instead, it often follows practices, technologies, and obligations across multiple sites and over time [208]. This multi-sited orientation recognizes that activities, relationships, and infrastructures are distributed and interdependent, and that design problems cannot always be located in one physical setting. In addition, ethnography in HCI is understood as situated and reflexive rather than neutral. Researchers are not treated as distant observers, but as participants whose presence, relationships, and decisions shape what can be seen, what is recorded, and what is ethically possible [99]. Reflexivity is therefore part of the method and part of its accountability, especially in work that engages with structural inequality and care. HCI has further developed rapid ethnography as a way of retaining this situated, contextual understanding while working within practical constraints [118]. Rapid ethnography narrows the focus to key practices, concentrates observation at critical moments, and coordinates multiple researchers to generate rigorous, design-relevant insight in shorter

time frames. It does not replace ethnography with surface-level interviewing; rather, it compresses access while maintaining attention to practice, relationships, and context [118].

In this study, ethnography-informed approach, including rapid ethnographic techniques [118], was used to develop a grounded account of how refugees in Australia navigate resettlement in everyday life. Through in-situ interviews, diaries, and observation at home and community settings, the study traced how participants made and remade “home,” engaged with services, and sustained belonging across places [76, 91, 134]. This methodological choice is informed by HCI work showing that self-reported visual probes can support agency and privacy in sensitive settings by allowing participants to document everyday experiences in their own time and on their own terms [?]. In Phase 1, photo-diaries similarly enabled participants to capture situated encounters with settlement support and everyday resettlement activities before discussing them in follow-up interviews. This ethnographic grounding informed the subsequent Participatory Design activities, where participants were invited to identify priorities, challenge assumptions, and imagine alternative futures [156]. Together, ethnography provided contextual understanding, and Participatory Design created a collaborative space for articulation and intervention.

3.1.2 Participatory Design

Participatory Design (PD) is grounded in the idea that people who are affected by a technology or system should have an active say in shaping it [152]. Rather than treating communities as “end users,” PD recognizes them as design partners with situated expertise, and aims to redistribute decision-making power toward those who live with the consequences of design [58, 82, 92]. This orientation has made PD especially important in work with marginalized communities, including children, people with disabilities, older adults, migrants, and refugees, where mainstream technologies and services routinely fail to reflect lived realities [15, 59, 77, 106, 146, 213]. By involving participants directly in articulating problems and imagining solutions, PD can build trust, create culturally grounded designs, and support a sense of agency among communities who are often excluded from formal decision-making [59, 92].

At the same time, PD does not automatically remove power asymmetries. Structural control over agendas, resources, timing, and language can still sit with researchers, professionals, or institutions, even in projects that call themselves “participatory” [37]. This is particularly sensitive in work with vulnerable participants such as refugees, survivors of violence, or communities living with ongoing precarity. Vyas et al.’s work on using e-waste with under-resourced communities demonstrates how generative toolkits can scaffold participation by drawing on locally available materials, participants’ existing knowledge, and values embedded in everyday problem-solving [199]. Similarly, Hedditch et al.’s auto-ethnographic study of makerspaces shows that spaces often framed as open and democratic can still reproduce gendered, racialized, and techno-centric exclusions, particularly when they assume confidence, technical familiarity, English proficiency, or comfort in male-dominated environments [84]. This reinforces the need to adapt participatory and making-based methods so that they are low-barrier,

culturally sensitive, and supportive of participants who may not identify as technically skilled makers. If handled carelessly, PD can reproduce dependency, emotional burden, or even conflict within the community [75, 102]. In response, scholars argue that responsible PD with marginalized groups must go beyond consultation and toward practices that (i) protect participants from harm, (ii) recognize and build on their existing strengths rather than deficit framings, and (iii) position researchers as accountable partners, not neutral observers [75, 102].

Recent work in PD has also embraced speculative and future-oriented methods to help participants imagine possibilities beyond current structural constraints [39, 81]. These approaches invite participants to envision more just, dignified futures and to articulate what systems would need to change to make those futures livable [81, 83]. However, purely abstract “blue sky” ideation can be difficult when people’s everyday realities are shaped by racism, poverty, displacement, or bureaucracy; participants may reject ideas that feel too distant from what they are allowed to hope for [81, 83]. One response to this challenge is the “magic machine workshop” [19]. Rather than asking participants to produce immediately “realistic” solutions, the method invites them to design fictional or “magical” devices that would address the problems that matter most in their lives. This lowers the pressure to be practical, protects unconventional ideas from early dismissal, and creates a space where participants can voice needs around safety, belonging, family connection, and dignity without being constrained by what is currently politically or economically available [17, 19, 150]. In this way, speculative PD is not only about imagining technology, but becomes a vehicle for articulating what a more humane future should look like for people who are rarely asked.

Ethnography and PD are mutually reinforcing: the former grounds design in an understanding of lived experience, while the latter enables collaborative imagining and evaluation of technological futures. Ethnography provided tools for developing a rich, contextual understanding of refugees’ everyday lives. Through interviews, diaries, and observations, the research sought to uncover how participants navigate institutions, relationships, and technologies during resettlement. The commitment of ethnography to “thick description” [76] ensured that participants’ perspectives guided interpretation, rather than abstract categories. Participatory Design (PD) extended the inquiry by involving participants as co-designers of ideas and artifacts that represent their experiences and aspirations. Rooted in democratic and dialogic principles [156], PD was especially important in refugee contexts, where voice and agency are often constrained. Workshops and field deployments enabled mutual learning and reflection on the meanings of “home”.

The project unfolded in three sequential phases, each building on the insights of the previous one:

Table 1: Theoretical and methodological integration across research phases

Phase	Theoretical Lens	Methodological Role
Phase 1: Early Resettlement Study	Indicators of Integration [2]	Guided exploratory interviews and diaries to examine practical, social, and institutional aspects of resettlement.
Phase 2: Co-design Workshops	Place-Belongingness [22]	Structured participatory design dialogues around home and belonging.
Phase 3: Field Trial	Ambiguous Loss [43]	Framed technology as a mediator for unresolved attachments and emotional continuity across distance.

3.2 Theoretical Foundations

This doctoral research draws upon three interrelated theoretical perspectives that guided the methodological design and interpretation of its three empirical phases: the UK Home Office’s Indicators of Integration Framework [2], Antonsich’s [22] Framework of Place-Belongingness, and Boss’s [43] Theory of Ambiguous Loss. Each framework was adopted to illuminate distinct yet connected dimensions of the refugee resettlement process, from early adaptation and service access, to emotional belonging and home-making, and finally to family connection and continuity mediated through technology. Collectively, these frameworks shaped how participants’ lived experiences were explored, represented, and re-imagined throughout the research.

3.2.1 Indicators of Integration

The first phase of this research was conceptually guided by the Indicators of Integration Framework developed by the UK Home Office [2]. This framework defines integration as a multidimensional process comprising ten interrelated domains grouped into four categories: Means and markers (employment, housing, education, health), Social connections (bonds, bridges, and links), Facilitators (language and cultural knowledge, safety, stability), and Foundation (rights and citizenship). These domains position integration not merely as functional participation but as a reciprocal process of inclusion and belonging between newcomers and the host society. In the first study, this framework structured both data collection and analysis. It guided the development of the photo-diary and interview instruments, ensuring that refugees’ resettlement experiences were examined across social, institutional, and material domains. The analysis revealed how participants’ early interactions with resettlement services unfolded in three temporal stages, including immediate, initial, and ongoing services. The study reflected the transitions from basic needs to emotional adaptation and self-sufficiency. Importantly, the findings highlighted that integration is not achieved solely through access to services but through feeling safe, welcome, and at home. This recognition motivated the shift in the second phase toward

investigating the sense of home as a central component of belonging.

3.2.2 Place-Belongingness

Building on insights from Phase 1, the second phase adopted Antonsich's [22] framework of place-belongingness for co-designing technologies. Antonsich [22] distinguishes between two dimensions: (1) the personal feeling of being "at home," composed of five interrelated factors, including autobiographical, relational, cultural, economic, and legal; and (2) the politics of belonging, which refers to the broader socio-political structures that define who is entitled to belong. This is also conceptualised as 'place-belongingness'. Yee et al. [209] build upon the place-belongingness framework by Antonsich [22], where they include an additional ancestral and historical dimension to capture the Pacific Island context, and outline that place-belongingness as a critical factor influences why the residents of Togoru choose to stay in their coastal village despite the increasing threats posed by climate change. Mohseni et al. [121] clarify how place-belongingness manifests in real-life context through systematical literature review. They categorize the practical meanings of place-belongingness, such as feeling at home, feeling of being accepted, security, comfort, emotional attachment, or empowerment. They also discuss the factors contributing to place-belongingness into personal elements (like memories and experiences), connections (including social and physical bonds), resources (such as material, economic, educational, and legal), and cultural factors [121]. Moreover, they emphasize the role of information technologies in enhancing place-belongingness and suggests a need for future research into this area [121]. This framework proved particularly useful for understanding how belonging is constructed and disrupted in forced migration contexts. It informed both the design of co-design workshops and the analytical approach to participants' creative expressions of home. Through drawing and model-making exercises, participants visualized homes that reflected not just physical comfort but emotional safety, cross-border family ties, and cultural continuity.

Applying Antonsich's framework [22] to refugee contexts extends its original scope by foregrounding transnational connections, i.e., the desire to maintain strong family connections across borders, and material culture as anchors of belonging. Participants regarded tangible artefacts such as traditional carpets, foods, and decorations as "precipitates of re-memory" that connect past and present identities, transforming belonging into an embodied, sensory, and symbolic experience. Thus, place-belongingness functioned methodologically as: a sensitizing concept guiding participatory design prompts around emotional and structural belonging, an analytic scaffold for mapping themes of attachment, safety, and agency, and a generative lens linking participants' artefacts to design implications for technologies that could support belonging and identity continuity.

3.2.3 Ambiguous Loss Theory

The third phase, a field trial study, was grounded in Pauline Boss's [43] Ambiguous Loss Theory developed by Pauline Boss [33, 34]. It describes two main patterns: (1) physical presence with psychological absence, such as in dementia or addiction; and (2) psychological presence with physical absence, such as when someone is missing because of war, migration, or human trafficking. Unlike a clearly confirmed death, ambiguous loss often comes without official confirmation or socially recognized rituals of support, leaving families in prolonged uncertainty and without closure [36]. Because this uncertainty destabilizes boundaries around who is in the family system, ambiguous loss is considered among the most stressful forms of loss [117]. Over time, the concept has been extended beyond missing persons to include ambiguous losses of roles, objects, and attachments. For instance, Perez's [132] work on Cuban American exiles illustrates how the loss of homeland can become a lifelong, unresolved condition—marked by enduring separation, disrupted identities, and nostalgia for a place that remains psychologically present yet physically inaccessible. Bunn et al. [43] similarly examine Syrian refugees in Jordan and conceptualize the ambiguous loss of home through four interrelated dimensions: safety and security, social connections and identities, connection to place, and imagined futures. Their grounded theory shows refugees oscillating between grieving and rebuilding home through cultural practice, faith, new relationships, and children's adaptation. Drawing on Ambiguous Loss Theory [34, 43], the study interpreted participants' engagement with *Culture Link* as a practice of meaning-making rather than closure. Families co-created images that symbolically reunited dispersed members, blended memories of past and present, and enabled intergenerational storytelling as a form of emotional adaptation. Ambiguous loss theory thus provided a methodological foundation for understanding technologies not as solutions to separation but as mediators of resilience, continuity, and reflection. It framed digital storytelling as a coping mechanism that helps families sustain psychological bonds across distance.

Chapter 4: From Arrival Support to Home-Making Needs: An Exploratory Study with Newly Arrived Refugees

On Arrival: Challenges and Opportunities Around Early-Stage Resettlement of Refugees in Australia¹

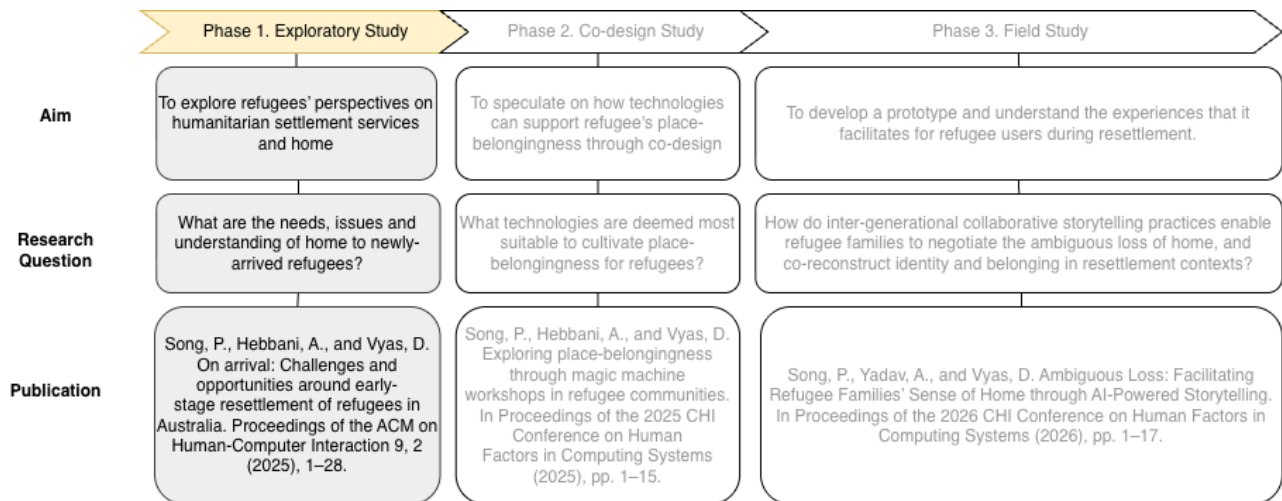


Figure 2: Phases Overview - Phase 1

This chapter presents the Phase 1 study that grounds the thesis in refugees' early-stage resettlement experiences in Australia. To address the overarching research question of how technologies can be designed to support newly arrived humanitarian entrants in developing a sense of home, this thesis was structured as three connected studies that move from understanding lived experience, to co-designing possibilities, to evaluating a deployed technological intervention. As the first step in this research trajectory, Phase 1 was designed to examine refugees' early-stage resettlement experiences in Australia and to identify how institutional support shapes their initial conditions for rebuilding home. This initial study provides the empirical foundation for the thesis by clarifying what kinds of needs are addressed through formal settlement services, what challenges remain unresolved beyond functional support,

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and why later studies need to examine home, belonging, cultural continuity, and social connection more directly. In this way, Phase 1 establishes the context and motivation for Phase 2, which uses participatory design to explore refugees' own aspirations for technologies that support home-making, and Phase 3, which evaluates an implemented platform for supporting family-based storytelling and cultural continuity. The chapter then presents the key findings, organized around three temporal phases of service provision, including immediate arrival, initial settlement, and ongoing settlement. It shows how refugees' needs, expectations, and challenges shift across time.

The material presented in this chapter is a part of the published paper "On Arrival: Challenges and Opportunities Around Early-Stage Resettlement of Refugees in Australia" (CSCW), included in Appendix A. This chapter condenses the paper's core empirical insights, focusing on how refugees perceive and navigate settlement support delivered through a mediating service provider. Importantly, the findings from Phase 1 do not only identify service gaps and opportunities for improving early settlement experiences; they also establish the broader motivation for the thesis: that successful resettlement cannot be reduced to functional access alone, and that longer-term processes of rebuilding belonging and a sense of home remain insufficiently supported.

To understand the early-stage resettlement context and refugees' lived experiences of institutional support, Phase 1 recruited 12 participants who had been in Australia for approximately six months through collaboration with a refugee settlement service provider. Data were collected through a two-stage qualitative approach: a photo-diary exercise to capture participants' day-to-day encounters with resettlement activities, followed by semi-structured interviews to unpack the meaning and consequences of these experiences. The analysis highlights how settlement support is experienced as a progression of interconnected steps. These range from immediate orientation and temporary accommodation, to connecting with essential services and systems, to longer-term housing and employment pathways, and how breakdowns in continuity, clarity, and agency shape refugees' early experiences of remaking home in Australia.

As the foundational phase of this thesis, these findings do two things that directly enable the later studies. First, they clarify what early settlement support is currently able to address (e.g., practical navigation and service access) and what remains persistent or unresolved as time passes (e.g., social connection, identity continuity, and the emerging work of feeling at home). Second, they motivate the shift in Phase 2 toward participatory design methods that can surface refugees' values and aspirations around home and belonging, and the move in Phase 3 toward evaluating an implemented intervention (*Culture Link*) that supports family-based, everyday practices of cultural continuity and meaning-making beyond the formal service window.

4.1 The Study

In this section, we outline the research design and methodology employed to achieve the objectives of this study, which aims to understand the experiences of newly-arrived refugees with the services provided by a service provider, identify potential areas for improvement and explore preliminary design opportunities.

4.1.1 Research Context

The authors collaborated with a refugee settlement service provider for migrants and refugees in Australia. This service provider has helped new arrivals in Australia to settle into their new lives in the new country, forging connections within their communities, seeking employment and educational opportunities, developing new skills, and establishing a sense of belonging. Different from other service providers focusing on a specific service, this service provider offers support and goods that are necessary to newly-arrived humanitarian entrants and connects them to all public resources and services available to them, which acts as a mediating organization. The service provider assisted our research project in locating participants and providing bilingual interpretation services for participants as and when needed. In return for taking part in this project, each participant received a \$20 grocery gift card, as a token of appreciation.

4.1.2 Participant Selection and Research Design

Our study employed a two-stage qualitative approach to gather an in-depth understanding of participants' perceptions and experiences of their initial settlement journey in Australia. Following ethical approval from our institution, potential participants were handed an information sheet along with a consent form. We sought participation from newly-arrived refugee adults who arrived in Australia between late 2022 and early 2023. Following this process, 12 participants volunteered to take part in this project – we had 3 participants each from Syria, Ethiopia, Afghanistan, and Iran (6 men and 6 women) of varying ages (from 23 years to 62 years). The demographic characteristics of the participants are presented in Table 1, along with their educational details, household details, ethnicity and language. It is important to note that the household size indicates the number of individuals migrating together as a family unit to Australia and living in a shared space. After receiving signed consent, participants took part in two consecutive stages of this research, each of which is explained below in detail.

Stage One.

Stage one comprised a photo diary task assigned to participants, which required them to document their living spaces and utilisation of goods provided by the service provider upon their arrival in Australia, over the course of 5-7 days. Diary studies are a well-established method used for capturing a wide range of information [125]. Typically, this method involves participants recording their experiences throughout the day using written descriptions, audio recordings, and pictures [6, 143]. Diary studies offer significant advantages by capturing data from the participant's perspective, using their preferred communication methods, and within real-world contexts, which is particularly effective for collecting subtle insights and nuanced details, especially for infrequent, sensitive, or hard-to-observe events [148]. Participants were asked to record responses to three major questions and photo shooting tasks every day for 5-7 days: 1) Item Usage: Choose an item from the basic essential package provided by the service provider, and record and discuss how it was used and incorporated into their daily lives, capturing photo evidence of its usage; 2) Perception of Services: Discuss a service provided by the service provider, how it facilitates the re-settlement or integration, and any suggestions on potential improvements, including taking a photo of the service if participants were receiving it during the photo-diary duration; 3) Accommodation and Personal Changes: Record any personal changes made to their current accommodations to meet their specific needs, any issues of their current homes and lives, and future expectations, including taking photos of their changes or modifications to their homes. Participants were empowered to select their preferred method for completing the photo diary, either digitally or via paper, based on their level of digital literacy or preference. Figure 1 shows examples of photo diaries from our participants. The photo diary submissions were made daily. Paper-based photo dairies were translated by interpreters and reviewed immediately before stage two of this research,

Table 2: Participant Demographics

Participant	Age Range	Gender	Educational Level	Household Size	Ethnicity & Language
P1	20s	M	Secondary	1	Afghan (Dari)
P2	30s	M	Secondary	1	Iranian (Farsi)
P3	40s	F	Tertiary	1	Iranian (Farsi)
P4	40s	M	Tertiary	1	Iranian (Farsi)
P5	60s	M	Secondary	6	Eritrean (Tigrinya)
P6	30s	F	Secondary	7	Eritrean (Tigrinya)
P7	20s	F	Secondary	2	Eritrean (Tigrinya)
P8	60s	F	Primary	3	Afghan (Dari)
P9	50s	M	Secondary	6	Afghan (Dari)
P10	30s	M	Tertiary	3	Syrian (Arabic)
P11	50s	M	Secondary	4	Syrian (Arabic)
P12	30s	F	Secondary	5	Syrian (Arabic)

i.e., the interview phase. Those opting for the digital format submitted their daily photo diary tasks via email, WhatsApp, or direct messaging the first author. The photo diaries completed in languages other than English were translated by interpreters. One elderly participant (P8) faced difficulty in completing the diaries or accurately expressing themselves due to their limited language literacy, so a young family member of hers assisted in completing the task.

Stage Two.

Upon completion of stage one, stage two involved semi-structured interviews accompanied by photo-elicitation with participants after they completed the stage-one photo diary. The photos that participants took from the stage one photo diary task served as a conversation catalyst for the interviews in stage two, to inspire rich discussions about their personal experiences, emotions and associations related to their resettlement process and the support they received. Participants were empowered to choose the physical locations of their choice for the interviews. Therefore, the interviews took place in participants' homes or other locations that were convenient for them. During the interviews, participants who were confident in their English proficiency communicated in English, whereas others received assistance from interpreters.

4.1.3 Data Collection & Analysis

Data are collected through the stage one photo diary study over 5 to 7 days, and stage two which comprised of semi-structured interviews, lasting on average of one hour. The former captured visual documentation of participants' living situations and interactions with the basic essential package, while the latter gathered in-depth insights guided by the photo diary. The collected data, including interview transcripts and photo diaries, underwent thorough thematic analysis [181]. This entailed

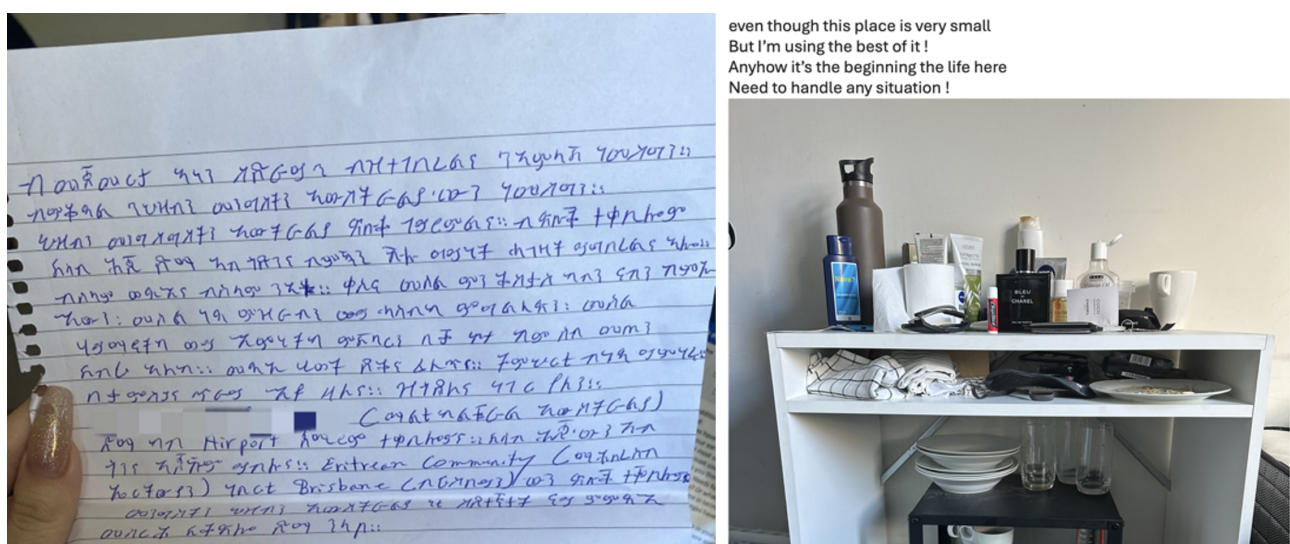


Figure 3: Examples of Photo Diary Collected; 1) Paper-based; 2) Digital, email-based

comprehensive readings of the materials, followed by systematic text coding. An inductive coding approach was utilized to initially cluster the services, then pinpoint and categorize the needs of participants that fall into each service category [65]. Besides grouping services based on the timeframe, the initial development of the codebook involved labelling recurring words and phrases, followed by hierarchical grouping of similar codes. Subsequently, the codebook underwent multiple rounds of revision by the second and third authors before being further refined by the first author. Consensus meetings were held to resolve coding discrepancies and improve the reliability of the coding process. Through this process, emerging themes and patterns were identified thereby providing insights into participants' perceptions of the early-stage resettlement and their evaluation of the support received.

4.2 Findings

This section presents the research findings, derived from an in-depth exploration of the multifaceted early-stage resettlement process for newly-arrived humanitarian entrants, where the authors identified a diverse range of services offered and associated challenges by individuals under the auspices of the local service provider. As depicted in Figure 2, the services are categorised based on the timing and duration of their provision to newly-arrived humanitarian entrants throughout their resettlement journey. There are three key stages of the refugee resettlement process, which include: immediate services upon arrival, initial settlement services, and ongoing services. Each of these stages represents a distinct phase in the resettlement journey, addressing specific needs and challenges encountered by newly-arrived refugees. The immediate services upon arrival focus on urgent needs, such as providing basic resources (e.g., transportation cards, SIM cards), airport pickup, and temporary accommodation arrangements. The initial settlement services cover the initial integration steps, including access to essential public resources, language training, housing, and employment assistance. This stage helps refugees begin their adaptation to local systems and environments. The ongoing services reflect the longer-term needs of refugees, particularly in healthcare, financial stability, and emotional well-being. These services aim to support refugees' long-term independence and successful integration into the host society. Throughout each stage, various themes emerged, highlighting the critical role of service providers and the participants' evolving needs. These themes are discussed within each stage to offer a comprehensive view of refugees' resettlement experiences.

4.2.1 Immediate Services upon Arrival

Upon their arrival, newly-arrived humanitarian entrants are greeted by a bilingual case worker, who is tasked to assist with a range of services. These comprehensive services include airport pickup and support at both the arrival and transferring terminals, providing meals, facilitating hotel check-in, and

property induction on the very first day upon arrival, along with a basic essential package provided for the first few days in Australia. Orientation to the local area is conducted on the second day. The basic essential package, a curated collection of indispensable items catering to daily necessities, encompasses a mobile phone with a SIM card, vouchers for shopping at supermarkets, and a local transportation card.

Sense of Welcome and Reassurance

Hospitality is a core notion embodied in the initial-stage resettlement services provided to newly-arrived humanitarian entrants. Many services create an environment of hospitality and friendliness, helping newcomers feel embraced and develop a sense of reassurance in the new environment. Participants frequently highlighted their positive experiences with the welcoming atmosphere fostered by social workers. For example, P10 initially worried that his family might not be able to find the social worker at the airport. However, he easily identified the social worker holding a large placard at the arrival gate. P10 remarked: *“The person is almost, could say waiting for us at the gate of the airport. It was very, very easy to find him. And he guides us through the checkout, step by step. The person was very helpful. And we personally had a problem and he helped us to solve it. We couldn’t find our visa and he got us to the person who could help us, and he said wait here is normal procedure and they find our visa and re-enter immediately. It was very helpful.”* Additionally, the orientation service conducted on the second day of each participant’s arrival, which included a city tour and introduction to local facilities, further demonstrated the commitment to hospitality, ensuring newcomers felt cared for and supported. P11 expressed his joy about the city tour and emphasised its significance in giving

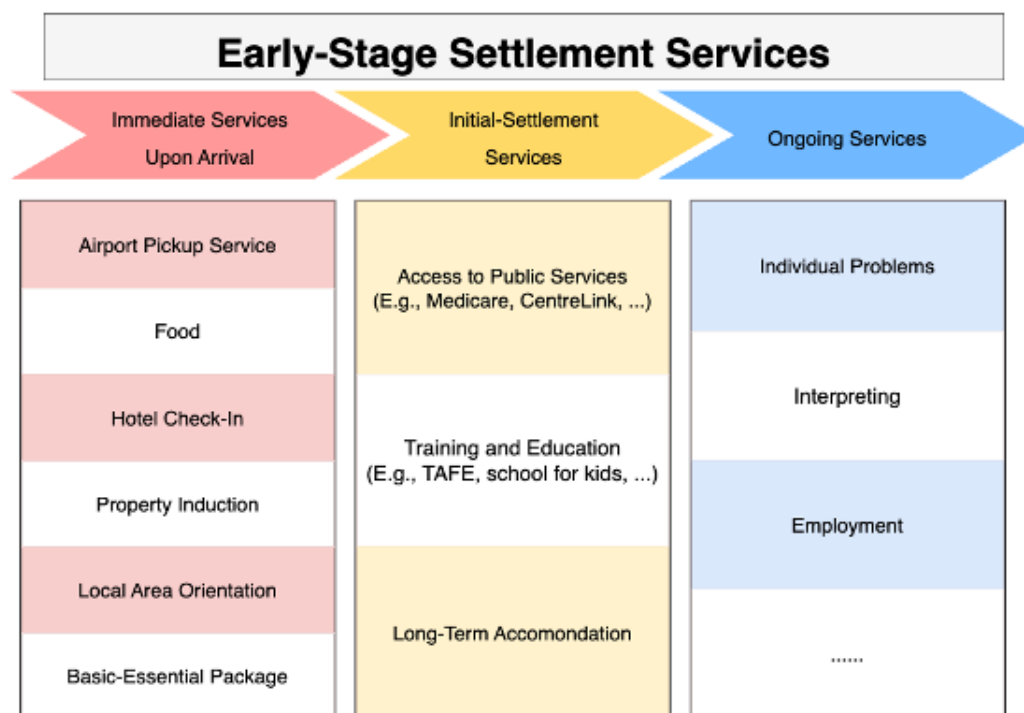


Figure 4: The array of services provided during various stages of resettlement.

newcomers a sense of welcome. P10 also highlighted this aspect of the orientation, stating: *“The second day they immediately met us in the morning, the guy took us for a tour in the city, showing the city council... They introduce the buses, the streets, the lights, things like that. Because everything is new for us, new rules. We don’t have it in our country. That’s why they introduced us to everything in the first two days.”*

Through participants’ responses, it is evident that the local area orientation service not only provided newcomers with an enjoyable experience of exploring the city, but also delivered feelings of hospitality, friendliness, and a sense of being embraced and accepted in their new home country and city. It familiarized them with the overall settings of the local area, local culture, and everyday practices, enabling them to integrate more effectively and quickly into the new country. One identified future improvement of the orientation service was the staffing level. In Participant P2’s case, the social worker was assigned to two families simultaneously, resulting in limited time for local area orientation after the bank appointments. Consequently, P12’s family was unable to receive information about essential information such as how to purchase groceries and use vouchers. Fortunately, P12 mentioned that a fellow hotel resident who spoke the same language assisted. This situation underscores the need for adequate staffing levels to ensure that all newcomers receive comprehensive orientation and support.

Tangible Support for Physiological needs

The initial-stage resettlement services effectively fulfil the basic physiological needs of newly-arrived humanitarian entrants, ensuring they have the essential resources required for daily living, such as food and shelter. It was learnt that newly-arrived humanitarian entrants were offered meals upon arrival, catering to their immediate nutritional requirements. Hot food was provided for participants who arrived during mealtime; otherwise, the service provider would offer bread and fruit. For example, P10 was served a chicken meal, whereas P4 received bread with jam and orange juice. Most participants expressed gratitude for the efforts taken - for example, P11 noted, *“The first meal when we arrived, it was so helpful, so help, because we don’t know where to find the restaurants”. The service provider accommodates newcomers at hotels before finding long-term housing solutions for them. Regarding the hotel check-in services, all participants reported that the process was quick. The social worker took them to the hotel immediately after picking them up from the airport, allowing them to rest on the first day. The provision of the basic essential package played a crucial role in meeting the basic needs of newcomers by providing transportation, access to information, technologies, and everyday goods. Many participants highlighted the importance of the transportation card in the package for navigating their new environment, and some participants still kept and continued using the transportation cards provided by the service provider till now. As P10 noted, “I’m still having the transportation card, you wanna see? Two transportation cards, one for me, one for my wife. I think the transportation*

card is the most useful one (among all the items in the basic essential package). The card helps you, especially at the beginning, when they learn how to use the public transportation, it helps a lot.” Another highly regarded item was the SIM card. Several participants emphasized how this SIM card facilitated their lives. For instance, P4 highlighted the significance of staying connected, while P12 emphasized the role of the SIM card in overcoming weak internet signals during their hotel stay. Individuals or families with smaller households expressed contentment with the voucher’s value, finding it adequate for their needs. P3 could not remember the exact number of vouchers, but she told us there were two or three cards of \$50, and it was sufficient for her to buy food and groceries, as the service provider had already provided personal hygiene products such as shampoo, toothpaste, and other essential hygiene products. While some families with bigger households mentioned they received \$350 vouchers for the first two weeks, P8 and P5 noted that they were able to request more vouchers if it was insufficient. For example, in P5’s case, as Centrelink had a delay in processing their payments, so they asked for an extra \$200 voucher, *“So when they came they give us, as I told you, the voucher. It was like \$350. And also, we didn’t have Centrelink. Obviously, they got everything sorted like the bank and everything. But the Centrelink was delayed for a month and two weeks. We have to just keep waiting for the social worker to send us voucher again. So she will send like \$200 voucher for the Woolworths for us to go and get food or whatever.”*

These comprehensive efforts underscore the resettlement services’ dedication to ensuring that newly-arrived humanitarian entrants have their basic and physiological needs met, facilitating a smoother transition and integration into their new environment.

Tailoring Support to Unique Needs

In addition, it is worth mentioning that besides conventional transportation and lodging provisions, another important aspect of the resettlement services is tailoring support to address individuals’ unique needs. Each newcomer or newly-arrived family may have different physical or mental conditions, especially families with disabled members. For example, P12 shared a touching narrative of how the service provider’s dedicated support made a profound difference in her family’s transition journey. P12’s family included members with severe disabilities, which required specialized attention. P12 mentioned that her family informed the service provider of their situation on short notice, yet the provider demonstrated exceptional commitment by arranging additional staff support in response to their needs. While the other family members were brought to the hotel, the disabled family members were taken to the hospital with medical assistance. Such personalized efforts were deeply appreciated by P12, who expressed her gratitude for the crucial role the service provider played during this critical phase of their lives. However, the hotel room provided to P12’s family wasn’t suitable for wheelchairs, due to the narrow doorways and stairs in the room. This example embodies a potential improvement for service providers. Another area for improvement is the provision of phones and vouchers. While

some participants were satisfied with the mobile phones included in the essential package (Figure 3), others suggested that the quality and functionality of the phones could be improved. For example, P7 noted issues with the phone freezing and not working well: *“The phone didn’t really work. So, we had a problem with a phone... it froze. It freezes, like if someone calls you, it just freezes, and you can’t pick it up or like something”*. These concerns about device quality were common, especially since many participants had brought their own phones to Australia, rendering the provided devices redundant. In light of this feedback, P4 offered a constructive suggestion to improve the provision of mobile phones. He proposed that the service provider could give newcomers the option to choose between receiving a mobile phone or an equivalent monetary voucher. This approach would allow participants to tailor their choices based on their specific circumstances and preferences. P4 also emphasized the significance of being allocated a ‘memorable’ phone number to facilitate integration, highlighting the potential benefits of providing flexibility in phone selection and associated use within the chaos of initial settlement. Similar advice was also proposed by P5 regarding the vouchers, who shared a story about his children playing in the park and wanting to buy ice cream like the other kids who were enjoying treats. Nevertheless, he was unable to purchase the ice creams for them because the vouchers could only be used at the major supermarket chains. Hence, he proposed an improvement idea: providing monetary support to families in special situations. Overall, these examples suggest that it is important for service providers to empower newcomers to choose the support or services that best meet their needs, ensuring a more personalized and effective resettlement experience.



Figure 5: The mobile phones provided to refugees by the organization.

4.2.2 Initial Settlement Services

Once the newly-arrived humanitarian entrants settle in the hotel and receive immediate services upon arrival, the service provider continues to assist with initial settlement services. These services include helping them access local services and resources. The newcomers also receive training and education arranged by the service provider. Since the hotel is temporary accommodation, the service provider

also assists newly-arrived humanitarian entrants in finding long-term housing. We identify and unfold the insights of participants on initial settlement services based on three perspectives as below.

Infrastructural and Social Adaptation.

To support the adaptation of newly-arrived humanitarian entrants to the local systems and environment, the service provider arranges for them to connect with essential services provided by Services Australia, an Australian Federal Government department. These government services include Centrelink, which provides income support and other payments, as well as Medicare, the health welfare program that offers Australian citizens and permanent residents access to healthcare. Additionally, the process includes opening bank accounts and completing other necessary steps for preparation. For instance, P12 noted that the service provider provided an interpreter to assist her with the bank appointment and all the paperwork needed. The service provider also held its own in-house training sessions for all newly-arrived humanitarian entrants to give them a comprehensive understanding of the local systems and environments. These sessions covered life skill topics and five major modules: transport, health, education, community participation, law, and Centrelink. The overall aim of these sessions was to provide an overview of the Australian systems and environments. These sessions were highly praised by all participants, and the information they acquired was found very beneficial for their daily lives thereafter. For example, the service provider not only introduced basic information about Australian systems but also introduced Australia's culture and how to integrate into the local communities. As P9 told us, *"They told us how you contact with police when you need, how you contact with ambulance, triple zero, and how you contact emergency, contact number, and when you need an interpreter, what's the number you're calling, and everything. And that was very helpful for helpful... So the program was very helpful. They taught us about the Australian government program, and how you deal with your neighbours, the people, like with your family, like everything in Australian culture."* P10 informed us that the service provider provided interpreters for the sessions, catering to all different languages for newly-arrived humanitarian entrants. However, he proposed a piece of advice regarding the timing and duration of these sessions. He mentioned that currently, the sessions ran from 8 am to 2 pm, with a one-hour break. There was a possibility of people becoming distracted and fatigued, particularly when listening to unfamiliar languages while awaiting interpretation. He recommended breaking down the sessions into shorter durations and spanning them over two or three days. Participants also highlighted the critical need for social connectedness as an essential step for their integration into the Australian community. P10, who had relatives in Australia, informed us that in their culture, people tended to prioritize recommendations from friends or family due to their cultural background. This reflects a common resettlement challenge among refugees and their mistrust towards local service providers or the government. As a result, P10 initially attempted to address banking and Centrelink matters independently after seeking advice from their friends but encountered issues and subsequently sought

assistance from the organization. ” *When we make our account, like, my wife, I connected for her (to) Centrelink, I need to get connected too, but my own, there was a problem. I couldn’t connect. Then they (the service provider) came and helped us with the matter. Also, they help us to connect it later.*” Participant P9 emphasized the importance and need for connecting with people from the same cultural background as a crucial foundation for social integration. P9 shared that he and his family lacked social connections in Australia. He expressed their desire to connect with individuals or families who spoke the same language and shared similar resettlement experiences, especially given their ongoing process of learning English. Their neighbors were all native Australians, and the lack of English language proficiency was proving to be a communication barrier. P9 suggested that if the organization could arrange a service aimed at enhancing social connectedness among newly-arrived humanitarian entrants and those who have previously resettled and share a similar cultural background, it would be greatly appreciated.

Individual Development.

The service provider facilitated the individual development of newly-arrived humanitarian entrants by helping them register for English courses at Technical and Further Education (TAFE), Australia’s largest vocational education and training provider. P3 expressed immense gratitude for the English training and mentioned that the financial support provided by the Australian government was sufficient to cover her living expenses even without employment, allowing her the wonderful opportunity to dedicate herself to full-time English learning for an entire year. Additionally, the service provider assisted with enrolling children into school. For P10, who had a young child, the service provider arranged day-care services. Participant P8 highlighted that the organization tailored its approach to each child’s situation. For her younger child with disabilities, the organization ensured enrolment in a special school. Participant P5 even expressed that he felt a renewed sense of hope for his family’s future when he was asked about his outlook on their future life in Australia during the interview because his children were now able to receive education, ”*So also, because the school here for the kids, they can study, they have a bright future, in the future, finishes school, look after themselves. So that’s like, for us, that’s a big thing. So, we can see a bright future for the kids, or either for us, the family.*” Through these insights from participants, it is evident that the training sessions and education provided by the service provider were extremely beneficial for all refugees. These services not only accelerated their integration into the Australian environment and helped them overcome language barriers, but also brought hope to their lives and instilled in them a positive vision for their future in Australia.

Sense of Home and Belonging.

Creating a sense of home and belonging is critical for the settlement of newly-arrived entrants. According to P12, she nourished a sense of home after residing in Australia, that she had never experienced before, *“We have been asking for asylum here in Australia since 2016, we waited for a long time. We didn’t have a home since 2016, and until we moved here. That’s like home, that’s home for us. Even when we go to school now (learning English at TAFE), we are just waiting to come back to our home and close the door and we feel at home here.”* P12 and her family were arranged a long-term accommodation by the service provider. As mentioned, since they had family members with disabilities, it would be inconvenient to live in an accommodation with stairs. The service provider made a special effort to identify and recommend one stair-free house. P12 and her family were very happy with the house that the service provider provided to them, which had been recently refurbished and featured adequate rooms and space. They also saved money to purchase new furniture and decorations for their home, including a large TV for the entire family to enjoy and two additional large sofas for the disabled family members to lie down. They regarded these practices as a way of establishing their new home in the host country, and found joy in the process, accompanied by a sense of accomplishment, and belonging. The authors were informed that newly-arrived humanitarian entrants are offered a maximum of a three-month free stay at the designated hotel and then transition to long-term accommodation after they connect to Centrelink. These newcomers had two options in seeking accommodation: 1) The first option was for the newcomers to search for rental properties on their own and apply for rental financial support from the service provider. Once the application is permitted, they can proceed to move in; 2) The second option was to allow the service provider to arrange rental properties for them. While the social worker would provide basic information on the available properties, the newcomers would be unable to inspect the property physically. If the newcomers decided to move in, they must sign a lease for at least six months, which was binding. Since the rental period is at least six months, unlike the hotel where they initially stayed for only a few days, newcomers need more than just a place to sleep; they need a place to live, a place that feels like home. Therefore, the participants expressed their needs for a ‘home’ and their expectations that the rented house could meet their needs. Participants who were able to rent properties by themselves were mostly satisfied with their accommodation since they could physically inspect and select the properties. An example of this is P10, who rented property with the help of his relatives, *“This is the most difficult process, finding a house and applying for it. We have some relatives here; they know the owner of this house. So, we talked to the owner. And he said, okay if you want the house, no problem, we’ll go through the paperwork. And when it came to the bond, they applied for a bond loan for us. The service provider applied for us, and we got a fast approval, saying they got the approval. Wow. That was very fast. And it was very, very helpful.”* P11’s family also opted to independently secure their current residence, as they preferred not to consider the second option due to its inspection restrictions, so they

applied for rental financial support to pay for the bond. They told us they could afford their current rent and reported being very satisfied with their living conditions, as shown in Figure 4. Their current residence was a 2-storey house, with a large living area, kitchen, and a car park on the lower level, and three well-maintained bedrooms on the upper level. While the two children occupied a smaller bedroom each, the parents resided in the master room. They were all content with the overall size of the house, as well as the individual rooms.



Figure 6: Bedrooms of P11's current long-term accommodation: a) master room for parents; b) single room for children

While other participants lacked personal connections in Australia, they followed the service provider's accommodation arrangements. It was found that families with bigger households tended to be mostly pleased with the provided accommodation, as they have the support of their family members and their primary need for a home is to stay together with their loved ones. For example, Participant P8 expressed that her need for a home is fulfilled as long as she is staying with her two sons. Participant P9 also expressed his gratitude for the house he lives in with his family, emphasizing that it is a safe place for them. The support and presence of family members significantly contribute to their satisfaction with the accommodation. However, the leasing situation and the no-inspection policy led to certain challenges for individuals settling in Australia alone. Some participants who came to Australia alone expressed that the long-term accommodation has not met their needs for a home. Living in shared housing arrangements can be particularly challenging, as individuals need to communicate with their roommates and occasionally make compromises regarding their own needs. For instance, P3, who lived in a two-floor shared housing, mentioned that there was a minor issue with her flatmate who was sharing the bathroom with her. She told us that the cleanliness of the house is the most important to her among all other living conditions. However, her flatmate constantly left the bathroom uncleaned after use. Though she tried her best to adapt, she still found it challenging to cope with the situation and remained uncomfortable due to the hygiene conditions. A family with smaller households also encountered a similar issue, involving conflicts with the neighbors. Participant P7, a young female who came to Australia with her little sister, was assigned to a residence that she thought was located in an unsafe area. From her sociocultural standpoint, she was concerned because she felt that the

particular neighborhood where she lived was frequented by intoxicated people, who did not welcome the newcomers and kept disrupting the peace. She shared, *“The neighbors were always drinking, drinking, drinking. So, when they get drunk, and like around 4 a.m., or whatever, they will throw the glass bottles on the house...And then we complained about it to the office and like to the social worker, they couldn’t do anything.”* Participants suggest that there is a need for enhancements in the procedures for assessing situations and revising policies, such as reconsidering inspection restrictions or adjusting leasing limitations for unique scenarios. This is particularly crucial for more vulnerable individuals, guaranteeing the well-being of recently arrived humanitarian entrants and ensuring that their needs for a home are met.

4.2.3 Ongoing Services

Care and Empathy

After transitioning to their long-term accommodations, newly-arrived humanitarian entrants may continue to face individual issues, including booking appointments with a general practitioner (GP), handling emergencies, or overcoming language barriers. During this phase of their settlement, the social worker assigned to each family or individual will be responsible for assisting with these problems, and the newcomers heavily rely on the support from their assigned social workers. Many participants expressed appreciation for the efforts of their assigned social workers, emphasising their helpfulness and strong willingness to assist. Participant P3 specifically mentioned that her social worker was exceptionally warm-hearted. She passionately said that the help and support from her social worker were more significant than any material support. In a particular instance, she was dealing with dental health problems and sought help from her social worker to assist her in scheduling an appointment with a dentist due to language and cultural barriers, *“She (refers to the social worker) followed up with a phone call, and we went to the clinic to do some blood tests and visit GP and they check everything and I’m, you know, satisfied about the medical services. And about that same dentist, I have an appointment, but in the next two months for the dentist, and she (the social worker) followed up to organise this.”* It can be seen that P3’s social worker’s support extended beyond P3’s initial request of booking the first appointment, but also cared for and assisted with the ongoing appointments. This level of commitment and personalised care from the social worker had an immensely positive impact on the well-being and successful integration. However, it came to the authors’ attention that a few social workers may not demonstrate sufficient empathy as expected. P1 expressed dissatisfaction with his social worker, who always ignored his phone calls or messages. He told us even though the social worker acknowledged his requests or needs, there was still no tangible assistance provided. This point was further discussed by P4, who highlighted the differences in the sense of responsibility among social workers, *“The first thing is about the social workers, they are different by case by case. For*

me, that social worker is like a friend, really responsible, and tries to provide me with everything I need in the short term, you know, very soon. But about the other friends of mine, it's not true, because for example, the, maybe, the social worker doesn't answer the phone." P4 shared that when he asked the organization to schedule a GP appointment, a social worker arrived without a vehicle to demonstrate how to take public transport to reach the clinic, which he already learned during the orientation. During his subsequent appointments, the organization repeatedly inquired if he required assistance in going to the clinic. This duplicated service was unnecessary for him. In contrast, while P4 received redundant services, P1 encountered a critical health situation and contacted his social worker for immediate assistance. Yet the social worker only told him to call the emergency himself, without offering any other support. Therefore, it is important that social workers consistently offer compassionate and effective assistance, to guarantee optimal outcomes for these newcomers. The service provider and stakeholders could formulate policies or assessments to evaluate the support provided by social workers to newly-arrived humanitarian entrants under their care, thereby ensuring the quality and consistency of the services.

Building Independence.

Most participants demonstrated a strong desire to work and become self-sufficient, rather than relying on government pensions. The service provider offers guidance in applying for work and some working opportunities. Participants who had a higher level of English proficiency found it easier to find jobs than those who were still learning English. For example, P1, who had basic English language proficiency, had been able to find work doing gardening. Likewise, according to P6, her family members with sufficient English proficiency were able to secure employment soon after resettlement, *"So my husband and my brother-in-law, because they're good at English, he used to do translating in Sudan, and he started working already. . . . So it's good if you know English, you're good. You can start your job like my husband."* Yet, for participants with a lower level of English proficiency, it was challenging to secure employment. P3 had made a personal decision to go to Sydney in search of a job, but she faced difficulties and was unable to find employment, ultimately returning to Brisbane. Upon her return, her social worker assisted her in finding a new place to live. Participants with a higher level of educational background tended to discover that the job opportunities provided by the organization did not meet their expectations. According to P10, who was currently working as a part-time delivery driver, his previous occupation before coming to Australia was a chemical engineer, and used to work for a German healthcare company as a production manager, *"I'm doing delivery work right now, but when they say that you have to work as a casual, in one place, picker-packer. It's not the job itself. The job is good. I'm not saying that I am not satisfied. That's not my skills. My skills could be more capable, I'm giving you more things. That's why I couldn't accept it. They provide a lot of jobs. But for me, I couldn't accept it."* P10 sought advice from his relatives who resided in Australia for a longer

time and realized if he wanted to look for a desired job, he needed to have a recognized degree and qualification assessment. Therefore, he was doing a diploma in IT with the hope of securing better employment in the future.

4.3 Implications for the Next Phase

The findings from Phase 1 establish the need to move beyond service-oriented understandings of resettlement toward a more direct examination of home and belonging. While the study shows that early settlement support plays an important role in helping newly arrived humanitarian entrants navigate practical systems, it also reveals that a sense of home is not fully addressed through functional support alone. Participants' experiences point to unresolved needs around stability, autonomy, social connection, cultural continuity, and emotional security.

These insights informed the design of Phase 2 by shifting the thesis from examining how refugees experience existing settlement support to exploring how they imagine technologies that could support home-making. Phase 2, therefore, adopts a participatory design approach, using Magic Machine workshops to elicit refugees' own values, aspirations, and design ideas around place-belongingness. In doing so, the thesis moves from identifying gaps in early resettlement support to collaboratively exploring what kinds of technological possibilities might better support refugees' longer-term sense of home.

Chapter 5: From Settlement Needs to Imagined Homes: A Co-Design Study with Refugee Communities

Exploring Place-Belongingness through Magic Machine Workshops in Refugee Communities¹

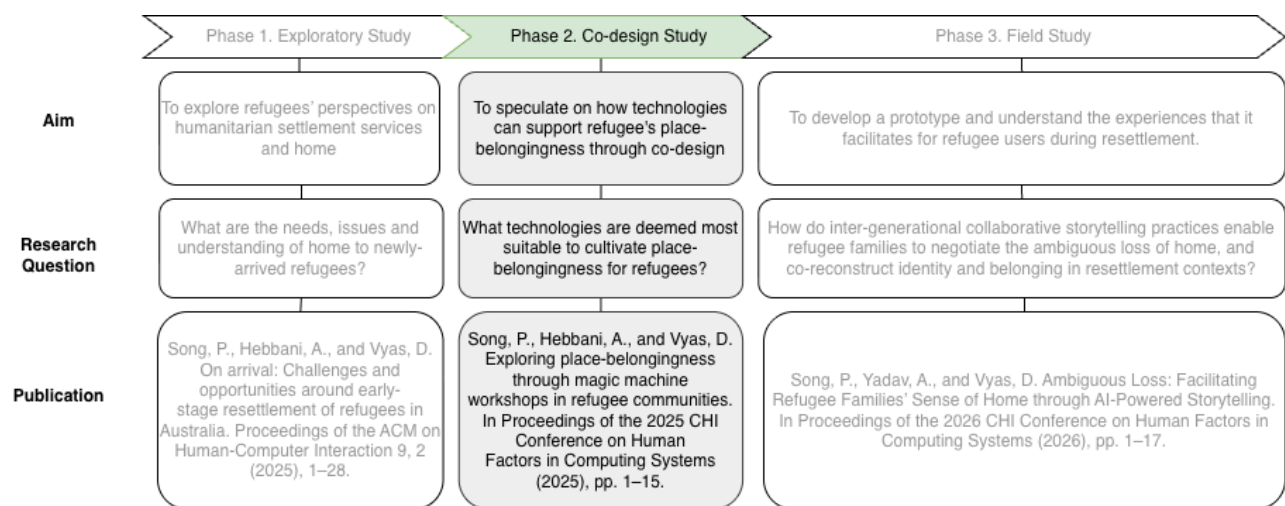


Figure 7: Phases Overview - Phase 2

To address the overarching research question of how technologies can be designed to support newly arrived humanitarian entrants in developing a sense of home, the thesis first needed to understand what early resettlement support enables, and what it leaves unresolved. Phase 1 established that although formal settlement services are crucial for helping refugees navigate immediate systems and resources, they provide only a partial account of the longer-term process of feeling at home. Building on this foundation, Phase 2 turns to refugees' own interpretations, aspirations, and imagined possibilities for home-making. Rather than asking only how existing services could be improved, this phase asks what kinds of values, relationships, memories, and everyday conditions refugees themselves associate with home, and how these might inform the design of future technologies. This chapter presents the Phase

¹This chapter is published as: Song, P., Hebbani, A., and Vyas, D. Exploring place-belongingness through magic machine workshops in refugee communities. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems* (2025), pp. 1–15. [160]

2 co-design study, which advances the thesis from understanding early settlement experiences toward articulating what home and belonging mean from refugees' own perspectives. It shifts the analytical focus from service encounters to the lived values, aspirations, and everyday practices through which refugees come to feel 'at home' over time. In doing so, Phase 2 responds to the need, identified in Phase 1, for design inquiry that can capture the emotional, cultural, and relational dimensions of home-making that are less visible in service-oriented accounts.

The material presented in this chapter is primarily a summary of the published paper "Exploring place-belongingness through magic machine workshops in refugee communities" (CHI 2025), included in Appendix B. This chapter condenses the paper's key findings and methodological learning, with an emphasis on how Magic Machine workshop [19], i.e., a co-design approach, can surface culturally grounded and value-laden dimensions of home that are difficult to capture through service-focused studies alone. In doing so, the chapter provides design ideas and considerations that directly inform Phase 3, where these insights are operationalized into the design and evaluation of the Culture Link prototype.

To explore what constitutes a sense of home and belonging in resettlement contexts, Phase 2 draws on Antonsich's [22] concept of place-belongingness and uses Magic Machine workshops as a participatory method to elicit refugees' imagined technologies and dream homes. Six workshops were conducted with 15 former humanitarian migrants who had lived in Australia for two to five years. This participant profile was chosen deliberately to complement Phase 1: whereas Phase 1 captures perceptions of settlement support among newly arrived refugees, Phase 2 engages participants who had moved beyond initial arrival and could reflect on how home and belonging evolve across time. Data were generated through workshop discussions, sketches, and speculative technology concepts, and analyzed through thematic analysis to identify recurring values and priorities embedded in participants' visions.

The findings are organized around key dimensions that participants associated with a sense of home, including cultural identities and memories, life normalcy and stability, security and privacy, social connections, and resilience and ingenuity. Rather than treating these themes as abstract design goals, this chapter interprets them as concrete, situated accounts of what refugees want to protect, rebuild, and sustain in everyday life. In this way, Phase 2 extends the thesis beyond the functional integration frame common in settlement discourse, showing how home-making is shaped by cultural continuity, autonomy, cross-border relationships, and the ongoing negotiation of identity between past and present.

As the bridge between Phase 1 and Phase 3, the contribution of Phase 2 is twofold. First, it translates the Phase 1 empirical foundation into a design-oriented understanding of longer-term resettlement: it clarifies what kinds of needs and values become more salient once refugees are no longer only trying to get settled, and it articulates why home and belonging must be approached as relational, cultural, and

intergenerational rather than purely individual or service-based. Second, it provides concrete design directions that inform the next phase of the thesis, including the use of artifacts to carry memory and cultural heritage, the importance of supporting cross-border and within-family connection, and the need for low-barrier creative participation that can include children and adults with varied language and digital literacy. These insights set up Phase 3's central move: designing and evaluating *Culture Link* as an intervention that uses a shared, collaboratively created artifact to scaffold family storytelling, cultural continuity, and belonging beyond the formal settlement service window.

5.1 The Study

Our research took place in a metro city in Australia. and strictly followed the ethical guidelines approved by the authors' institution prior to the study.

5.1.1 Participants

We recruited participants by collaborating with various refugee-focused settlement service providers and participating in the events they organized for refugees. We left flyers of our project to enable opt in process of recruitment, and where possible we engaged directly with participants so that we could explain our research in detail and answer questions. We handed out flyers and through the snowball sampling approach [129] we recruited our participants. The data for this study was collected through a series of co-design workshops informed by the magic machine approach described above [19]. We engaged with 15 former humanitarian migrants who have been in Australia for at least 2 to 5 years. This was done to ensure that participants would have developed some insights around a sense of home. Table 1 provide details of our participants. We aimed to include participants from a diverse range of ethnicities.

5.1.2 Methods

Our engagement with participants started with them reading through the ethical consent form and signing the same. We made it clear to our participants that this was their participation in workshops was completely voluntary. We also assured them that we would de-identify their data prior to processing and would ensure that their privacy was protected.

We primarily used magic machine workshops [19] as a way to engage with our participants in a co-design activity. Magic machine workshops provide a speculative approach to support imaginative thinking in participants to envision futuristic technologies. These workshops do not yield concepts and ideas that are immediately design-able, but they provide a platform for open discussions around technological futures and participants' lives.

Table 3: Participants' Demographics

Participant	Workshop	Gender	Age	Country of Origin
P1	W1	F	18	Syria
P2		F	18	Iraq
P3		F	35	Papua New Guinea
P4	W2	M	61	Iran
P5		F	52	Iran
P6	W3	M	28	Uganda
P7		M	26	Uganda
P8		F	30	Uganda
P9	W4	F	41	Iran
P10		F	50	Iran
P11	W5	M	22	Senegal
P12		M	25	Congo
P13	W6	F	41	Iran
P14		F	38	Iran
P15		F	25	Iran

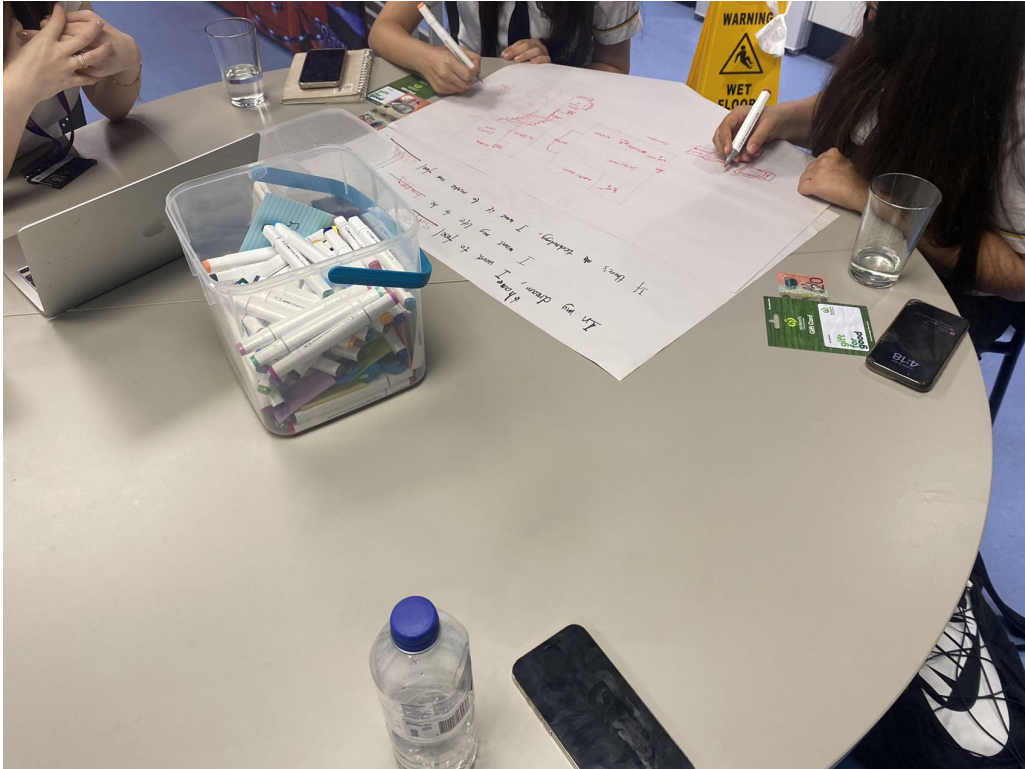


Figure 8: Magic machine workshop picture

We started with some ice-breaker questions, where participants were asked some open-ended questions designed to elicit detailed narratives about participants' experiences of displacement and resettlement journey in Australia. We also asked questions focused on their understanding of home, both in their country of origin and in Australia. Questions explored topics such as memories with the home countries, current living situations, and the evolution of their sense of home since arriving in Australia.

Next, we introduced the idea of the magic machine workshops to our participants. While previous

studies that used magic machines utilised a multi-modal approach where cardboard boxes and similar maker tools were used [15, 19], we took a more simpler approach where participants were give a set of drawing papers and marker pens to draw ideas. We believed that this approach would work with a more diverse participant group. Figure 1 shows three participants working in a magic machine workshop. Participants were invited to design their ideal homes that would have magical elements to enable a sense of home. We especially suggested to conceptualize technologies that would have the magical powers. Participants were guided by a set of pre-prepared, fill-in-the-blank prompts designed to stimulate creative thinking and articulate their aspirations for a sense of home. Examples of these prompts included: *'In my dream home, I want to feel _____, I want my life to be _____,'* and *'If there's a magic technology or machine, I want it to be / do _____'.* These prompts were deliberately open-ended to allow participants to focus on their prioritized needs while engaging participants to express their ideas and preferences regarding their living environments in a tangible and imaginative way. Data was collected through audio recordings of the discussion, which were later transcribed, and the photos of sketched ideal homes and magic machine drawings were co-interpreted within the research team. At the end of workshops each participants were given a AUD 20 gift vouchers as a token reimbursement for their time.

5.1.3 Data Analysis

The collected data underwent thorough thematic analysis [38]. This entailed comprehensive readings of the materials, followed by systematic textual coding. As the authors adapted the theoretical framework of belonging by Antonsich [22], both inductive and deductive coding approaches were employed to initially cluster the services [23], then pinpoint and categorize the notions of home or feeling 'at home' that fell into each service category. The initial development of the codebook involved labelling recurring words and phrases, followed by hierarchical grouping of similar codes. Subsequently, the codebook underwent multiple rounds of revision by the second and third authors before being further refined by the first author. Consensus meetings were held to resolve coding discrepancies and improve the reliability of the coding process. Through this process, emerging themes and patterns were identified thereby providing insights into participants' feelings and sense of home.

5.2 Findings

5.2.1 Cultural Identities and Memories

The theme of cultural heritage and aesthetics was a frequently discussed element associated with feeling 'at home'. Participants tended to stress making an effort to stay connected with the cultures

they come from through the decoration and organization of their homes. One such example was when a participant P9 described the worth of traditional handmade carpets: *"We very care about carpets, and we also have rules, no shoes on carpet. We have actually special, traditional carpets from handmade that are very, very expensive, special, and historic for our country. Sometimes we just hang it on the wall"*. Participant P10 described how she would like her home arranged so that there were spaces set aside for her to freely express her culture or religion: *"I want to have some corner or front of the house or something like (to) show that culture or that part of religion"*. P9 and P10 designed a magic screen to display traditional carpets, allowing them to freely choose or change the colors and patterns, as purchasing handmade carpets was beyond their budget. Similarly, participant P12 wanted to have a statue of the president from his home country, who he always admired - *"I think it is really important (to have a statue or other cultural elements), because it makes it feel like home, like, oh, okay, so this is African, I used to live there, the memory and say, not gonna make me feel lonely...Yeah, and remember something as well"*. This kind of personalization through culturally significant aesthetics allows the maintenance of identity and a sense of continuity, as cultural artifacts are not merely decorative but hold historical and emotional significance, serving as tangible links to participants' homelands.

Another important way to add a personal touch and make one's house feel like home was through the use of colors and other artistic expressions to reflect individual tastes, past experiences, and memories. As P10 indicated, she also liked to design the wall of rooms in her desired colour, and P1 and P2 expressed their longing to decorate their rooms through painting the walls. The aesthetic choices they make are not merely about decoration but are integral to bridging the past with the present, making them feel 'at home'. According to P2, *"The area that I live in, like, it's very quiet and safe, like, but just like the house that we live in. It doesn't feel like home. It doesn't has like memories. It doesn't like it doesn't feel warm."* Past experiences also shaped individuals' aesthetics in home decoration. For example, P10, who was unable to go outdoors during her time in detention, designed a magic ceiling that could turn transparent or display the scenes of nature. She emphasized that the feeling of being in the nature brought her peace of mind and greatly contributed to her mental well-being.

5.2.2 Life Normalcy and Stability

Participants who take on the role of the 'provider' in their families prioritize life stability as the foundation for building a sense of home and belonging. According to Participant P9, who was raising her daughter alone, *"I learned home (is) to do just normal life"*. Her interpretation of 'normal life' included having planned daily routines, achieving financial independence, understanding how bureaucratic systems work in Australia, and having knowledge of, as well as access to, services and resources. Both participants agreed on the difficulties of achieving their perceptions of life stability for refugees - the lack of systematic navigation and education in accessing resources. As P9 pointed out,

" They (Refugees) need to have computers, yeah, and also they should have an email address, and they work with computer and media, and then also, they have to have English talking. They need to know English a lot. And they need to have a computer to work with. This is a really important for technology. They need to know technology also, because a lot of people are of other countries, they don't even access to computer. They don't know how they can have an email. They need to know that, and they have to have a driver license and everything like legal documents, legal language, access to technologies"

P13 argued that she was unable to feel a sense of home without having a stable job and income. She explained her mindset before coming to Australia was, first establish a stable life, then focus on self-improvements and achieving her life goals. However, her current situation has forced her to prioritize secure any job first, and only if she's successful, then she can think about a job that suits her interest. Without a stable job, she felt that her life was unstable and lacked even the minimum standard of living. Similarly, P12 highlighted the sense of home for him was to see opportunities and hope in life, *"Home, I can describe it as, the most important part, I think, place of opportunities"*. Furthermore, P4 highlighted the difficulties many refugees faced in finding employment, particularly the complex process of having their skills and knowledge recognized. Companies in Australia often did not recognize degrees and certificates from their home countries, where there were different education systems, as argued by P4, *"For example, now refugees of Hong Kong, everything for them is easy, University, licenses, everything, but for Iranian, they can't take license for any job. And me, about 30 years, working (as) the technician in Iran. In Australia, I was going to find this job, but they tell me, I have to going in the college again, you take license for Australia, after that, you can go work in the market"*. Getting support with respect to bureaucratic processes was also a challenge to many refugees. P6, P7 and P8 discussed the issue of agencies shirking responsibilities to others when they sought services and assistance. In response, they designed a phone specifically for refugees to connect with various services, with each button corresponding to a specific agency, clearly labeling each agency's responsibilities and the range of services they provide. Similarly, P4 designed the website containing all sorts of information and educational resources that could prepare refugees with certificates, *"I want to make a technology for us, (that contains) job, university, freedom of all"*.

5.2.3 Security and Privacy

Security and safety are essential concerns for refugees as they resettle in new environments. For instance, participants noted that they had come from backgrounds marked by wars and conflicts and expressed being grateful for now living in a safe environment. As P12 stated, *"I think 'peace' is the major one, because in my (home) country, like, there's no peace. And I think everyone wants peace to call that area as a home, because that's the reason why we left"*. P4 and P5 pointed that driving

was not safe in their home country. However, in Australia, they found that people were kind, and they felt secure doing everyday activities outside such as shopping for groceries, without concerns for their safety. The need for security around the living area was also reflected in the technology designs created during the workshop. P9 and P10 collaboratively designed a monitor-robot, which was similar in shape and size to a small, crawling animal (figure 2). They explained that it was intended to catch wild animals or insects that could potentially harm humans in their yards, given that Australia had many wild animals or insects they hardly encountered in their homelands.

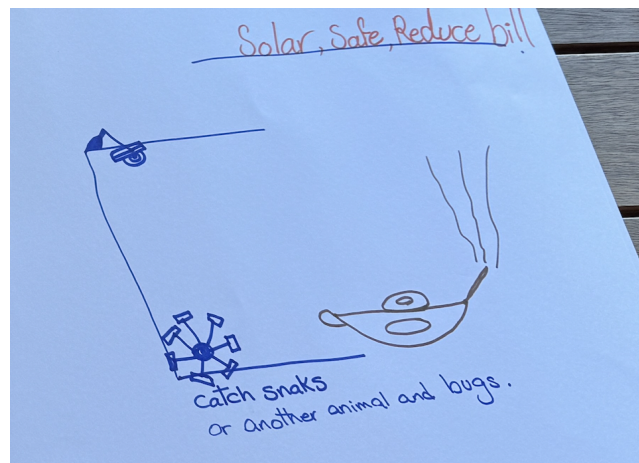


Figure 9: P9 and P10's design of insect / snake catching machine

Ownership and autonomy of the living spaces also emerged as being crucial for establishing a sense of security. As participant P13 noted, *"Home means a place that you are the only person that has the key and has your own bathroom and kitchen,"* underscoring the value placed on personal autonomy and control over one's environment. Many participants, like P4 and P5, set a goal of working and saving money to buy their own properties in the future. Participant P3 had achieved this goal after settling in Australia for 5 years - she had bought land, and her house was currently under construction. Participants emphasized the importance of having control over their own spaces - however, they felt that renting limited and compromised their freedom and daily routines. P2 mentioned they had some restrictions in making sounds in their rented accommodation. Likewise, P9 stated, *"I don't have home here. It's renting, renting from some company"*. P9 shared with the author that her house was rented through a refugee-focused service provider, which schedules mandatory monthly property checkups even when nothing is broken and all electronics are functioning well. These inspections disrupt her daily routines and plans, and significantly affect her mental well-being:

"They gave us the house, but controlling it. And they come in every once a month to check everything, furniture, what issue you have in your house. You know, this is annoying for us. We had always, once a month knocked at door, 'Hello, inspection'. It feels tired. You know it is. Actually especially for us, we released after long term of detention. They (do)

not really understand the pain. But we came from pain. We don't need more pain anyway, for all refugees, (we) need safe house and support"

Having their own privacy was also a critical aspect of feeling safe and secure, especially for individuals living in shared accommodations. The ability to retreat to a private space where one can be alone and undisturbed was seen as being essential for mental well-being and a sense of safety. Participants frequently mentioned the stress and discomfort caused by the lack of privacy in shared living arrangements. For example, P15 was a transgender women who emphasized the inconvenience of sharing accommodations with other refugees two years ago when she newly arrived in Australia. She frequently experienced hatred from her roommates because of her gender identity, faced judgment, and was concerned about her privacy due to others' curiosity about her body. In addition, P10 shared his own experience, "For my first house accommodation, just one bathroom and there were four people living together. All the time they knocked the door and say: Come out, it is my time. I need to use the toilet," illustrating the challenges of shared resources and the impact on personal privacy. Ensuring that refugees have secure and private living environments appeared to be vital to build their sense of home and belonging. This included not only physical safety from external threats but also the psychological comfort of having a personal, secure space. The narratives tell us that technological interventions can play a significant role in enhancing the security and privacy of refugees, helping them to feel more at home in their new environments.

5.2.4 Social Connections

Family Togetherness

Social connections emerged as a fundamental aspect of their sense of home and belonging. Participants deeply valued their familial and social ties, and embodied their love for friends and family in the design of their ideal homes and technologies. For instance, participant P2 also stated, "*It's like for me, home is, any place that my family lives in...When I lived in Lebanon, I was just looking for a safer place to live in. That was the main idea of home for me. But now I feel like I just want to be with my family, like in any place, it doesn't matter anymore*". Family togetherness was what most participants longed for. Participant P3 described home as a place where she could live happily with her children, and she designed the magic machine that displayed different shapes and images on the wall for her children and family engagements. Likewise, participant P9 who regarded her daughter as the hope and motivation for her to striving for a better life, designed the ideal home with great considerations and care for her daughter,

"I wanted to have a comfortable house. I wanted to have a good, colorful life, because I didn't have these all my life. My father passed away when I was nine year old, and we lost

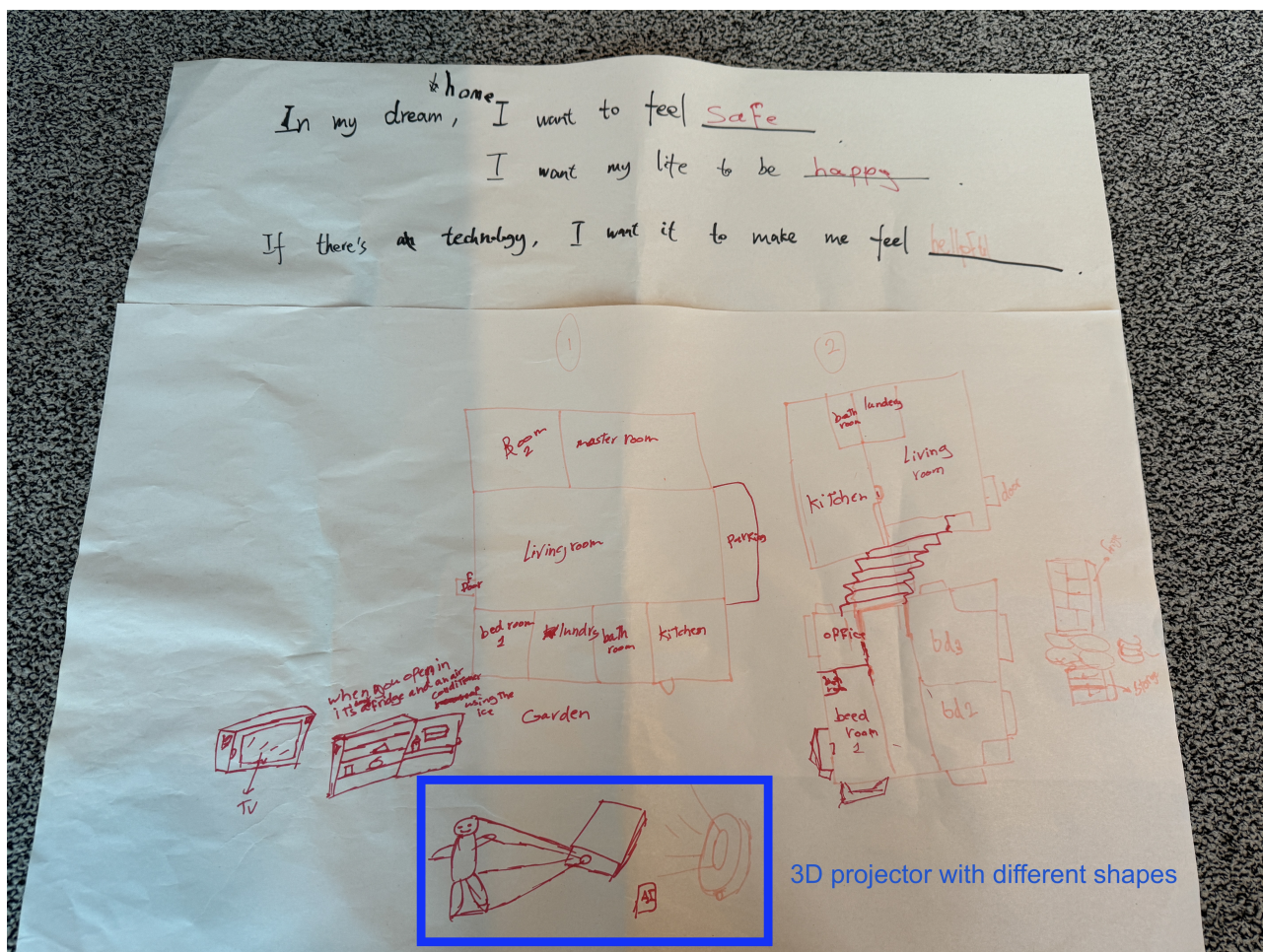


Figure 10: P1, P2, P3's design on the 3D projector in different shapes

five children. We always have something to share together. I never had my bedroom for myself, or school stuff. I had dream of having my own stuff from school. That's why this age, I love school stuff. I love writing, reading, painting, toys. I like everything, but I didn't have a good quality of life when I was child. But now my child, I'm really, really upset for that if my child doesn't have any good quality of life too, because this is not fair..... You know, I had a hard life, hard time. I don't want my daughter have this experience too. I don't want my daughter, when she's my age, She's thinking about this, how she had a hard time life, from long time ago, from when she was child."

Participant P12 included a kids' room for his siblings in the design of his ideal home. He also showed concern for a friend with a disability, who came from a refugee background like him, when designing magic machines. He created a virtual learning and job-seeking device in the form of a helmet, allowing his friend to learn English and work remotely from home.

Preserving Cross-Border Connections

Establishing and preserving cross-border social connections with family members remaining in participants' countries of origin was also a significant focus among participants. P2 argued that the

sense of home wasn't necessarily tied to a place but was closely connected to the people who mattered to her. P2's grandmother didn't move to Australia with her and the rest of the family. To bridge this gap, participants designed a magic projector 10 that could display a person in real-life size with 3D effects,

" (P1:) you will feel it like, when you come back to this, like, you will see, oh, I saw my grandma here, you know. (P2:) It may be like, it may be like you're gonna stay at the same at this room with this projector, like giving with, like a shapes, not a review, that will... (P1:) make more memories for the house, yeah."

Similar design ideas were also proposed by other participants like P11 and P9. P11, the only child who grew up in a large family with his cousins in Senegal, moved to Australia with only his parents. He suggested designing a real-time, wall-sized screen at home, allowing him and his cousins to see and check in each other just like the past time of living together, providing a sense of reassurance. Participant P9, on the other hand, gave birth to her daughter alone in a detention center. Her husband was deported before their daughter was born, so the 5-year-old little girl has never had a chance to see her father in real person. She outlined the importance of imaginary technologies like 3D projectors that could provide an immersive experience, that would allow her daughter to interact more closely with her father, not only through video calls on the mobile phone screen.

Forming New Local Connections

In addition to maintaining social bonds with family and friends from similar backgrounds, participants also regarded building social bridges with local communities and forming social links with organizations as important aspects of creating a sense of home and belonging. According to P11 and P12, who had overcome language barriers, made local friends, and pursued higher education, they emphasized the importance of building and maintaining social bridges. They joined local sports clubs, such as the local football club, where they shared common interests with local people and could meet up peers of the same age. Similarly, P3 noted, *"I feel that like people here, they're really good at communicate with people and understand people, and they treat us like all of us are, like, equal."* Participants indicated that their turning points for their sense of belonging were where they felt accepted and began to integrate into the community. P4 and P5 highlighted the kindness of people in Australia as a key factor in accelerating their sense of belonging and integration. However, while most participants expressed feeling comfortable building social connections with locals and highly praised Australia's social and multicultural environment, P6 and P7, male refugees from Uganda, emphasized the discrimination for them as men of color, due to the negative stereotypes and perceptions that portray them as aggressive and dangerous. P7 shared an experience when he was searching for accommodation. In comparison to P8, a woman of color who was in a similar situation, it was notably harder for him to

find accommodation as an African man, reflecting the additional barriers they encounter due to these prejudices.

5.2.5 Resilience and Ingenuity

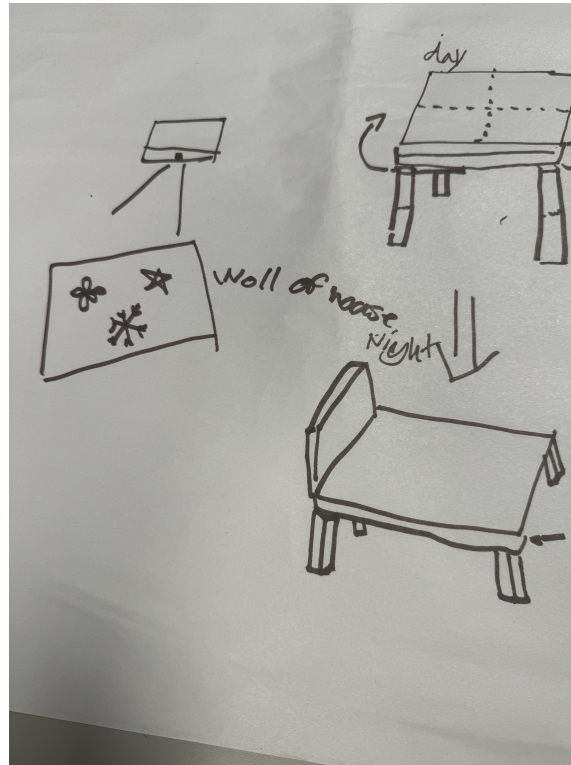


Figure 11: P3's design on the foldable bed (night-time) to table (day-time)

The availability of sufficient resources within the home to meet one's basic and physiological needs was necessary for cultivating a sense of home, however, the limitation of resources was a common problem faced by refugees. P10 is a single mother living in a shared accommodation with her daughter, the water heater in their home did not have enough storage to meet the usage needs of the number of residents,

"In the first house where I stayed, there was only one bathroom for 4 people. People were constantly knocking on the door, telling me to hurry up because it was their turn to use the toilet, it was incredibly uncomfortable. That's why I really wanted to have my own separate bathroom, ideally with a single toilet just for me in the master bedroom. Whenever I tried to take a shower, the water would suddenly turn cold, especially when it was my turn to shower. As a mother, I always put my daughter first and made sure others were taken care of before thinking about myself. But when it was finally my time, I'd often find myself shivering in the cold water during winter. It was an awful experience, and I just couldn't believe how difficult and uncomfortable it was."

Many participants encountered similar issues in shared accommodations. P14 and P15, due to their religious beliefs, did not eat pork and even experienced allergic reactions when they smelt it. However, they shared a kitchen with others who frequently cooked pork. To address this issue, they brainstormed a magic mask that would block the unpleasant smell. Participants like P1, P2, and P3, who experienced a lack of space in their homes, came up with design solutions to maximize space efficiency. For instance, Participant P1 designed a tall, wall-mounted storage unit combined with a fridge, P2 envisioned an all-in-one electronic device that functions as a TV, air conditioner, and fridge, and P3 designed a foldable bed (figure 4) that could be transformed into a table during the day, allowing her kids to do their homework without buying an additional table. Financial constraints also influenced the living experiences of refugees. P10 noted the most important technologies at home was solar, as the electricity bills were too expensive for newly-settled refugees who did not have stable income, *"Electricity bill is too expensive. I have a friend, she even can't turn on the heater in the winter because she has to pay lots of money to warm up her house. But when they have a solar they don't have problems using the power...Technology for home is internet, and solar, for electricity"*.

5.2.6 The Role of Time and Proactive Integration

Time plays a significant role in shaping participants' sense of home and belonging throughout their resettlement journeys. Our findings revealed that participants' needs evolve over time, with some challenges being resolved as they adapt, though proactive efforts are often required to address these issues. During the initial adjustment period, participants primarily focused on overcoming practical and material barriers; fundamental needs such as housing, employment, and navigating bureaucratic systems, were central concerns during the early to mid-integration period. For instance, P11 and P12 overcame language barriers through active social participation in local activities and interactions with local people. Similarly, P4 obtained a driver's license and secured employment at a local supermarket to deliver food, where the financial and bureaucratic barriers were addressed. Once these basic material needs were met, participants began to prioritize emotional, social and other higher level needs. For example, participants like P13, P14, and P15, who are still in the early stages of resettlement, designed their magic machines with the purpose of security and privacy, due to living in shared housing, limited English proficiency, and unstable financial situations. In contrast, participants like P11 and P12, who had progressed further in their integration, focused their designs of magic machines on fostering connections with family members or enhancing their own relaxation and entertainment at home. Likewise, P10 mentioned that during the initial stage of her resettlement, she struggled with basic living resources in shared accommodation, such as access to hot water for bathing. Now, she aspired to include cultural decorations in her new home. This progression demonstrates how participants' sense of home and belonging evolves over time, moving from addressing physiological needs to fulfilling individual aspirations as they integrate more deeply into their new environments. Participant P3 now

considered herself successfully integrated after five years in Australia, having bought land and begun building a house for her family. Reflecting on her journey, she remarked, *"Some people, they worry too much. I feel sad too, because that's what I was doing, like in my situation. 'Oh my gosh, there's no hope,' I was thinking. There was no hope in Australia. But now, I can see there's hope. It's just a (matter of) time; when it's the right time, you eventually will be good"*. This sentiment underscores the transformative role of time in resettlement, as participants gradually move from initial struggles to achieving a sense of belonging and optimism for the future.

5.3 From Imagined Home-Making to Designed Intervention

Phase 2 builds on the findings of Phase 1 by moving from the constraints of early settlement support to the meanings, values, and aspirations that refugees associate with feeling at home over time. While Phase 1 identified the limits of functional and service-based support, Phase 2 shows what becomes important when refugees are invited to imagine home on their own terms. Through the Magic Machine workshops, participants articulated home as a culturally, materially, and relationally situated experience, shaped by cultural identities and memories, life stability and normalcy, security and privacy, social connections, and resilience and ingenuity. These findings extend the thesis from documenting resettlement challenges to identifying the conditions refugees seek to preserve, rebuild, or create in everyday life.

Importantly, Phase 2 also clarifies which aspects of home-making practices are most appropriate for technological exploration in the next phase. Participants' emphasis on cultural memory, material artifacts, family togetherness, and cross-border connection suggested that technologies should not simply provide information or solve isolated practical problems. Rather, they should create opportunities for refugees to express culture, preserve memories, share stories, and sustain relationships across time and distance. These insights informed the design direction of Phase 3 by shifting the thesis toward a family-centred intervention that uses shared digital artifacts as prompts for storytelling and connection.

This transition is particularly important because the Magic Machine workshops generated values and design directions, rather than a deployable system. As such, phase 3 takes forward the most salient insights from Phase 2, especially the importance of cultural continuity, memory, family engagement, and intergenerational connection, and operationalizes them through the design and field evaluation of *Culture Link*. In doing so, the thesis moves from refugees' imagined technologies for place-belongingness to an implemented intervention that examines how collaborative, AI-mediated storytelling can support the ongoing negotiation of home, identity, and belonging within refugee families.

Chapter 6: Responding to Home-Making Needs through AI-Mediated Storytelling: A Field Study with Refugee Families

Culture Link: Supporting a Sense of Home through Digital Storytelling ¹

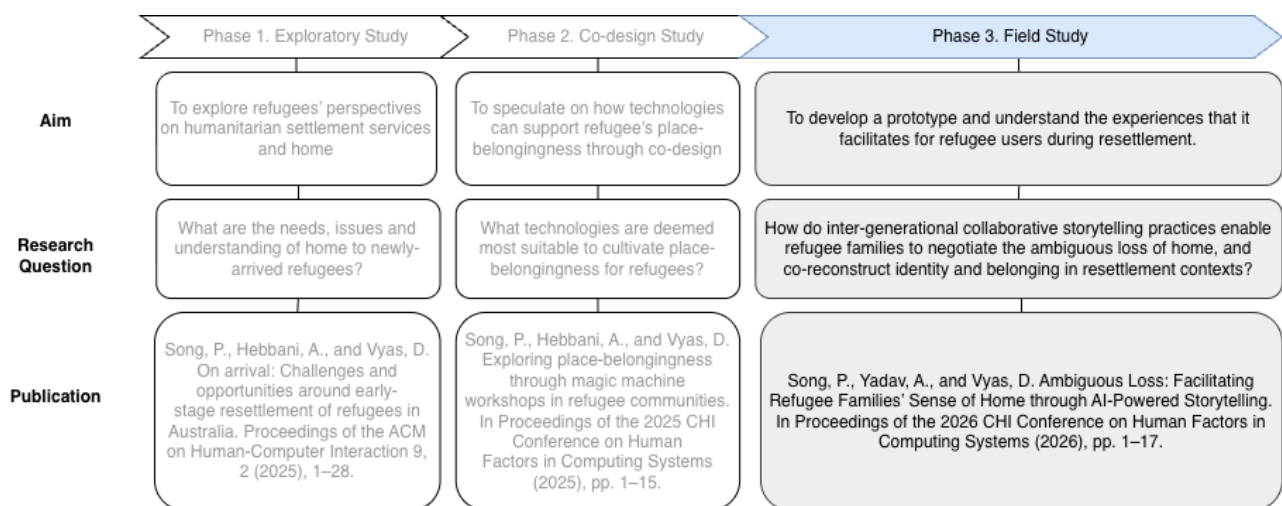


Figure 12: Phases Overview - Phase 3

To address the overarching research question of how technologies can be designed to support newly arrived humanitarian entrants in developing a sense of home, Phase 3 moves from understanding and imagining home-making to evaluating how it can be technologically supported in everyday family life. Phase 1 established that early resettlement support provides important practical foundations, but leaves open questions about how belonging, cultural continuity, and home are rebuilt over time. Phase 2 then identified the values and conditions that refugees associate with feeling at home, particularly cultural memory, material symbols, family connection, and the negotiation of identity across past and present. Building on these two phases, Phase 3 examines how such insights can be translated into a deployed intervention. It does so by designing and evaluating *Culture Link*, an AI-mediated storytelling platform that enables refugee families to co-create shared visual artifacts and use them as prompts for memory

¹This chapter is submitted to CHI 2026.

sharing, cultural transmission, and intergenerational dialogue. This chapter presents the Phase 3 field study and reports the design, deployment, and evaluation of *Culture Link*, i.e., a prototype intended to support home-making as an ongoing, relational, and intergenerational process beyond the formal settlement service window.

The material presented in this chapter is based on a CHI 2026 submission. It reports the design rationale, deployment, and evaluation of Culture Link through a ten-day field trial with seven refugee families in Australia, followed by semi-structured interviews. This chapter condenses the key empirical findings from the field study while making explicit how Phase 2's co-design insights informed Culture Link's design decisions and interaction mechanics.

Phase 2 directly shaped Culture Link in three concrete ways. First, participants in the Magic Machine workshops repeatedly framed home as something sustained through cultural identities, memories, and tangible symbols (e.g., carpets, religious corners, culturally meaningful places and objects). This motivated *Culture Link*'s core design choice: to treat images as symbolic prompts rather than factual records, and to allow each family member to contribute personally or culturally significant images (places, foods, objects, traditions) that can anchor storytelling. Second, Phase 2 highlighted home as deeply relational—participants emphasized family togetherness, cross-border co-presence, and the desire to “be together” despite separation. This inspired Culture Link's room-based, multi-user co-creation model, where different family members contribute separate images from their own devices, and the system produces a single shared composite intended to be viewed, discussed, and interpreted together. Third, Phase 2 showed that participation must be low-barrier and accessible across age, language, and resource constraints; participants valued “magic-like” experiences that feel engaging without requiring technical skills, and many designs relied on playful speculation rather than precise realism. In response, *Culture Link* was built as a lightweight, mobile-friendly web platform with a simple upload-and-generate workflow, playful cartoon-style aesthetics, and minimal text, designed to invite children's engagement while keeping parents in control of pacing and interpretation.

Culture Link therefore embodies a deliberate progression from Phase 2's speculative, values-driven design space into an implemented prototype: it takes the co-designed “magic” logic seriously, but translates it into a concrete interaction that can be sustained as a family routine. Rather than asking participants to draw or verbally describe home, *Culture Link* leverages image-to-image generative AI to combine dispersed inputs into a single composite, making it possible to stage togetherness even when no canonical photo exists (e.g., family members, places, and objects that cannot be captured in one frame). This is particularly relevant in displacement contexts where artifacts are lost, places are inaccessible, and family histories are fragmented.

The field trial evaluates not only whether families enjoyed the platform, but how Culture Link mediates the specific dimensions of home that emerged in Phase 2, now observed in situ. For example, Phase 2 participants emphasized cultural continuity through artifacts and aesthetics; in the trial, families

used *Culture Link* to merge children’s contemporary interests (e.g., popular characters, aspirational travel images) with culturally rooted materials (e.g., traditional food practices, festivals, places of origin), enabling a shared visual space where cultural heritage and present-day identity could coexist. Phase 2 participants also described cross-border longing and the desire to maintain ties; in Phase 3, families used composites to bring absent people and unreachable places into the same scene, supporting what participants described as moments of being together even when physically separated. Likewise, Phase 2 surfaced tensions around privacy, autonomy, and the need to participate on one’s own terms; in Phase 3, the platform’s occasional generic rendering of people and its stylized outputs revealed a double edge, sometimes protecting identity, sometimes frustrating families seeking specificity; thereby providing concrete evidence for the trade-offs implied in the earlier co-design aspirations.

Across seven families, the findings show how *Culture Link* supported home-making through five interrelated mechanisms: enabling memory preservation and reinterpretation, scaffolding intergenerational cultural transmission, encouraging children’s creativity and imaginative participation, fostering family engagement through routinized co-creation, and revealing generational divergence in how home is defined and valued. These outcomes continue the themes identified in Phase 2, but they are now grounded in families’ everyday practice. In Phase 2 workshops, participants articulated these themes as values and aspirations. In Phase 3, those values become visible as interactive work: parents narrate and contextualize images, children remix and play with inputs, and families negotiate mismatches between expectation and output. Through this process, the shared artifact helps redistribute storytelling and memory work across generations. In doing so, Phase 3 completes the thesis arc from understanding early resettlement conditions (Phase 1), to eliciting designable values around belonging (Phase 2), to evaluating a concrete technological intervention that supports everyday, family-centered practices of home-making in resettlement contexts.

6.1 The Study

The study was conducted in a metropolitan city in Australia. All participants were informed about the purpose and procedures of the research. The researchers initiated the engagement with participants following their review and endorsement of the informed consent form. Our project was approved by our university’s human ethics committee. We ensured that the participation was completely voluntary and participants could opt-out of the study without any concerns raised. We were also aware that the *Culture Link* platform may evoke past memories in our participants and hence provided contact details for the university’s health services. We explained to our participants as well as the collaborating organizations that all collected data would be de-identified and stored securely on university servers, following institutional data-management protocols.

6.1.1 Culture Link Platform

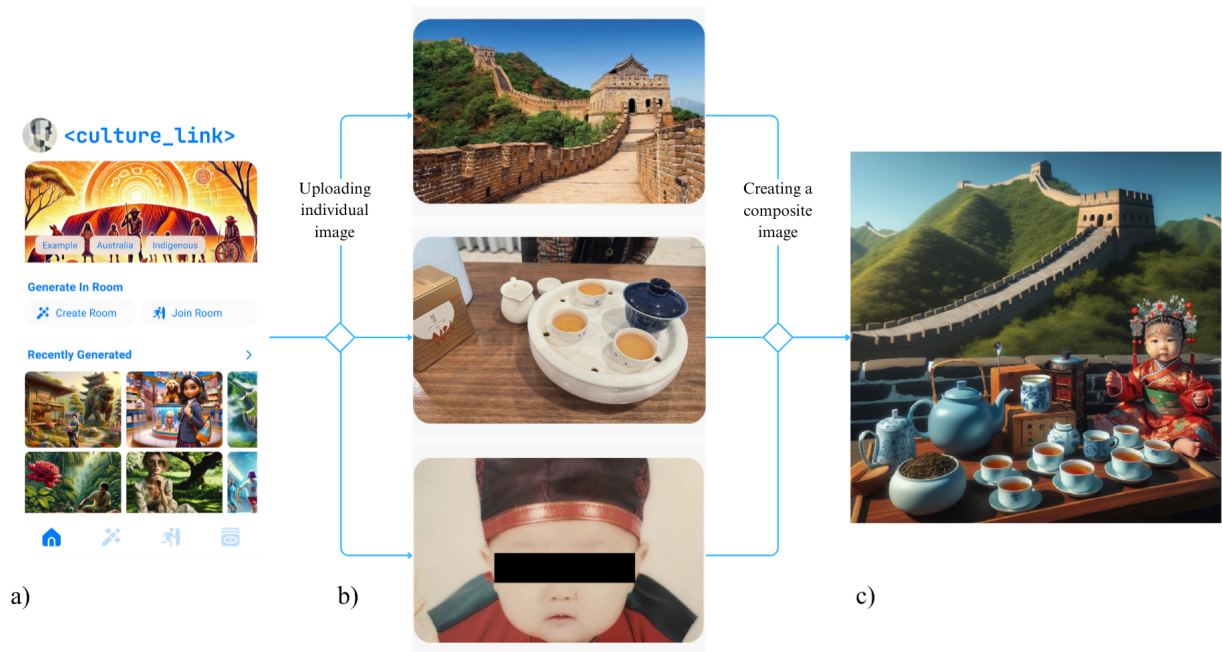


Figure 13: Workflow of Culture Link: a) Home screen of the platform, where users can create or join a room; b) Family members upload individual images of cultural or personal significance; c) The system generates a composite image that integrates these contributions, serving as a prompt for storytelling and family dialogue.

Informed by ambiguous loss theory [35, 43] and existing research on ambiguous loss of home [43, 132], which frames the unresolved and cyclical nature of losing and remaking home in forced displacement, we developed *Culture Link*, a web-based platform for sharing AI-generated images. Specifically, *Culture Link* uses the dimensions of social connections and identities, connection to place, and imagined futures [43] by leveraging AI image-generation technology with playful features, enabling users to co-create a composite image generated through the *OpenAI* API. *Culture Link* is designed to foster a sense of home and belonging among refugee families through preserving memories, sharing culture, storytelling, and promoting conversations between family members. The platform allows multiple users to create or join a room with the same code, where each person is allowed to upload an image of personal or cultural significance, e.g., a photo of loved ones, a childhood memory, a historical place, or a favorite character. The system then combines significant features from each image into a single, AI-generated image. Figure 13 is the workflow of *Culture Link*, where the images are researcher-created demonstration materials and do not contain participant-generated content or identifiable participant data. This resulting image output is available to all users, and is intended to facilitate conversation, elicit memory work, and foster family engagement, particularly across generations. Designed to be mobile-friendly and accessible on commonly available smartphones,

Culture Link incorporates playful features and cartoon-style visuals to engage children, while also fostering storytelling and strengthening connections among family members.

6.1.2 Participants Recruitment

Table 4: Demographics of Participating Families. Note: All household members are listed for context.

Family	Family Members (Role + Age + Gender)	Country of Origin	Length of Stay in Australia
F1	Father 39M; Mother 34F; Son 6M; Daughter 1.5F	Syria	3 years
F2	Father 49M; Mother 39F; Daughter 12F; Daughter 10F; Daughter 9F; Son 6M; Son 4M; Daughter 0.25F	Sri Lanka	11 years
F3	Father 40M; Mother 36F; Daughter 9F; Son 7M	Afghanistan (Hazara community)	6 months
F4	Father 47M; Mother 40F; Son 12M; Daughter 9F	Cameroon	Father 7 years; Others 2 months
F5	Mother 54F; Daughter 14F; Daughter 11F	Papua New Guinea	2.5 years
F6	Mother 44F; Son 7M; Son 4M	Mongolia	2 years
F7	Father 35M; Mother 30F; Daughter 10F; Daughter 7F	Afghanistan	1.5 years

The authors collaborated with an Australian not-for-profit organization that helps and supports refugee families for over 25 years. We visited the managers of this organization and gave a demonstration of *Culture Link*. We sought participation from refugee families with children who possessed basic English proficiency and digital literacy. The organization assisted us in identifying and reaching out to suitable families. Through handing out posters and project information sheets, seven families volunteered to take part in the study. The study required consistent participation from entire families. We recognized the significant time and commitment this entailed. As a token of appreciation, participating families received AUD\$100 gift vouchers at local supermarkets upon completing the study.

Although households included infants and toddlers, we did not treat these very young children as research participants. They were present during family interactions but did not engage with the platform independently, did not provide data, and were not included in analysis. Only family members who meaningfully interacted with *Culture Link* and/or participated in interviews contributed data to this study.

Overall, participants had limited prior exposure to AI technologies, particularly genAI for images. Among parents, only Family F7 reported prior experience with automated image-editing tools; all other families had not previously used genAI. Some parents, such as those in Family F1, were aware of AI and had a rough sense of what image-based GenAI could achieve but had never tried it. While most children had little knowledge of AI, one exception was Family F2's 12-year-old eldest daughter, who reported using ChatGPT for text-based learning and information seeking. Each family represented a distinct cultural background, contributing to the diversity of perspectives in our findings. The demographic characteristics of the participants are presented in Table 1, along with their country of origin and their length of stay in Australia.

6.1.3 Study Methods and Analysis

The study comprised two phases: 1) a ten-day field trial of *Culture Link*; and 2) a follow-up semi-structured interview. Families recruited through our collaborator firstly attended an introduction session held at the organization's head office, where we provided an overview of the study. This included guidance on logging in with researcher-provided accounts, creating or joining a room, uploading images, and sharing stories about those images. Then, a pilot task was given to participants where they practiced uploading images and sharing stories to familiarize themselves with the platform. We also provided printed step-by-step instructions for using *Culture Link*, so that families had a clear reference guide when engaging with the platform at home. We created a *WhatsApp* group for participating families to ask questions and also established direct contact with one member in each family to provide timely technical support.

Phase 1.

Following the introduction, each family participated in a ten-day field trial of *Culture Link*. As the platform was designed to promote interaction among multiple users within a family, households lacking at least two mobile phones were provided with additional devices. Children used the platform under the supervision and guidance of their parents. For younger children or those with limited digital literacy, parents assisted them in uploading their chosen images. During the trial, families were encouraged to share the personal significance of each image and to reflect on the final AI-generated image after each round. While we did not enforce a minimum or maximum number of sessions, we encouraged families to engage with the platform regularly over the 10-day period; in practice, each family generated between 5 and 10 composite images. For each round of image generation, *Culture Link* took up to two minutes to produce a composite output; the time spent selecting images and narrating stories varied by family, but participants commonly reported completing a session within approximately 15 minutes.

Phase 2.

Upon completion of the trial, we conducted semi-structured interviews with the families. While all parents were encouraged to participate, their attendance was not mandatory. Each family interview lasted approximately one hour and took place either at the collaborating organization or at a location chosen by the family. For those with limited English proficiency, other family members with stronger language skills voluntarily assisted with interpretation. The researchers collected all image data uploaded by families by accessing and downloading it from the application’s backend storage on the *Firestore* database. The images were employed as elicitation prompts during the interviews to facilitate rich narratives about participants’ engagement with *Culture Link* and to surface the stories associated with each image. The semi-structured interview guide focused on four areas: 1) meanings behind the uploaded images; 2) family interactions with *Culture Link*; 3) emotional reactions and conversations following the composite images; and 4) broader reflections on home, culture, and family bonds. Example questions included: “Can you tell me the story behind this uploaded image?”, “How did you use *Culture Link* as a family?”, “What did you talk about when you saw this generated image?”, and “In what ways, if any, did this activity make you think differently about home?”.

The interviews were audio-recorded and transcribed, while the image data were rendered into textual descriptions aligned with participants’ narratives for subsequent analysis. The collected data underwent thorough thematic analysis [38]. The codebook was initially developed by labeling recurring words and phrases and grouping similar codes hierarchically. It then underwent multiple rounds of revision by the second and third authors, before being refined by the first author. Consensus meetings were held to resolve coding discrepancies and strengthen reliability. This process led to the identification of emerging themes and patterns, providing insights into participants’ experiences with *Culture Link* and its role in mediating the ambiguous loss of home.

6.2 Findings

Through thematic analysis, five key themes emerged. This section presents findings across five dimensions showing how the AI-mediated storytelling tool supported refugees in negotiating ambiguous loss and developing a sense of home: memory preservation and reinterpretation, intergenerational transmission of culture, children’s creativity and imagination, family engagement, and generational divergence.

6.2.1 Memory Preservation and Reinterpretation

Through the uploaded images and stories, participants underscored the role of preserving family memories in maintaining ties to their past and strengthening bonds during resettlement. For instance,

the parents of Family F4 shared photos of Saturday Ranch, the site of their honeymoon, but the AI-generated version appeared far more glamorous. Their 12-year-old son joked that he might be disappointed if he saw the real place. As the mother elaborated, the image diverged from the real setting: *“When they saw the photos, my son said, ‘Is this for real?’ But again, it looks nicer and they like it... And again, the (place name) where we went for a honeymoon (was) very beautiful... we share these memories with them... to tell that how we liked each other, we met each other, our journey...”*. Although there was a lack of fidelity, the aesthetics of images stimulated children’s curiosity and questioning. Their questions further prompted parents to reflect on the emotional significance and personal histories tied to the image, rather than disrupting remembrance.

At the same time, families used *Culture Link* to imaginatively re-stage and recombine these memories, producing new visual narratives that sometimes departed from what actually happened in reality. Family F2 is originally from Sri Lanka, where the parents met before moving to India for several years and later settling in Australia after their first daughter was born. Although the mother never visited the Taj Mahal, she uploaded an image of it, viewing the monument—learned about during her time in India—as a symbol of true love. The image reminded her of her joyful marriage, and her eldest daughter recalled the story her mother had shared: *‘We haven’t been to the Taj Mahal, but... she asked my dad, if we had a visa, could we go to the Taj Mahal and visit it, because there’s this guy called Sarge, and there’s a girl... they loved each other. And Shah Jahan built this Taj Mahal just for her. And my dad and mom also had a love marriage. So my mom always wanted to visit it’*. While the Taj Mahal does not document a past event, it symbolically extends their love story into a place they hope to visit, blending remembered stories and imagined futures.

Participants also co-constructed composite representations that bridged separate people, places and objects through *Culture Link*. For example, in Family F1, the father had visited a theme park with his son before the daughter was born. To create a shared memory, they merged a photo from that day with a later selfie of the mother and daughter. The generated image showed the mother holding the baby daughter in front of a circus. As described by F1 Father: *‘One photo was the circus. The other photo was F1 Mother and F1 Daughter... They put the background (as) the circus, and took [F1 Mother] and [F1 Daughter] and put it in that. Very successful’*. By merging photos taken years apart into a single composite that never occurred in reality, the family re-imagined themselves to be present together, turning separate memories into a new, shared scene. Likewise, Family F3 uploaded photos of their children enjoying special moments. In one notable co-creation, they combined two images: one of their daughter at an art gallery with colorful dotted walls, and another of an indoor camping scene where the children had built a tent from a white bedsheet and were happily lying inside. Rather than simply recalling each outing on its own, this co-created image foregrounded togetherness over chronological accuracy.

Children also used the tool to revisit meaningful childhood memories. Family F7’s 10-year-old



Figure 14: AI-generated image created by Family F3, combining photos of their children visiting a gallery and camping indoors in a homemade tent.

daughter uploaded photos of her cousins in Afghanistan, while the younger daughter in Family F5 uploaded an image of a pet cat left behind in Papua New Guinea, and her mother added a photo of the river near their former village. The daughter recalled the cat as her best friend when she was three or four, with fluffy white fur and ginger patches; lacking a real photo, she searched online for a similar one. The generated image placed the cat by the riverside, prompting the family to imagine it catching fish. Despite this fictional detail, the daughter found the AI-generated result very satisfying: *'It seems like the way I think it is...the picture they generate with AI, it looks the same as the cat... and the cat got two children. The other one was black and white, but I don't know what they're doing right now'*. In selecting an online picture that looked like her cat and placing it beside the river from her mother's memory, she was not reconstructing an exact scene, but composing how she wished to remember the cat in relation to their former home. Across families, children also appropriated the tool to deliberately re-imagine and interpret their parents' stories in humorous ways. Family F3's mother, for instance, uploaded a photo of their village and tried to explain its history, but her children insisted on turning it into "a cat family" scene instead: *'For this one, I explained our village, but they (the children) said, "Mom, it's more funny to have a cat family... So cat families are in our village."* The final image layered playful animal characters onto a place that was emotionally charged for the parent, allowing the children to participate on their own terms through fantasy. Taken together,



Figure 15: AI-generated image of Family F5’s daughter’s pet cat, placed beside a river in their home village in Papua New Guinea.

these examples show that Culture Link supported both the preservation of family histories and their active reinterpretation, enabling families to stitch together past, present, and imagined futures into new, shared visual memories.

6.2.2 Intergenerational Transmission of Culture

Participants expressed a strong desire to pass down cultural traditions and values, seeing this transmission as vital for preserving identity in a new cultural environment. In Family F3, both parents and children are fluent in English, but the parents, who fled Afghanistan, spent about 10 years in an Indonesian refugee camp and 20 years in Iran, and whose children were born abroad, strictly upheld a “no English at home” rule to maintain their mother tongue. Family F7 echoed this concern, noting that their 7-year-old daughter had begun mixing English and Dari and was already forgetting some native vocabulary. Family F1 parents were originally from Syria, where they left the country when their son was four months old and moved to Iraq - “We use *like*, because our children, both of them, they never visit the country, like [F1 son] lived all his life outside. Yeah. [F1 daughter] born here (Australia). So they we didn’t have much photos for (their country of origin), so we bring very old photos of our country, and we try to merge it with some photo of children”. However, F1 also noted certain drawbacks of the generative AI tool in processing human images. People in the generated photos sometimes looked noticeably different, and the outputs occasionally failed to align with participants’

expectations. For instance, F1 mother uploaded an image of a famous spot, the waterwheel of Hama from their hometown, where both children had never visited. F1 father, on the other hand, uploaded a photo of his children with the expectation that the AI would place them prominently in front of the waterwheel. However, the generated image instead displayed a group of generic children playing near the wheel. None of the figures had recognizable features of his own children. This illustrates both the potential and limitation of *Culture Link*, that the tool can erase specificity by producing generic outputs. While the tool protects participants' identities, the results sometimes fall short of expectations for unique representations of their families.

Important festivals were another focus for participants. Family F4's father, who had left his home country Cameroon for around seven and a half years, uploaded several images of end-of-year cultural homecoming festivals in his hometown. As he revisited the images, he recalled vivid details from his village's cultural celebrations, including masquerades dancing on tall stilts and the annual gatherings where people, especially those living abroad, would return home to celebrate their heritage. For him, these festivals were a powerful representation of cultural identity and community connection. Traditional clothing and food served as tangible anchors for connecting to participants' cultures of origin. Almost all participants uploaded images related to their traditional recipes. In particular, Family F5's mother uploaded two images illustrating the process of making sago starch. One image showed the beginning of the process, where a group of women sitting around a felled sago tree. The other image depicted the filtered and dried wet starch sediment. She described this as a communal task in her culture that men would cut down the tree, while women would sit by the river to process it together. Reflecting on her experiences and the cultural meaning behind cooking sago, she shared:

"All the hard work of chopping that sago tree down around, beating, scrubbing, squeezing, putting it aside, and I enjoy my hard work...The water of the sago, the liquid with where you sit there, your legs and hands will get black. Oh, that's one thing disgusting. Sometimes I don't like... I pay that, ask the girls to do it for me, because I don't like that... This sago, oh, even it comes all the way to Australia. We have international workers in my country, Australia owned company operating in my country, Santos. So those expert rights, those Australian internationals, they buy sago from my village, they uplift the sago... We already have teaching them to make sago, cultivate the land... They must know where they come from... God created me differently with my culture and my custom... something unique, and God has placed in me."

Family F5's mother spoke with deep pride about her culture, land, and the hard work behind their traditional way of living. Describing how they grew food in their garden in Papua New Guinea, she grew visibly animated, viewing it as both a core part of their identity and a healthier, more organic lifestyle she hopes to pass on to her children. Family F5's daughter uploaded images of Elsa and

(Upload images)

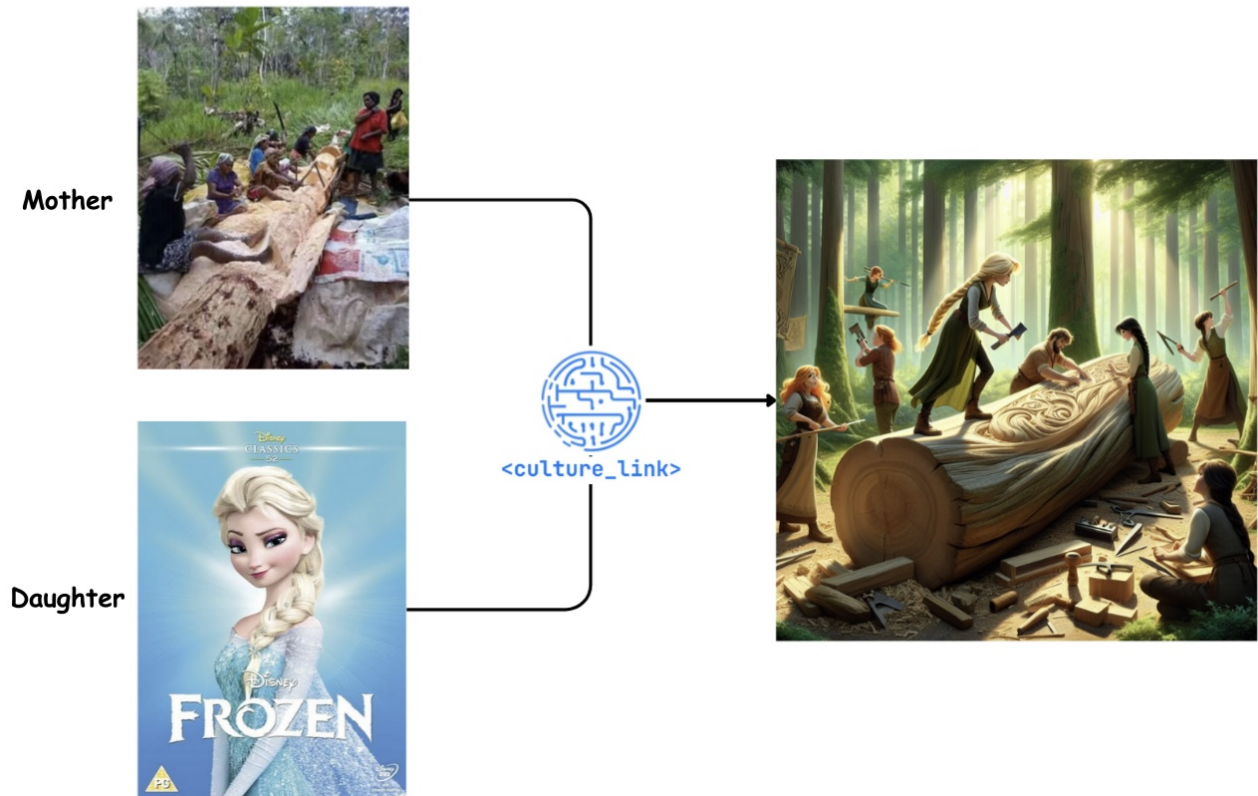


Figure 16: Images uploaded and generated by Family F5's mother, depicting the traditional communal process of making sago starch in Papua New Guinea.

roses alongside their mother's photos of traditional sago processing. Here, *Culture Link* facilitated a shared visual space where popular children's media and cultural heritage coexisted, prompting cross-generational dialogue around origins and identity.

6.2.3 Creativity and Playfulness

Children expressed great excitement and enjoyment while interacting with *Culture Link*. For all but one family, this was their first encounter with GenAI for image processing. Children's excitement often centred on seeing their own photos transformed in surprising, sometimes 'magic' ways into shared composite scenes. Parents, by contrast, were more attuned to the new form of interaction that *Culture Link* afforded. For example, F6's mother, who had not previously used to genAI tools, highlighted that this turn-by-turn co-creation was a novel at-home activity with children. Similarly, F7's father, who had used genAI before, contrasted *Culture Link* with their usual board and card games at home, highlighting how uploading images from separate devices and waiting together for an unknown composite created a new kind of shared anticipation. In this sense, the platform acted not only as a first-time AI experience, but also as a scaffold for playful, creative interactions within the family.



Figure 17: AI-generated image by Family F3's children showing Superman flying alongside Pikachu, blending cultural icons with imaginative play.

Children also used the platform as a way for self-expression. Family F5's younger daughter, who was 11 years old, uploaded an image of the Eiffel Tower to express her desire to visit Paris and her strong interest in French culture, while her mother contributed a photo of traditional men's dress from Papua New Guinea. She particularly liked the generated image, which portrayed a man in traditional attire playing billiards in front of the Eiffel Tower. Likewise, the oldest daughter in Family F2, aged 12, chose a photo depicting a traditional dance in Sri Lanka. She explained, *"That's a traditional dance in Sri Lanka. I'm learning a dance piece for Christmas."* Family F3's mother shared that her children, who were 9 and 7 years old, uploaded images of their favorite animals or cartoon characters to the platform, and during the image generation process, they would excitedly speculate and discuss what the final result might look like, *"Maybe because of their age, they prefer to choose (photos) that make this story funny. They say, 'Mom, let's choose this and this, so we can have something flying', so we choose Spider Man from this picture and Pikachu from this, and the result is there..."*. Moreover, family F3's children demonstrated an emerging understanding of the underlying logic of the image generation process. According to family F3's mother, *"...Because the only one who wore this dress, it was just me, yeah. But the result with four, so you can see a little pattern in each one, like this one, this one and this one. So from this, they realized that with this application, we can have something to share, like the same pattern of clothes or something like that"*. They noticed in one activity that when a family photo showed only the mother in traditional clothing, the generated image reproduced similar patterns across all figures. This insight helped them make more intentional creative choices—selecting

images to shape the visual output and highlight familial or cultural themes. For instance, in Figure 1, the children blended the white tent with the gallery's dotted patterns to create a colorful version. They later uploaded another pair of photos, a Pikachu image and one of themselves looking at a cat, and the platform generated a merged scene where the cat had Pikachu-like features, appearing as a flying magical creature they were observing. In these cases, children did not treat *Culture Link* as a black box; they experimented with how different inputs would be combined, and learned to “bend” the model's behavior toward the playful scenes they wanted to create.

The platform also served as a catalyst for storytelling, encouraging children to learn about their family's histories and cultural narratives from their parents. Compared to plain language, the visual nature of these images more effectively stimulated children's imagination and fostered a more immersive storytelling experience. The platform's playful, cartoon-like aesthetic was particularly effective in capturing children's attention. Beyond the final outputs, the process of using the app also sparked curiosity and promoted active engagement. Children brainstormed ideas and speculated about what the final image might look like. As F1's father observed, *“It's fun, especially when you get the result that you are expecting. It's actually pretty fun, yeah, and the photo is beautiful, AI-generated photo is actually very beautiful, we had too much fun... [F1 son] He would listen, he would be happy, be enthusiasm”*. Similarly, Family F4's children expressed a strong desire to visit their mother's hometown after an image was generated using a photo she uploaded of the village where she used to live in Cameroon: *“this generation or this era...children, they don't, they hardly go back home, yeah, or go back to the villages to learn about the culture. When you generate some of these images, and you tell the story behind them...they like it and start imagining, 'Oh, Mom, I want to go back someday and see what you were doing.'”*.

However, not all results were satisfying. Family F7, originally from Afghanistan, consisted of four members, including two daughters aged 7 and 10, who both had digital literacy and access to mobile phones. In one round of the activity, they uploaded portraits of grandparents, parents and uncles in the hope of producing “one big family photo”. The generated image included only two of the relatives, while others appeared merely in the background as framed wall hangings. Although the outcome was aesthetically pleasing and described as “nice,” the family expressed disappointment, as they had hoped all relatives would be depicted together. The parents noted that it did not achieve the sense of being fully “all together” that they had imagined. The father later speculated about a future version of *Culture Link* where relatives spread across Afghanistan, Europe and Australia could each upload their own photo and have them all meaningfully presented in one image. This revealed an aspiration of participants for digitally staged reunion across borders.

6.2.4 Family Engagement

Culture Link cultivated small, repeated moments of “being together” that many parents described as feeling like home. Multiple participants expressed that the collaborative nature of the storytelling activities through *Culture Link* was highly engaging. As Family F2’s mother commented, “*This app is very good...it brings (us) back home, and plus, you’re also telling your children about the history behind it...how we lived in Sri Lanka and stuff (like that)*”. Family F3 mother expressed her perceptions of the application, “*It’s not about the reality ... more like engagement with children*”. Rather than evaluating the accuracy of the output, they positioned *Culture Link* as a shared activity that legitimized time spent talking with children about memories and feelings. *Culture Link* also provided an opportunity for routinized family engagement. The parents from Family F1 greatly enjoyed the activities and revisited old memories while selecting images to upload. “*In the evening, we have, like, game time... that’s actually what we did. Yeah, we dug into very old photos. Actually, we used to forget them. It helped us to dig up some old memories of our hometown,*” F1 father reflected. The practices of selecting, re-interpreting, and narrating images drew family members together. Individual recollections were turned into a shared, playful activity of remembering and articulating what “home” now means in Australia.

Participants also reflected that home and belonging were reconstituted through new support structures from local communities, and how belonging can span dual cultural identities. *Culture Link* facilitated moments of such hybrid identity expression. As Family F5 mother shared, “*We came to Australia to seek protection. Even though half of my heart [is] back in PNG, I miss my traditional way of cooking, it is so healthy. Now I feel it’s safe, I’m with my two daughters. Church members here they pray together with me, help me, support me financially, spiritually, intellectually. They are my family now...Australia is our home now. We have two cultures: PNG and Australian culture... both are my home*”. Her story showed how memories of pre-displacement life, new relationships in church, and day-to-day family routines are woven together into a multi-sited sense of home. *Culture Link* provided a venue to visualize and narrate this dual belonging to her daughters.

Maintaining cross-border family connections was seen as a deeply significant aspect of home for many participants. For example, the father from Family F2, a former military serviceman from Sri Lanka, continues to carry unresolved trauma from his past. The oldest daughter shared, “*Sometimes my dad talks about his home and how he feels...we also understand and stuff. So we don’t really like make him upset and we comfort him*”. The family also reflected on the emotional toll of long-term separation. One father had not seen his elderly mother for over 25 years, and the father in Family F4 described being apart from his wife and children for seven and a half years after arriving in Australia as an asylum seeker in 2017. Reunited only two months ago, he noted how this prolonged separation deeply affected his emotional well-being, identity, and sense of home and family. “*Living without*

my family, all the anxieties and the depression and the trauma... Especially for an asylum seeker, is so, so daunting and difficult. I left my daughter when she was just like, one and a half years old. Sometimes I will cry, I'll wipe my tears, I miss them so much." He described relying on technology to stay connected, making daily video calls and celebrating important dates and festivals online despite the distance. For his birthday, for instance, his wife and children would bake a cake, call him on video, and his son would cut the cake on his behalf so they could celebrate together across continents. These practices illustrate how digital media help families maintain a sense of co-presence despite physical separation. Reflecting on these experiences, he imagined that if a tool like *Culture Link* had been available during his time apart from his family, it would have offered a more engaging way to share photos and everyday moments, further facilitating cross-border family connections and emotional closeness. *Culture Link* is imagined as an additional shared artifact that could have helped the family visualize "being together" during years of enforced distance.

6.2.5 Generational divergence in identities

The uploaded images on *Culture Link* revealed marked differences in preferences between parents and children. As Family F6's mother, who was from Mongolia, expressed that home is still deeply rooted in her past: *"Home means the place where I was born and raised. Although I'm in a foreign country now, many things remind me of my own history, culture, and old memories. Essentially, I think of home as the place where I was born"*. Parents tended to upload photos tied to their countries of origin, reflecting identities deeply rooted in the past and shaped by nostalgia. In contrast, children more often selected images from their current lives, highlighting their ongoing identity formation within the new cultural environment. At the same time, some parents with higher language proficiency and familiarity with Australian cultural norms gradually came to see both Australia and their country of origin as parts of their homes. Parents of families F4 and F5, who were both Christian, shared how participating in church communities helped them build a sense of belonging. As F5's mother described, they received support "financially, spiritually, intellectually" and she noted, "I have met new family members, especially in the church members. They are my family now." Similarly, F4's mother reflected on the comfort found in their church: "A home is where you find comfort...especially here in Australia, where we found ourselves in a church community where everybody - we see ourselves as a family...we look after each other, we have each other's problems in mind, and we pray together and study together. So I find it a wholesome place to be." Together, these accounts show how parents stitch together memories of the homeland with new relational anchors in Australia, constructing home as a network of people and practices across locations. Integration into local communities emerged as an important way of building belonging in a new place, not just for parents, but also for children. However, the process was not always smooth. For instance, Family F3's daughter expressed discomfort at school due to difficulties making new friends. While she had some good classmates, she still did not

feel she had formed close friendships in her new environment. The example highlights that children's sense of home is also negotiated through peer relationships, which are not easily visible in family narratives or images.

Age also shaped how refugee children experienced integration. As Family F6's mother explained, her four-year-old son had not yet formed a concept of home or understood the distinction between home and host countries, whereas her seven-year-old was beginning to grasp these ideas: *"My seven-year-old still says he misses Mongolia and wants to go back. He understands we are in a foreign country. But my younger child doesn't really know where we are, since he hasn't traveled far and is still very young"*. Families F1 and F2 also observed the same pattern during field trials of *Culture Link*: younger children, particularly those under the age of five, were primarily captivated by the visually appealing outputs. However, they paid little attention to the stories shared by other family members. As the eldest sister in Family F2 noted, while the older siblings engaged with the narratives, the younger ones were more focused on the images themselves: *"They're just looking at (the pictures)... They listen, but don't memorize... This app might be better for a little bit older children"*. These observations suggest that while very young children may enjoy the visual novelty of generative outputs, they are less able to participate in the reflective, narrative work that *Culture Link* is intended to scaffold.

Children around the age of 10 appeared to be the most suitable users of *Culture Link*, as they showed both excitement toward the generative AI experience and the ability to understand and discuss the deeper meanings behind the images. In contrast, older children around 15, like Family F4's son and Family F5's eldest daughter, were noticeably less engaged than their younger siblings. For example, the 14-year-old daughter in Family F5 engaged only minimally with the platform, possibly reflecting a developmental shift in interests common among teenagers. Similarly, while Family F4's son did enjoy the activity to some extent, he questioned the authenticity of the generated image, remarking, *"Is this for real? It doesn't really look real..."*. His skepticism points to a different kind of engagement, where older adolescents may be more inclined to critically evaluate the realism and legitimacy of AI outputs. However, this skeptical stance distances them from the playful, imaginative way of engaging that younger children adopt. For middle-childhood participants, their developmental readiness for both imagination and reflection aligns with the platform's aims of co-constructing stories about home.

6.3 From Co-Designed Place-belongingness to Everyday Home-Making

Phase 3 completes the empirical trajectory of this thesis by translating the insights developed across Phases 1 and 2 into the design and evaluation of an implemented technological intervention. Phase 1 showed that early resettlement support is essential for helping newly arrived humanitarian entrants

navigate practical systems, yet it also revealed that the longer-term work of rebuilding home, belonging, and identity extends beyond formal service provision. Phase 2 then examined this less visible work more directly, identifying cultural memory, material symbols, family connection, privacy, stability, and social relationships as central dimensions of refugees' place-belongingness. Building on these findings, Phase 3 evaluates how a technology can support these dimensions not as abstract design aspirations, but as part of everyday family practice.

The findings from the *Culture Link* field trial show that technologies can support refugees' sense of home by creating shared opportunities for memory preservation, cultural transmission, family engagement, and intergenerational dialogue. In contrast to Phase 2, where participants imagined possible technologies and articulated values around home, Phase 3 demonstrates how such values are enacted through interaction: parents explain the cultural and personal meanings behind images, children reinterpret these materials through play and imagination, and families negotiate the relationship between past memories, present life in Australia, and imagined futures. In this way, *Culture Link* functioned not simply as an image-generation tool, but as a prompt for storytelling, reflection, and shared meaning-making.

This phase provides a concrete response to the overarching research question of how technologies can be designed to support newly arrived humanitarian entrants in developing a sense of home. Across the three phases, the thesis shows that such technologies need to address more than access to information or services. They must also support the emotional, cultural, relational, and temporal processes through which home is remade after displacement. Phase 3 demonstrates one possible design pathway: using low-barrier, family-centered, AI-mediated storytelling to transform dispersed images, memories, and cultural references into shared artifacts that can scaffold conversation and belonging. At the same time, the field trial also highlights the tensions involved in this approach, including issues of representational accuracy, privacy, differing expectations across generations, and the need to ensure that AI-generated outputs remain prompts for family interpretation rather than replacements for lived memory.

Together, Phases 1, 2, and 3 form a coherent progression from understanding the conditions of early resettlement, to identifying refugees' values and aspirations around home, to evaluating a designed intervention in everyday family life. Phase 3 closes this progression by showing how design can move from recognizing refugees' unmet needs to supporting concrete practices of home-making. These findings provide the basis for the following discussion chapter, which synthesizes the thesis's theoretical and design contributions: extending place-belongingness in forced displacement contexts, extending ambiguous loss theory through intergenerational memory work, and outlining implications for designing technologies that support refugees' evolving sense of home.

Chapter 7: Discussion

In this chapter, I present an overview of the research questions and summarize the corresponding findings. I then articulate the theoretical contributions of this research, focusing on how the study extends and enriches the conceptual frameworks adopted throughout the thesis. This is followed by a discussion of the design implications derived from the findings, highlighting their relevance to the field. Finally, I outline the limitations of the study and propose directions for future research.

7.1 Research Questions and Findings

The overarching question guiding this thesis is how digital technologies can support refugees in fostering a sense of home. To address this question, I break down and structure the research into three phases with corresponding sub-questions. I respond to each sub-question and synthesize the findings from each phase to approach the overarching research question.

7.1.1 RQ1 - What are the needs, issues and understandings of home to newly-arrived humanitarian entrants?

The data show that newly-arrived entrants understand home less as a fixed dwelling than as a collection of practices and assurances that allow everyday life to cohere. Across arrival and initial settlement, participants construed ‘home’ as more than shelter. It was defined through safety, stability, family presence, and practical means to navigate a new life. Immediate services were foundational in establishing this trajectory. Airport pickups, expedited hotel check-ins, and next-day city orientations communicated a sense of welcome and reduced early uncertainty. As one participant recalled, “They introduced us to everything in the first two days”. These activities helped newcomers map local infrastructure, laying the groundwork for imagining themselves in place.

Material provisions were deeply intertwined with participants’ emerging sense of capability and stability. For example, transport cards were consistently described as the most useful item, not simply for mobility but as an entry point to understanding the broader system. SIM cards and phone numbers supported both logistical functioning (e.g., accessing services) and emotional anchoring (e.g., staying in touch with relatives), underscoring connection as a constitutive practice of home.

As families transitioned from temporary accommodation to longer-term leases, expectations shifted from “a place to sleep” to “a place that feels like home”. Where participants could inspect and select

housing, they reported a greater sense of fit, adequacy, and control. For instance, those who secured rentals through family or community contacts described their homes as aligning with both practical needs and personal preferences. In contrast, single entrants who were placed in shared housing without prior inspection often encountered tensions around hygiene, privacy, and safety—highlighting how limited agency can erode the feeling of homeliness, even when basic shelter is provided.

Family co-presence emerged as a stabilizing force. Some participants described their need for home as already fulfilled by being reunited with children or spouses, framing home as inherently relational. Yet neighborhood safety and housing context remained critical. Several participants reported feeling unsafe in environments where intoxicated neighbors disrupted sleep or where complaints about disturbances went unaddressed. These experiences revealed how environmental disorder and perceived indifference from co-residents or landlords undermined the possibility of belonging.

Conversely, tailored accommodations could actively foster a sense of home. One participant, housed with their disabled family member in a stair-free, refurbished unit, described the dwelling as a space of “joy... accomplishment, and belonging,” particularly as the family invested in furnishings that supported shared routines. These accounts illustrate how built environment, recognition of need, and personal investment converge to produce domestic stability.

Finally, the quality of service relationships shaped participants’ ongoing capacity to “make home”. Empathic, responsive social workers were praised for follow-up care—such as booking and confirming GP and dental appointments for participants with limited English, which some valued “more than any material support.” In contrast, inconsistent communication and duplicated services produced frustration and instability, especially in moments of crisis (e.g., unanswered calls during emergencies), revealing how gaps in care ripple into the domestic sphere.

7.1.2 RQ2 - What technologies are deemed most suitable for addressing the needs for home to humanitarian entrants, and the corresponding design factors that must be taken into account?

Phase 2 addressed this research question by using Magic Machine workshops to move from identifying resettlement challenges toward understanding refugees’ own design priorities for home-making. Rather than producing a single preferred technology, the findings show that suitable technologies are those that respond to the key dimensions of place-belongingness identified in Chapter 5: cultural identities and memories, life normalcy and stability, security and privacy, social connections, and resilience and ingenuity. Across these dimensions, participants valued technologies that could fit within everyday domestic life, support continuity between past and present homes, and reduce the material, spatial,

linguistic, and institutional barriers that shape resettlement.

First, the findings on cultural identities and memories show the importance of technologies that support cultural expressivity and memory preservation. Participants' designs around digital carpets, culturally meaningful images, religious corners, colours, and ceiling projections demonstrate that home-making is not only about functional shelter, but also about recreating familiar cultural and emotional environments. These examples suggest that suitable technologies should enable refugees to display, adapt, and personalize meaningful cultural content, particularly when physical artifacts are unaffordable, lost during displacement, or difficult to accommodate in rental housing. In this sense, ambient and situated media can operate as low-cost proxies for material culture, helping refugees maintain symbolic continuity without requiring permanent changes to the physical dwelling.

Second, the findings on life normalcy and stability show the need for technologies that reduce cognitive and bureaucratic burden. Participants' concerns about employment, skills recognition, income, digital literacy, legal documents, service navigation, and access to information indicate that stability is a precondition for feeling at home. This aligns with Lee et al.'s study of refugee and asylum seeker entrepreneurs in Australia, which shows how digital platforms, organizational support, community networks, and family support can shape refugees' longer-term pathways for self-learning, professional development, and business goals [103]. Together, these findings suggest that technologies for resettlement should help refugees navigate evolving trajectories of capability-building, work, and future-making. Their proposed technologies, such as a refugee-specific phone interface connected to service providers or platforms for accessing learning and employment resources, were not imagined as complex all-in-one systems. Rather, they emphasized clarity, directness, and reliable guidance. This indicates that technologies for humanitarian entrants should prioritize legibility, task-specific support, and institutional alignment over feature breadth.

Third, the findings on security and privacy show that technologies must support household autonomy rather than extend institutional control. Participants' accounts of shared accommodation, restricted personal space, intrusive inspections, unsafe cohabitation dynamics, and limited control over bathrooms, kitchens, and rooms show that security is experienced at the micro-level of everyday domestic life. Their design ideas, including private rooms, resident-controlled spaces, and devices for monitoring environmental risks such as snakes or insects, point to a broader design principle: technologies should enhance residents' sense of control, privacy, and safety on their own terms. They should not intensify surveillance or make refugees more dependent on landlords, agencies, or service providers.

Fourth, the findings on social connections show that suitable technologies should support both cross-border co-presence and co-located family interaction. Participants' designs for life-size 3D projections, wall-sized real-time screens, and immersive communication systems were grounded in the loss or fragmentation of everyday family togetherness after displacement. These designs show

that connection with distant family members is not an optional communication need, but part of the domestic and emotional infrastructure of home. At the same time, participants' concerns about isolating technologies, such as head-mounted displays, suggest that systems should support shared, inclusive forms of presence that can involve both remote and co-located family members.

Finally, the findings on resilience and ingenuity show that technologies must be compatible with the spatial and financial constraints of refugee households. Participants' ideas for foldable furniture, modular storage, multi-functional devices, smell-filtering masks, and solar-powered utilities demonstrate that home-making often involves creative adaptation to limited resources. These designs highlight the importance of compactness, affordability, energy efficiency, and flexibility, especially for refugees living in shared, temporary, or rental accommodation.

Overall, RQ2 shows that the most suitable technologies for supporting humanitarian entrants' sense of home are not necessarily advanced, immersive, or feature-rich systems. Rather, they are technologies that are culturally expressive, simple to use, privacy-preserving, socially connective, and practically compatible with constrained domestic environments. The corresponding design factors are therefore: low-cost cultural personalization, burden reduction, user control and privacy, inclusive co-presence, and spatial and financial practicality. These findings provide the design foundation for Phase 3 by identifying cultural memory, family connection, low-barrier participation, and shared domestic engagement as key directions to be operationalized in the design and evaluation of *Culture Link*.

7.1.3 RQ3 - How does the designed technology foster a sense of home for newly-arrived humanitarian entrants?

Building directly on the phase 2 findings, I instantiated the identified design factors, including cultural expressivity at low cost, legibility and burden-reduction, household sovereignty, immersive-yet-inclusive presence, and spatial/financial pragmatics into a working application, i.e., *Culture Link*. The app operates a family-in-the-loop workflow in which household members upload personally meaningful photos and co-author an AI-aided composite that serves as a mediator for intergenerational storytelling. In addressing RQ3, Phase 3 demonstrates that *Culture Link* is effective because it targets a different layer of 'sense of home' needs that remain unresolved after practical services stabilize daily life. Phase 1 shows how newcomers initially depend on mediating providers for safety, orientation, and basic infrastructure, and how home can first emerge as relief, reassurance, and the ability to close a door and feel safe. Yet Phase 2 shows that once basic routines begin to stabilize, refugees' place-belongingness becomes increasingly shaped by cultural continuity, family connection, privacy, and the ability to re-author identity across past and present. *Culture Link* operates these Phase 2 values as an everyday family practice. Families repeatedly selected images, waited together, and then narrated

the meaning of the composite. This created small rituals through shared talk and attention, rather than through factual documentation. The field trial provides concrete evidence of this mechanism. The image became a bridge between remembered family narratives and an imagined future visit. Family F1 merged a circus visit that happened before the daughter was born with a later mother and baby selfie, and treated the result as a successful way to stage togetherness across time. Such example shows that the tool supports memory preservation through reinterpretation, not strict fidelity. That matters in displacement, where loss and remaking of home are cyclical and ongoing [43]. Phase 3 also shows intergenerational tradeoffs. Children led playful remixes, such as turning a parent’s village photo into a “cat family” scene. Parents still retained narrative authority by explaining place histories and cultural meaning. In this way, the artifact redistributed storytelling work across generations, and lowered barriers for participation through a visual, collaborative interaction surface. At the same time, the study surfaces bounded effectiveness and design trade-offs. The “waterwheel of Hama” example shows that identity protection via generative abstraction can also erase specificity, which can disappoint families who want recognizable likeness and cultural accuracy. Taken together, Phase 3 provides empirical evidence that *Culture Link* is effective for sense-of-home needs that are relational and cultural, and that it enables refugee families to practice belonging through repeated co-creation, shared narration, and negotiated meaning-making in everyday life.

7.2 Theoretical Contributions

This thesis makes two interrelated theoretical contributions to HCI and CSCW research on forced displacement, home, and belonging. First, it extends Antonsich’s framework of place-belongingness [22] by showing how the feeling of being ‘at home’ is rebuilt under conditions of forced displacement, where belonging is shaped not only by attachment to place, but also by institutional support, domestic autonomy, cross-border relationships, and material-cultural continuity. Second, it extends ambiguous loss theory [33, 36] by showing how the unresolved loss of home is experienced and negotiated across generations within refugee families, and how shared digital artifacts can support storytelling, reinterpretation, and memory work. These two contributions are connected: place-belongingness explains the conditions through which refugees remake home, while ambiguous loss theory explains why home remains emotionally and temporally unresolved even after physical resettlement.

Extending Place-Belongingness in Forced Displacement Contexts

Antonsich [22] conceptualizes place-belongingness as the intimate feeling of being at home, shaped by autobiographical, relational, cultural, economic, and legal factors. While this framework is useful for understanding belonging in general life settings, this thesis shows that in forced displacement contexts these factors are not simply present or absent. Rather, they are dynamically assembled

under constraint, shaped by the temporal structure of settlement support, the material conditions of housing, and refugees' ongoing relationships with both home and host countries. This section therefore extends place-belongingness by identifying how security, social relations, culture, and autobiographical attachment are reconfigured in refugee resettlement.

Table 5: Extensions on Antonsich's Framework of Place-belongingness

Key Factor	Antonsich's Framework of Place-Belongingness	Extensions in the Context of Forced Migration
Autobiographical Factors	Attachment through personal history, childhood memories, and ancestral ties to a place.	Refugees' sense of home is dynamic and shaped by both positive and negative past experiences, not just static ties to origin.
Relational Factors	Social ties with family, friends, and weak ties in public spaces.	Refugees also aspire to maintain cross-border family connections disrupted by displacement beyond local relational ties.
Cultural Factors	Shared language and cultural practices as core elements of belonging.	Tangible and material artifacts (e.g., traditional carpets, food practices) as key to recreating a sense of home.
Economic Factors	Stable material conditions and integration into the local economy.	Stressed the importance of job stability, access to systemic resources, and financial independence for achieving a sense of stability.
Legal Factors	Legal status and citizenship as primary contributors to security and belonging.	Emphasized privacy and autonomy as equally critical for security, particularly in shared living spaces during the early resettlement phases.

First, this thesis re-situates place-belongingness as time-sensitive and institutionally mediated under forced displacement. Phase 1 shows that early-stage resettlement is dominated by mediated access to essential resources and institutions, where refugees' everyday agency depends on navigating service ecosystems and bureaucratic systems that are time-bound and fragmented [96]. This matters theoretically because it clarifies that belonging cannot be treated as a downstream outcome that naturally follows from initial service provision. Even when practical needs are partially addressed, the longer-term work of rebuilding home and belonging often remains unsettled, especially after formal programs taper off and support becomes intermittent. The thesis therefore frames place-belongingness not as a stable attachment that accumulates linearly, but as an ongoing negotiation whose conditions change across resettlement phases. This complements accounts of learning and

adaptation in resettlement as practical, situated engagements with local systems and socio-technical ecosystems [52].

Second, this thesis extends the security dimension of place-belongingness by introducing privacy and domestic autonomy as micro-level foundations that complement legal and political accounts. Prior scholarship agrees that security is central to belonging, but locates security in different ways. Ignatieff frames belonging as protection from violence [93], while Antonsich emphasizes legal status and citizenship as primary determinants of security and belonging [22]. Papastergiadis further argues that precarious legal statuses and exploitation heighten insecurity for migrants, and that border control and surveillance technologies can compromise privacy in the name of security [128]. This thesis retains these structural insights, but shows that security is also produced or undermined inside the home through everyday control over space, access, and bodily boundaries. In Phase 2, P9 described unease when a roommate invited men over during her pregnancy, indicating that safety is not reducible to the absence of external violence. P15, a transgender woman, reported discomfort due to roommates' intrusive curiosity about her body, showing how insecurity can emerge through identity-based exposure and everyday cohabitation dynamics. P13's formulation of home as a place where "you are the only person that has the key and has your own bathroom and kitchen" further underscores autonomy as a felt condition of being at home. These accounts extend Antonsich's legal factor by arguing that legal status alone does not explain security in resettlement; privacy and autonomy are co-constitutive conditions of place-belongingness in forced displacement [128].

Third, this thesis refines the relational dimension of place-belongingness by foregrounding disrupted cross-border strong ties as central to refugees' sense of home. Antonsich's relational factor includes family and friends, as well as 'weak ties' formed through occasional encounters in shared spaces [22]. Phase 2 demonstrates that, for refugees, relational belonging is shaped by relationships that were once part of everyday co-presence but became fragmented through displacement. P11's longing for cousins he used to live with, and P2's sense that home was incomplete without her grandmother, show that home is often anchored in disrupted strong ties rather than only in emerging local or weak ties. Participants also designed for this need. For example, the magic projector concept imagined projecting an absent person in life-size 3D within the home, representing an aspiration to materially repair broken co-presence and re-situate cross-border relationships inside domestic life. This aligns with Papastergiadis's argument that modern belonging increasingly relies less on geographic proximity and physical contact, as media technologies facilitate cross-border communication and forms of displacement without physical movement [128]. The thesis adds specificity by showing that cross-border connection is not merely communication or support, but a core constituent of place-belongingness for refugees.

Fourth, this thesis broadens the cultural dimension of place-belongingness beyond language and abstract cultural practice by theorizing material culture, sensory boundaries, and domestic aesthetics as

mechanisms of belonging and continuity. While Antonsich emphasizes shared language and cultural practices [22], Phase 2 shows that cultural belonging is also enacted through tangible objects and embodied practices. This aligns with Tolia-Kelly's account of artifacts as 'precipitates of re-memory' that carry personal and collective histories across time and space [184]. P9 and P10's attention to traditional Iranian carpets, including domestic rules such as 'no shoes on carpet', shows that artifacts are not merely decorative, but function as identity infrastructure and emotional anchors. Likewise, P14 and P15's accounts of halal restrictions and discomfort when roommates cooked pork show that culture is also a bodily and sensory experience shaped by smell, food practices, and shared domestic space. These insights align with research showing that migrants anchor themselves through familiar objects and practices that sustain continuity amid displacement [111, 138]. The theoretical extension here is that cultural place-belongingness can be scaffolded through mediated materiality, not only through translation, information provision, or language support.

Finally, this thesis extends the autobiographical dimension of place-belongingness by showing that refugees' sense of home is not simply anchored in birthplace, childhood memory, or ancestral origin. Antonsich emphasizes autobiographical factors such as personal history, childhood experiences, and ancestral ties [22], including bell Hooks' account of the Kentucky hills as her 'true home' [89]. However, in forced displacement contexts, autobiographical belonging is often shaped by both positive and negative memories. While some participants described childhood homes as sources of family warmth and attachment, others described memories of deprivation, detention, or constrained movement. P9, for instance, described lacking her own room, clothes, or stationery in childhood, while P10 imagined a magical ceiling displaying the night sky or natural scenes, inspired by time in detention where she could not go outdoors. These examples show that home is not automatically tied to origin as a stable or idealized place. Instead, refugees' place-belongingness is fluid, shaped by past and present experiences across both home and host countries. This resonates with Papastergiadis's argument that globalization and migration weaken the link between identity and fixed location, producing hybrid identities and multiple layers of belonging [128]. In this thesis, place-belongingness is therefore conceptualized as a dynamic process through which refugees negotiate continuity, attachment, and selfhood across disrupted places and times.

Extending Ambiguous Loss Theory through Intergenerational Storytelling

The second theoretical contribution of this thesis is to extend ambiguous loss theory in the context of refugee families' home-making. Ambiguous loss theory describes losses that are unclear and lack closure, suspended between presence and absence [33, 35, 36]. Displacement scholarship has extended this concept to non-human attachments such as home, identity, and belonging [43, 132]. Prior work shows that refugees simultaneously grieve and remake home through memory, cultural transmission, and place-making practices [43, 132, 159]. Building on this work, this thesis argues that

the ambiguous loss of home is not only cyclical and relational, but also generationally divergent, and that shared storytelling around co-created visual artifacts can provide a site where such divergence becomes visible and negotiable.

Phase 3 shows that parents and children do not simply share a single sense of loss. Instead, they attach different times, places, and relationships to ‘home’. Parents’ uploaded images were often anchored in countries of origin and long histories of struggle and resilience. F6’s mother, for example, described Mongolia as her only home, “where I was born and raised,” even while living in Australia, and selected images foregrounding Mongolian landscapes and traditions. Such accounts align with work showing that homeland loss can become a lifelong unresolved condition shaped by nostalgia, disrupted roles, and enduring attachments to place [43, 132]. Children, by contrast, more frequently chose images tied to their present lives, imagination, and speculated futures. F5’s younger daughter used images of the Eiffel Tower to express a desire to visit Paris and an interest in French culture, while F2’s eldest daughter foregrounded a traditional Sri Lankan dance she was preparing for a school Christmas performance. For children who were born or raised outside their parents’ home countries, home appeared less as a singular lost place and more as a hybrid of current routines, aspirations, and cultural reference points in Australia. This resonates with Crooks et al. [50] and McGillicuddy et al. [115], who show that migrant and refugee children negotiate belonging across both transnational ties and local peer contexts, and that recognition in school and peer settings shapes their emerging sense of belonging and identity.

The composite images generated by *Culture Link* made these divergent orientations materially visible. Parents and children placed distant homelands, present commitments, and hoped-for futures into the same frame. Rather than collapsing these differences into a single family narrative, the shared artifact allowed multiple temporalities of home to sit side by side. This extends ambiguous loss theory by showing that the family does not hold one unified loss of home; rather, loss and belonging are negotiated across generational orientations, where parents may be oriented toward homeland and past continuity, while children may be oriented toward present belonging, peer contexts, and future possibility.

This thesis also extends ambiguous loss theory by showing how families can negotiate loss through shared narrative rituals. Perez [132] documents how memorabilia, rituals, and storytelling help Cuban American exiles negotiate the ambiguous loss of home by finding meaning, sustaining cultural identity, and revising attachments. Similarly, families in Phase 3 used *Culture Link* as a small, repeated ritual that kept memories of home active and shareable with children. For F1, parents described turning the field-trial sessions into an evening ‘game time’, digging into forgotten photos of their hometown and laughing together about earlier stages of family life. The repeated sequence of gathering phones, choosing pictures, waiting for the output, and commenting on the generated image created a low-stakes script for remembering. This echoes Tibau et al.’s [182] account of shared musical activities as gentle

rituals for sustaining intimacy and cultural connection over time. F7's father similarly compared *Culture Link* to the family's usual board and card games, emphasizing that uploading images from separate devices and waiting together for the composite created shared anticipation. In line with Basso's [29] and Perez's [132] discussions of ritualized remembering, *Culture Link* did not resolve ambiguous loss, but inserted small narrative rituals into everyday family life, offering familiar rhythms through which memories of home could be approached, shared, and gently reworked.

Finally, this thesis theorizes the co-created visual artifact as a concrete site for reinterpretation rather than fidelity-bound recollection. In *Culture Link*, the artifact is not primarily a storage device for preserving a factual record. It is a prompt that coordinates participation, enables co-authorship, and holds multiple temporalities of home together. Family F2 used the Taj Mahal, a place the mother had never visited, as symbolic narrative infrastructure for a 'love marriage' story and a hoped-for future trip, blending remembered identity with imagined futures. Family F1 merged a father-son theme park visit that occurred before the daughter was born with a later selfie of the mother and baby; the resulting composite created a 'family together' memory that never occurred, yet was experienced as successful because it repaired fragmented timelines into a shared scene. Family F5's younger daughter, lacking a real photo of her childhood cat left behind, searched online for a similar one and merged it with her mother's river image from their home village; the generated river-cat scene prompted further narration and longing. Across these cases, symbolic composites supported continuity even when canonical photos did not exist. The contribution is therefore not that AI-generated images accurately preserve memory, but that co-created visual artifacts can scaffold reinterpretation, distribute memory work across generations, and make past, present, and imagined futures jointly discussable.

Together, these two theoretical contributions clarify how refugees remake home after forced displacement. Extending place-belongingness shows how home is rebuilt through institutional, domestic, relational, material, and cultural conditions. Extending ambiguous loss theory shows why home remains unresolved across time and how this unresolved condition is negotiated across generations through shared storytelling. The thesis therefore positions refugees' sense of home not as a stable outcome of integration, but as an ongoing process of negotiating belonging, continuity, and loss across changing resettlement contexts.

7.3 Design Implications

Across Phases 1–3, our findings suggest that designs for fostering a sense of home cannot be reduced to a single app, device, or intervention. A sense of home emerges through a progressive continuum of needs, and technologies can contribute at different points along that continuum. Phase 1 shows how early-stage home begins as safety, welcome, orientation, and access to essentials. Newcomers such as participant P10 described the reassurance of being met at the airport and guided step by

step, while the day-2 city tour helped participants understand local rules and infrastructures, which made the host environment feel navigable. These early experiences of welcome and support are the groundwork that later enables refugees to pursue belonging beyond survival. Phase 2 then shows that once basic stability is partially secured, “home” becomes increasingly tied to privacy, autonomy, cultural continuity, and cross-border family attachment, in ways that are often invisible to service systems and under-supported by ‘one-size-fits-all’ services [22, 52, 128]. Phase 3 demonstrates how a lightweight, family-facing tool for family storytelling can meaningfully contribute to these later needs by turning cultural memory and family storytelling into repeatable, shared practice [48, 98, 111]. Together, these phases motivate an integrated set of design implications that connect service navigation, material and relational home-making, and family co-creation under one overarching question: how can technologies be utilized to foster a sense of home for refugee communities?

7.3.1 Design for phased needs

A central implication is to design technologies that explicitly recognize resettlement as a phased process. Phase 1 identified immediate, initial, and ongoing stages, each with distinct forms of support and distinct “home-related” needs. This structure aligns with calls for continuous and progressive support under social inclusion perspectives [203]. It also complements socio-technical ecosystem framings that emphasize how refugees’ technology practices shift across contexts and learning settings [52]. Designing for sense of home therefore requires a portfolio of interventions that map to phases, rather than treating refugees as a single user group with static needs. HCI study on homelessness emphasizes the importance of understanding marginalization as a journey shaped by critical moments, changing needs, and navigation across services, places, and support networks [45]. Similarly, Rathnayake et al. show that economic hardship and social stigma can coexist with strong forms of resilience, family responsibility, and entrepreneurial agency, and that technology design should build on existing assets, social networks, and culturally situated practices rather than imposing external solutions [140].

In Phase 1, newcomers valued practical supports that reduced uncertainty and enabled everyday functioning. For example, participants like P10 emphasizing the importance of transportation cards and SIM cards. These are foundational conditions for belonging because they determine whether a newcomer can access information, reach appointments, and maintain relationships. Technologies that support sense of home should therefore begin with orientation, clarity, and low-friction access, rather than assuming that community-building or cultural tools will succeed without infrastructural stability. In later phases, the relevant needs expand. Phase 2 surfaces a shift toward privacy, cultural expression, and longing for cross-border ties. Phase 3 shows that once families have enough stability to engage in repeated activities, tools like *Culture Link* can create routinized moments of togetherness. For example, Family F1 described “game time” evenings where they “dug into very old photos,” implying that home is not only a location but also a rhythm of shared practice. A key design implication is therefore to

make phase assumptions explicit. Systems should communicate which needs they address, and what prerequisites they rely on. Without this, technologies risk being misaligned with refugees' immediate constraints, or being evaluated unfairly for not solving problems outside their scope.

7.3.2 Design with Heterogeneity and Fluidity

Phase 1 shows that service delivery often struggles with matching. Some participants received redundant support, while others lacked support at critical moments. P4 was repeatedly offered help getting to a clinic even after he already knew the route. Meanwhile, P1 reported urgent health needs that were not met with the empathy or responsiveness he expected. This mismatch echoes broader critiques that poor coordination and limited consultation with refugees undermine service effectiveness [96]. It also reflects the heterogeneity of refugees' capacities, risks, and preferences, which must be treated as a design requirement rather than an implementation detail [18]. A concrete implication is to design service-navigation tools that operate as two-way coordination infrastructure. Such systems should allow refugees to (a) understand the overall service flow and (b) state their needs early, while enabling providers to allocate support where it is truly needed. A checklist or lightweight needs-assessment workflow can help prevent cases like P12's inaccessible hotel room for wheelchair users. The goal is for the system to proactively surface accessibility and risk factors at intake, and to trigger service adjustments by default. This aligns with arguments that understanding refugees' needs is essential for effective welcoming and support [116]. This navigation layer should also support flexibility in aid modalities. Participants' critiques of "phones and vouchers" illustrate how rigid provisioning can undermine dignity and usefulness. Participant P7 described malfunctioning phones that froze. Participant P4 proposed offering a choice between a phone and an equivalent voucher. Participant P5 described how vouchers restricted purchases in everyday family life, such as not being able to buy ice cream when children saw other kids enjoying treats. These show that autonomy in micro-decisions shapes whether a new place can feel like home. Digital systems can operate this by supporting choice architectures, such as allowing newcomers to select preferred support types within defined budgets and constraints. Design should also recognize that refugees often rely on mobile messaging as a practical backbone for coordination, especially in early stages [170].

7.3.3 Design for Trust and Empathy

Phase 1 shows that information alone is not sufficient for successful settlement. Trust and empathy shape whether support is usable. Participants valued social workers who acted "like a friend," and described warmth and follow-up care as more meaningful than material support. Conversely, P7's experience of unsafe neighborhood conditions, with drunk neighbors throwing bottles at night, illustrates how a lack of effective response can undermine not only safety but also belonging. This resonates with

research on discrimination, stereotypes, and the social conditions that make refugees feel unwelcome [18]. It also reflects the bridging role of service providers in mediating relationships between citizens and refugees [193].

A design implication is therefore to support empathy as a system property, not an individual virtue. Service organizations could use tools that track not only tasks completed, but also responsiveness patterns, follow-up actions, and escalation pathways. The point is not surveillance of staff. The point is quality assurance that prevents severe “support gaps” from being treated as anecdotal exceptions. At the community level, technologies can also support mutual understanding by facilitating safe, structured social contact and cultural learning opportunities, consistent with arguments that social contact can reduce misunderstanding and build empathy [193].

Designs should also address mistrust toward authorities and unfamiliar systems. In Phase 1, P10 initially relied on relatives’ advice for Centrelink and banking, and only sought provider help after encountering problems. This is consistent with findings that refugees often prefer identity-known sources and peer advice, and avoid unfamiliar information channels [18]. Technology can respond by enabling peer-to-peer knowledge exchange with moderation, multilingual scaffolding, and mechanisms that help people assess the reliability of guidance without demanding formal literacy.

7.3.4 Enabling Social Connection and Cross-Border Ties

Across phases, the findings suggest that fostering a sense of home requires designing for both local bonding and transnational continuity. Phase 1 highlights newcomers’ desire to connect with co-ethnic peers. Participant P9 explicitly wanted connection with people who share language and similar resettlement experiences, especially while learning English. This aligns with literature emphasizing refugees’ reliance on peer networks for everyday support, and the value of community participation through cultural and religious groups [74]. It also aligns with work arguing for social events and peer exchange to address information gaps and mistrust [18].

Phase 2 extends this by showing that many refugees’ strongest relational attachments remain cross-border. Participants imagined technologies that go beyond conventional video calls, such as a life-size “3D projector” that could display distant family members, or a wall-size screen enabling real-time co-presence. These designs express an experiential need: to make connection feel less like scheduled communication and more like ordinary togetherness. While tools like *WhatsApp* and *Zoom* support contact, they often fail to convey the embodied and ambient qualities of family life. At the same time, Phase 2 highlights constraints. VR/MR telepresence introduces problems when some family members are co-located and others are remote, and avatar technologies still struggle to reproduce subtle emotional cues.

Phase 3 offers a complementary approach. *Culture Link* does not attempt to simulate real-time presence. Instead, it creates shared artifacts that make families feel together through co-authoring

and joint interpretation. F4's father, reflecting on years of separation, imagined that a tool like *Culture Link* could have offered a more engaging way to share everyday moments. This suggests an implication: cross-border connection does not require perfect telepresence. It can also be mediated through shared creative routines and artifacts. Designers should consider a spectrum of connection modalities, from synchronous telepresence to asynchronous co-creation, and choose approaches that fit resource constraints and family rhythms.

7.3.5 Support Home-Making through Material Culture in Constrained Environments

Phase 1 demonstrates that housing is a pivotal anchor for belonging. Participants described home as something they finally had after years of uncertainty. P12's account of waiting to "come back to our home and close the door and we feel at home" shows how security, privacy, and stability converge in everyday domestic practice. At the same time, Phase 1 surfaces housing constraints that undermine this. No-inspection policies and six-month lease commitments limited newcomers' ability to choose housing that fits their needs. Shared housing introduced conflicts around hygiene, safety, and co-living norms. P3 struggled with a flatmate leaving a shared bathroom unclean. P7 experienced neighborhood insecurity. These align with arguments that housing and sense of place are fundamental to belonging, and that unstable or unsuitable accommodation can harm well-being [54, 149, 168].

Phase 2 adds that home-making is not only about physical safety, but also about cultural continuity and dignity through personalization. Refugees often cannot carry meaningful artifacts through displacement. This creates a design space for technologies that help recreate or represent lost artifacts and aesthetic anchors [111, 202]. A digital artifact DIY and display platform, potentially using AR, can allow refugees to overlay cultural objects into rented spaces where physical customization is limited. The "magic screen" concept designed by participants P9 and P10, which displays Iranian carpets, is an example of how digital augmentation could restore cultural familiarity without violating rental constraints. This aligns with calls for low-cost DIY toolkits that enable personalization in resource-limited contexts [124] and with work showing that migrants anchor themselves through familiar objects and practices.

A practical implication is to design for shared and constrained living. Vyas et al. has highlighted everyday resilience as a situated, social, and care-focused process through which people navigate constrained circumstances using existing strengths, resourceful routines, and community networks [197]. In line with this thesis, the interpretation of refugee home-making as not only a response to loss and constraint, but also an active process of adaptation, care, and everyday ingenuity. Phase 2 participants proposed foldable beds and solar-powered systems, and highlighted cost and space limits. Designers should prioritize compact, modular, and multi-functional forms, and ensure that power

requirements and maintenance burdens are minimal. This emphasis on contextual fit also resonates with recent HCI work on smart and accessible homes. Vyas and Shipankar argue that accessibility is not a fixed property of a technology or dwelling, but emerges through situated interactions between people, built environments, adaptive practices, tools, and care networks [201]. Although their work focuses on people with paraplegia, this perspective is relevant to refugee home-making because participants in this thesis also navigated constrained domestic environments, including shared housing, rental limitations, limited space, privacy concerns, and uneven access to resources. Similar ideas appear in prior work with refugee youth, such as solar-charging devices [71]. In short, “home technologies” for refugees must assume partial control over space, partial control over infrastructure, and limited budgets.

7.3.6 Lower production barriers for cultural expression

Phase 2 and Phase 3 jointly show that cultural continuity and storytelling are central to home. Yet many tools presume representational skill or language fluency. Systems that require drawing, writing long narratives, or navigating complex menus can exclude precisely the participants they aim to support. Phase 2 noted that some migrants felt discomfort with hand-drawing in prior systems, which can limit expressivity and uptake [146]. Phase 3 shows a different interaction pattern. The image-to-image workflow allowed children and adults to propose imaginative combinations using existing photos or web images. F3’s children could suggest playful combinations such as “Spider-Man and Pikachu,” and see them materialized without advanced editing skills. Parents could combine old photos, landmarks, and symbols without producing polished drawings. This resonates with work arguing that generative tools can widen participation by decoupling idea quality from representational skill [112]. An implication is to treat low barriers as a core mechanism for belonging. Simple interfaces, visual-first flows, and low learning costs help families participate on their own terms. This is particularly important where literacy and language proficiency vary across family members and across generations.

7.3.7 Design for engagement and participatory prompts

Phase 3 provides specific guidance for AI-mediated storytelling. The key effect was not visuals but engagement and interactions among family members. In Family F4, the AI rendered the honeymoon place more glamorous than reality, prompting the 12-year-old to ask whether it was “for real.” This mismatch did not confuse the family. It gave the mother an opening to narrate the emotional history of the place and the relationship journey. In Family F1, merging two photos from different times created a “successful” composite because it captured the feeling of everyone being together. In Family F2, the Taj Mahal served as a symbol of love and a hoped-for future visit, even though it was not a record of a past event. These episodes show that symbolic recomposition can help families hold past, present, and imagined futures in one frame.

This motivates an implication: design AI systems to support open-ended reinterpretation rather than strict recollection. This aligns with arguments that digital mementos and artifacts invite people to continually rework the meanings of the past, rather than freezing them [111]. It also aligns with framings of family stories as mosaics assembled through small contributions across generations [98]. In displacement contexts, this is especially important because closure is often impossible. Families benefit from technologies that support meaning-making under uncertainty.

At the same time, designers must actively manage the risks of false memory and deceptive realism. Phase 3 suggests that stylized, “cartoon-like” outputs can help users interpret composites as prompts rather than evidence. This contrasts with findings that photorealistic AI edits can induce false memories when they mimic authentic records [130]. A design implication is to provide interface cues that reinforce “prompt” status. Examples include presenting inputs alongside outputs, inviting reflection questions, and encouraging talk about what changed and why. These cues support sense-making and reduce the chance of users treating outputs as factual records.

7.3.8 Redistribute Memory Work across Family Members

A major cross-phase implication concerns who does the work of belonging. Phase 1 shows that service systems can unintentionally create burden when coordination fails. Phase 2 highlights that memory work and cultural continuity can be meaningful, but also taxing and unevenly distributed. Prior work has shown that transnational families often have a designated “memory-keeper,” and that this role can be gendered, imposed, and exhausting [48]. Phase 3 shows micro-moments where *Culture Link* supported more shared participation. Children initiated contributions and shaped directions. In F5, the younger daughter used an online image resembling a left-behind cat, and the generated composite placed it by the river from her mother’s village memory. This staged a shared remembering that did not rely solely on the parent to supply artifacts and narratives. In F2, the eldest daughter described how the family comforts the father when war memories surface, showing that children can be emotional contributors in memory conversations. At the same time, parents remained central storytellers, such as F5’s mother’s detailed explanation of sago processing, or F4’s father’s account of celebrating birthdays via video calls during separation. The implication is that systems can create interaction formats that allow multiple members to have legitimate roles. Designers should support multi-agent co-construction, rather than building tools that assume one person curates archives for everyone else [48, 98]. Turn-taking mechanics, shared prompts, and equal opportunities to contribute can make memory work feel more like family life and less like unpaid labor.

7.3.9 Design Considerations for Ethics, Privacy and Inclusion

Across phases, ethics is not separate from usability. It is part of whether refugees can safely build a sense of home. This aligns with prior work on designing digital platforms with refugee and migrant women, which shows that successful technology design for marginalized communities requires more than providing access to an online tool; it also requires centering care, safety, cultural relevance, digital literacy, material access, and ongoing support [85]. In this thesis, this concern extends from service and housing contexts to AI-mediated representation. Phase 1 shows the importance of safety and privacy in housing and shared spaces, and how insecurity undermines belonging. Phase 3 highlights a specific AI ethics tension. Families sometimes wanted identifiable representations of loved ones. For example, in F1's waterwheel-of-Hama case, the parent hoped the AI would place their own children in front of a hometown landmark, but the output generated generic children. This was simultaneously a limitation and a protective feature. It reduced identity exposure, but it sometimes disappointed expectations for specificity. In F7, the family wanted 'one big family photo', yet the output failed to include everyone as foreground subjects. These cases show that privacy-protective abstraction can conflict with users' desires for faithful representation.

This tension also relates to the broader issue of factuality in AI-mediated memory work. In Phase 3, some generated images departed from what actually happened, such as by idealizing places, recombining people and settings that were never physically together, or replacing specific family members with generic figures. Such outputs can be meaningful for storytelling, but they also risk blurring the boundary between documentation and imagination if treated as accurate records. This is particularly important because generative AI systems can reflect dominant cultural aesthetics and platform values, producing images that may appear more polished, idealized, or culturally generic than participants' lived realities [177]. Therefore, while generative imagery may help protect privacy by breaking the direct indexical link between images and real individuals [114], systems like *Culture Link* should explicitly frame generated images as symbolic prompts for storytelling rather than factual photographs. This requires interface-level cues, onboarding guidance, and clear explanations of how images are generated, so that families can engage with AI outputs as reinterpretations of memory rather than authoritative evidence of the past [32, 157]. This interpretation aligns with recent HCI work on blending generative AI with speculative design, which shows that AI-generated outputs are most valuable as catalysts rather than final design outputs for discussion, reflection, and value articulation [176].

A design implication is to offer graduated privacy modes and transparent trade-offs. Systems could provide clearer options for levels of identifiability, alongside accessible explanations of risks. At the same time, ethical critiques of AI should not translate into withholding AI from marginalized communities. Exclusion can also be a harm, especially where limited access reflects structural inequity

rather than disinterest. In Phase 3, participants with little prior AI exposure still engaged successfully with *Culture Link*. This suggests that the relevant problem is often accessibility, not unwillingness. Therefore, inclusive AI design should prioritize low-friction interaction, minimal text, icon-supported interfaces, and workflows that rely on images rather than literacy.

In addition, generative approaches can sometimes support privacy by breaking a direct indexical link between an image and a real person, while still enabling storytelling. This resonates with arguments that generative imagery can protect subjects in sensitive storytelling contexts [114]. However, designers must remain attentive to governance and accountability concerns around AI deployment in everyday life [157]. For refugee communities, this requires careful protocol design, clear guidance, and interface-level safety features, rather than relying only on written consent forms.

7.4 Limitations

This thesis is based on three qualitative studies that span different moments of resettlement and different kinds of technological engagement. This design enables a staged understanding of sense of home, but it also introduces limits that should be considered when interpreting the findings and implications.

First, the empirical basis is necessarily bounded in scale and context. Phase 1 drew on 12 newly-arrived humanitarian entrants in Australia and focused on services mediated by a single local provider. This offers depth about a specific service ecology, but it may not reflect settlement infrastructures, policies, and resource environments elsewhere, including rural resettlement contexts or countries with different welfare, housing, and visa regimes. Phase 2 relied on a small cohort of participants in Queensland and used group interviews and co-design workshops. The findings foreground what participants could articulate and imagine in a facilitated setting, rather than what they would do without researcher scaffolding. Phase 3 involved seven families in a ten-day deployment of *Culture Link*. It provides rich, practice-based accounts of family storytelling, but it remains a short field trial rather than a long-term adoption study. Across phases, the sample sizes support analytic generalization, but not statistical representativeness.

Second, recruitment and participation constraints shape whose experiences become visible. In Phase 1 and Phase 3, participation depended on contact with a collaborating organization and on the ability to commit time. In Phase 3, the study required multiple family members to participate across days, and families with unstable schedules, low energy, or high caregiving loads may have been less able to join or fully engage. In Phase 2, workshop participation favored those comfortable with group discussion and creative exercises. These practical constraints risk under-representing the most resource-constrained households, including those with limited English, limited time, or acute stress. The dataset is rich, but it does not capture the full tail of vulnerability.

Third, the methods emphasis narrated experience, which creates known biases. Phase 1 relies

on interview accounts about services and early settlement experiences. These are shaped by recall, social desirability, and participants' relationships with service providers. Phase 2 uses speculative and interpretive methods, which are powerful for surfacing values and design imaginaries, but they can amplify what is discussable in a workshop and compress what is hard to verbalize, especially trauma, shame, or interpersonal conflict.

Fourth, there are technological and infrastructural limits in what could be evaluated. Phase 3 evaluates a specific prototype configuration: a web-based, mobile-friendly, image-to-image workflow that produces stylized composites. This choice is central to the argument that low-fidelity generative imagery can support reinterpretation without being treated as evidentiary records. However, the results cannot be assumed to hold for other generative systems, other aesthetic styles, or other interaction designs. The platform also depended on stable connectivity and access to multiple devices. Although devices were provided when needed, this does not eliminate the broader structural issue that connectivity and device access are uneven in refugee communities. These constraints are not only implementation issues. They are part of the phenomenon the thesis studies, since resource constraints directly shape whether technologies can be taken up at all [52, 203].

Fifth, ethics and privacy protections introduce trade-offs that affect both experience and outcomes. In Phase 3, the decision to avoid identifiable likeness in composites helps reduce risks around children's images and third-party processing. At the same time, this abstraction sometimes clashed with families' desire for specificity, such as when parents wanted the image to clearly feature their own children and felt disappointed by generic outputs. This means the prototype's effectiveness must be interpreted as effectiveness under a specific ethical stance, not as a maximal storytelling tool. In addition, participants' comfort with risk varied. Some families expressed little concern about uploading personal images. The study could not fully resolve the tension between participant agency and the responsibilities of researchers and designers in settings where power and information asymmetries exist.

Finally, the thesis makes an integrative argument about shifting needs and belonging across stages of resettlement. While Phase 1, 2, and 3 form a coherent progression, they are not a single longitudinal panel following the same individuals across years. The "continuum" claim is therefore conceptual and comparative, rather than a within-person causal trajectory. Future work could strengthen this by tracking families over longer periods, or by deploying tools like *Culture Link* earlier in resettlement to examine how meaning-making practices interact with acute service navigation needs.

Chapter 8: Conclusion

This thesis asked how technologies can be utilized to foster a sense of home for refugee communities. It contributes a staged, practice-grounded account of how home and belonging are produced through changing needs, resources, and relationships across resettlement, and it demonstrates how different technological roles become significant at different moments.

Phase 1 mapped early-stage resettlement as an evolving service ecology, showing that the first foundations of home are often built through coordinated access to basic resources, service navigation, and interpersonal care. Participants' accounts highlighted how welcome and reassurance were established through small, concrete practices, such as airport pickup, orientation, and immediate provisioning. At the same time, the findings showed that home is undermined by mismatches between support and lived needs. This included inaccessible temporary accommodation for disabled family members, device and voucher provisions that did not fit everyday realities, and housing arrangements that reduced autonomy and safety in shared living conditions. Together, these findings position technologies as potential infrastructures for tailoring, coordination, and agency in the earliest phase of settlement.

Phase 2 shifted focus from service access to place-belongingness and the everyday reconstruction of home. The workshop findings clarified that refugees' sense of home is not only anchored in language and abstract cultural practices, but also in privacy, autonomy, material culture, and the continuity of cross-border strong ties. Participants' designs and narratives pointed to needs that sit between the structural and the intimate. They include control over domestic space, the ability to sustain cultural aesthetics and sensory boundaries, and more immersive forms of connection to distant family. This phase re-framed integration away from a single destination and toward ongoing belonging work that is negotiated under mobility, trauma, and constrained resources.

Phase 3 then translated these insights into a concrete prototype and an in-the-wild evaluation. *Culture Link* was designed to fulfill the thesis's argument of utilizing technologies to foster a sense of home by scaffolding shared meaning-making. In practice, families used composite images as prompts for storytelling, cultural transmission, playful creativity, and intergenerational negotiation. The deployment showed how a co-created visual artifact can redistribute narrative labor. It can invite children to initiate and remix stories, while still recognizing parents as essential carriers of cultural knowledge and memory. It also showed that the how generative AI in this space is not primarily about fidelity. It is about whether the tool creates a shared interactive surface that helps families articulate what matters, negotiate mismatches, and weave past experiences, present routines, and imagined futures into a livable sense of home.

Across the three phases, the thesis advances an integrated view of technology's role in refugee resettlement. Early on, technologies matter as navigational and coordinating infrastructures that can reduce friction, support tailoring, and protect dignity in moments of uncertainty. Later, technologies matter as cultural and relational scaffolds that help people remake home through memory practices, artifacts, and social connection. Finally, technologies can also be designed as family-facing prompts that make belonging co-constructible across generations, even when home remains ambiguous and multi-sited. The thesis shows that fostering a sense of home is not a single intervention problem. It is an ongoing design challenge that requires aligning technological forms with the shifting realities of resettlement, and with refugees' own ways of narrating, negotiating, and living what home can become.

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Appendix A

On Arrival: Challenges and Opportunities Around Early-Stage Resettlement of Refugees in Australia

Song, P., Hebbani, A., and Vyas, D. On arrival: Challenges and opportunities around early-stage resettlement of refugees in Australia. *Proceedings of the ACM on Human-Computer Interaction* 9, 2 (2025), 1–28.[50]

Abstract

When refugees arrive in a host country, the form of immediate help and support they receive from various service providers sets the stage for successful settlement, integration, and social cohesion. This paper presents results from an exploratory study that investigated refugees' perceptions of initial services received upon migration – in the first six months of their arrival. In collaboration with a refugee settlement services provider, we engaged 12 newly-arrived refugees in a qualitative study that employed a photo-diary study and semi-structured interviews. Based on our findings, we present refugees' experiences over three phases: immediate services upon arrival (first day); initial-settlement experiences (first week); and ongoing settlement experiences (up to twelve months). Through an in-depth unpacking of these phases, we show ongoing efforts and challenges associated with resettlement; and present implications for design for CSCW researchers.

.1 Introduction

Australia is a popular destination for migrants. The latest Australian Bureau of Statistics (ABS) census data indicates that in the period extending from 2000 to 2022, Australia welcomed approximately 3 million permanent migrants, with 9% of this comprising of humanitarian migrants [11]. Within Australia's national context, a "humanitarian entrant" refers to individuals who enter the country through its Humanitarian Programme, which encompasses refugees and other individuals with humanitarian needs [12]. While COVID-19 halted most international arrivals into Australia, recent conflicts in Ukraine, Syria, Ethiopia, and Afghanistan, resulted in Australia re-opening its doors to people fleeing these countries and seeking a refugee status. According to the United Nations High Commission for Refugees (UNHCR), as of mid-2022, the total number of individuals subjected to forced displacement

surged to 103 million [61]. Governmental or non-governmental organisations (NGOs) have been making efforts to assist refugees' early-stage resettlement. Australia has two government programs that support newly-arrived refugees: the Special Humanitarian Program (HSP) and the Settlement Engagement and Transition Program (SETS). The HSP encompasses initial services to help refugees begin their lives in Australia, such as airport pickup, immediate accommodation assistance, assistance in finding permanent housing, and connecting refugees with essential public resources. These resources include Australia's social security agency, Centrelink – an Australian Government department that delivers economic support and other payments to Australians, banks, public transport options, translating and interpreting services, healthcare services, educational opportunities, employment assistance, and childcare services [12]. The SETS program provides support for post-arrival refugees who have come to Australia alone. It consists of two parts: client services, which offer refugees settlement-related information, advice, advocacy, and assistance in accessing mainstream and other relevant services; and community capacity-building services, which aim to enhance refugees' social participation, economic prospects, and overall personal well-being, ensuring long-term positive settlement outcomes [40]. In other countries such as the U.S., the initial services provided within 30 days upon arrival include basic food, clothing, shelter, orientation and referral to social service agencies [27]. Ongoing services, encompassing English language training, case management, and employment support, are accessible during the initial 3 to 12 months and can be extended up to 5 years for refugees who are unemployed or receiving welfare assistance [36]. Thus, non-governmental service providers and organisations in the multicultural space, play a crucial role in supporting refugees, by providing mediating support to connect refugees with essential public resources. Current research in Computer Supported Cooperative Work (CSCW) and Human-Computer Interaction (HCI) has primarily focused on understanding and addressing the multifaceted challenges faced by refugees through the development of technological solutions. These challenges encompass language barriers, cultural disparities, limited access to essential resources and services, employment discrimination, and housing difficulties during the initial resettlement phase [42]. Information and Communication Technologies (ICTs) have played an important role in aiding refugees [15, 57], and emerging technologies like extended reality are proposed to have great potential in assisting them [4, 44]. While HCI research has paid significant attention to the services themselves and their accessibility, most studies tend to be narrowly focused on a specific service or challenge, such as healthcare, information-seeking, or interpreting services [15, 24, 58]. There is limited coverage of the understanding of how newly-arrived refugees perceive the support provided by settlement agencies. Therefore, within this context, we aimed to understand the experiences of newly-arrived refugees with the services provided by a mediating service provider, understanding their perspectives of these services to identify potential areas for improvement and explore preliminary design opportunities. To achieve this, we recruited 12 participants who had been in Australia for 6 months, by collaborating with a refugee settlement service provider. The overarching

research question that we aim to explore in this paper is ‘how do newly-arrived humanitarian entrants perceive the settlement services provided by the service provider in Australia?’. Data were gathered by employing a two-stage qualitative approach that combined a photo-diary exercise, where participants were asked to take photos to record their experiences, followed by semi-structured interviews to further unpack/understand these experiences. Our data analysis is presented across three distinct phases of service provision: immediate services upon arrival, initial services, and ongoing services. The immediate services upon arrival include our participants’ experiences on the first day of their arrival in Australia (e.g., hotel accommodation, giving a basic essential pack, and induction of the local area for buying groceries and using public transportation). The initial services comprise connecting refugees to essential public resources, such as registering with local municipalities, medical insurance, and welfare agencies, and enrolling them into training programs around education, employment, and language learning. The ongoing services include providing long-term accommodation and exploring employment opportunities to enable settlement in the host country. This paper makes two contributions to the current CSCW & HCI research on the refugee discourse: 1) It provides an empirical account of newly-arrived refugees’ experience in accessing services provided by non-governmental organizations. There are limited studies in the HCI domain where the mediating service providers’ role is discussed in relation to refugee research. 2) It identifies areas where services offered by service providers can be enhanced and proposes design implications to address these problems.

.2 Background

.2.1 Refugees in HCI & CSCW

Current research in CSCW and HCI that focuses on refugee resettlement largely aims to address various challenges associated with the process [49]. These challenges range from mistrust and skepticism from local communities to cultural barriers, trauma from displacement, and limited social resources [5, 6, 49]. For example, Talhouk et al. investigated the experiences of refugees in Lebanon using the electronic voucher system for food aid and highlighted the existing issues of the system such as power and information asymmetry [56]. Weibert et al. proposed the Arrival Literacy concept, referring to mastering the necessary skills to navigate various forms of text (digital and paper-based) for dealing with bureaucratic and administrative tasks, and argued such skills are crucial for establishing a sense of belonging [65]. Fisher et al. summarized the principles of the humanitarian research framework, after years of engagement in conflict zones, and pointed out the issue that the young generation suffered from disrupted education leading to low literacy levels [22]. To aid refugees in overcoming these challenges, researchers have developed and explored technologies primarily for educational and skill-building purposes. For example, certain studies have promoted cultural engagement and preservation

by making [33], and employing 3D digital fabrication techniques to enhance children's education [52], and focused on maintaining cultural identities, health, and well-being [23, 49]. Lee et al. studied how RAS (refugees and asylum seekers) in Australia develop their entrepreneurship and suggested that technologies have the potential for upskilling refugees, and benefitting their entrepreneurship [32]. Moreover, researchers have delved into the difficulties refugees face in adopting technologies in host countries. One notable study by Sabie et al. used three years of fieldwork in Canada to outline the challenges refugees experience when accessing essential services through digital platforms [46]. HCI research has also ventured into fostering empathy and public engagement. Studies like those by Norman et al. used CityScope, a platform for urban planning, to facilitate public participation in decisions related to refugee accommodation [39]. Additionally, Kors et al. utilized a Mixed-Reality game to spotlight the struggles that refugees endure, suggesting that Extended Reality (XR) could serve as a powerful medium for generating empathy [30]. Virtual Reality (VR) has been particularly effective as an empathy-building and knowledge-building tool. The 360-degree film "Clouds Over Sidra" allows viewers to immerse themselves in the experiences of residents of the Zaatari Refugee Camp, which houses 130,000 Syrian refugees [10]. In addition, Virtro Technology [59] has developed VR programs to assist refugees and immigrants with language acquisition and job readiness. The use of mobile technologies is also beneficial for refugees' resettlement process, including promoting social integration and providing chances to improve their access to valuable information that can support their daily routines [3]. For example, Talhouk et al. pointed out that refugees have varying informational needs at different times in their adaptation journeys, and technologies should facilitate the sharing of both general and local knowledge [58]. ICTs have been widely deployed to support refugees [31], such as helping refugees find essential information [7, 24], treating mental stress problems [4, 20, 53], building social networks [5, 49], as well as aiding in the design and planning of living spaces [39, 49]. As Bhandari et al. argued most of their asylum seeker participants accessed the internet using mobile devices at least part of the time [14]. However, due to digital literacy and language barriers, Jensen et al. revealed that digital tools can both aid and hinder the integration process of refugees [28]. Thus, there are many challenges in designing technologies for RAS (refugees and asylum seekers). Talhouk et al. identified challenges in integrating health technologies for Syrian refugees in Lebanon, highlighting that varying resources, mobility of refugees, and perceptions of refugees' technology and health literacies can affect the success of such initiatives [55]. Lengyel et al. also suggested that online technologies can be a resource for RAS while also exposing them to racism [34]. Literature has increasingly engaged with the issue of refugees' access to public services, focusing on aspects such as user experience, language barriers, data privacy, and accessibility. Although these themes contribute significantly to the existing body of knowledge on refugees in CSCW & HCI, there is a gap in understanding the role that mediating service providers and non-governmental organisations play during refugees' resettlement and refugees' experience towards the services facilitated by the service

providers. As such, the primary objective of this research is to explore the systematic support that newly-arrived humanitarian entrants received from the service providers.

.2.2 Early-Stage Settlement Services and Service Providers

The refugee-focused service providers play a pivotal role in facilitating the integration and well-being of refugees by connecting them to essential services such as housing, healthcare, education, and employment [51]. As the definition of mediating organisation proposed by Berger and Neuhaus, “those institutions standing between the individual in his private life and the large institutions of public life”, the non-governmental refugee-focused organisations and service providers serve as mediating organisations [13]. These service providers create a sense of welcoming, belonging and appreciation among individuals and endeavour to integrate refugees into the local community [26].

While in the field of CSCW & HCI research, the mediating organisations or service providers to refugees are not widely studied, other research fields have shed light on their effects and existing issues. Üstübcici [63] conducted interviews, observations, and informal discussions with service providers in Istanbul, highlighting their crucial role in supporting refugees. This role encompasses unpacking hospitality, facilitating refugee reception, and fostering social cohesion. The author emphasized the importance of focusing not only on interactions between refugees and service providers but also on interactions between service providers and their fellow citizens, which is essential for mitigating public resentment towards refugees [63]. Ekmekcioglu et al. [19] studied the practicality of remote work mode for social workers from humanitarian organizations and concluded that pivoting to remote is not favoured or feasible under a low-resource context.

Jewson et al. [29] studied the experiences and issues of service providers in supporting refugees, in Geelong, Australia. Through semi-structured interviews with 22 participants who worked in refugee-specific roles or other related service providers, they concluded that the barriers negatively influenced the effectiveness of the services provided to refugees in regional and rural areas, which include political elements and media, the locality of resettled refugees, and structural and organisational cultural issues [29]. McIntosh et al. [35], in their New Zealand-based study, adopted the Ketso method with stakeholders from 34 refugee-focused service providers, a facilitated workshop technique, to gain insights on how to better organise the welcome offered by service providers. They found seven common emerging themes identified by participants including relationships to challenge discrimination, education, resources, policy, and service delivery, understanding clients’ needs, empowerment, and capacity building, welcome and nurturing, research and advocacy for change [35]. However, it is essential to note that they predominantly collected this data from the viewpoints of service providers, as all participants involved in these studies were either employed by or affiliated with service providers.

In contrast, O’Higgins [41] focuses on the perspectives of young refugees and their experiences with service providers in the UK, through engaging them in focus groups and other group activities.

The author argues that social workers tend to deny support if young refugees do not meet the level of vulnerability they were expected to, as social service providers consider agency and vulnerability as two opposing and exclusive categories and discuss the significance of engaging young refugees in participative group work for peer support [41]. While our research also focuses on the newly-arrived humanitarian entrants' experiences with service providers, it covers a more diverse range of ages of participants and proposes ideas on how technologies can be utilised for improvement.

Many have investigated the initial services provided to refugees upon their arrival in different countries. For example, in the UK, newly-arrived refugees are provided with information covering group charters, introduction to the neighbourhood, property instructions, emergency contacts, maps of the local area, public transportation timetable, a group charter, contacts of the service provider, as well as photos with a welcoming message [43]. They also receive initial goods for the first two weeks in the UK, comprising £200-300, pre-paid transportation cards, SIM cards, groceries, toiletries, warm clothes or vouchers to purchase clothes if refugees arrive in winter, and a laptop or tablet to access information online [43]. In addition, under the national context of New Zealand, the organisation Save the Children, designed a dedicated kit for refugee children to facilitate their school transition [1]. Different from the adults, the kit for refugee children contains a welcome letter or video, photos or a tour of a New Zealand school, instructions for preparing for school, a school bag, uniforms, tips for making friends, an introduction to New Zealand culture, and Māori greetings and phrases [1]. In the U.S., the ongoing services lasting for 3-12 months to support refugees' integration contain English training, case management, and employment support [36].

Social Inclusion Theory emphasizes the importance of enabling all individuals to participate fully in society [64]. For refugees, social inclusion involves overcoming barriers related to language, culture, employment, and access to services [9, 62]. This theory provides a lens to examine how resettlement services can support refugees in becoming integrated members of their new communities. Recognizing the known difficulties refugees encounter in accessing public services, prior research in HCI has dedicated significant efforts to enhance the accessibility of resettlement-associated services. Dahya et al. explore the intersection of technology and social inclusion for refugee women in the United States and provide insights into how technology education and access can support refugees' integration and participation in society [17]. Coles-Kemp and Jensen [16] found that even though refugees face uncertainty and insecurity in their daily lives, they focus more on the benefits of accessing services over the vulnerability or the protection from threats in the services. Their research also indicates that health, time, and language-related challenges represent the primary obstacles for refugees when accessing services, rather than issues related to digital literacy or the accessibility of technologies. Similarly, Talhouk et al. [57] found that Syrian refugee women in rural Lebanon commonly utilize mobile phones and the messaging app WhatsApp. In addition, they investigated the potential of ICTs to remotely assist these women in accessing antenatal care services. The communication between refugees and service

providers has also been deemed essential for refugees' integration and resettlement. Brown and Grinter [15] created an app Rivrtran to facilitate communication between newly-arrived refugees and their mentors, where the objective was to enhance the mentors' capabilities and streamline communication processes, particularly in cases where mentors and refugees did not share a common language. This was achieved by introducing a voluntary interpreter and implementing a human-in-the-loop interpretation system. Previous studies have often focused on a particular aspect of service accessibility, aiding specific public service concerns [15]. However, there remains a gap in understanding the complete resettlement landscape for refugees, encompassing all services offered by service providers. Therefore, our exploratory research aims to bridge this gap by providing a holistic overview of resettlement services delivered to refugees during their initial resettlement phase, as well as capturing the refugees' experiences with each of these services. Furthermore, our study seeks to identify areas where service providers can improve their support to facilitate the integration and resettlement of refugees more effectively.

.3 The Study

In this section, we outline the research design and methodology employed to achieve the objectives of this study, which aims to understand the experiences of newly-arrived refugees with the services provided by a service provider, identify potential areas for improvement and explore preliminary design opportunities.

.3.1 Research Context

The authors collaborated with a refugee settlement service provider for migrants and refugees in Australia. This service provider has helped new arrivals in Australia to settle into their new lives in the new country, forging connections within their communities, seeking employment and educational opportunities, developing new skills, and establishing a sense of belonging. Different from other service providers focusing on a specific service, this service provider offers support and goods that are necessary to newly-arrived humanitarian entrants and connects them to all public resources and services available to them, which acts as a mediating organization. The service provider assisted our research project in locating participants and providing bilingual interpretation services for participants as and when needed. In return for taking part in this project, each participant received a \$20 grocery gift card, as a token of appreciation.

.3.2 Participant Selection and Research Design

Our study employed a two-stage qualitative approach to gather an in-depth understanding of participants' perceptions and experiences of their initial settlement journey in Australia. Following ethical approval from our institution, potential participants were handed an information sheet along with a consent form. We sought participation from newly-arrived refugee adults who arrived in Australia between late 2022 and early 2023. Following this process, 12 participants volunteered to take part in this project – we had 3 participants each from Syria, Ethiopia, Afghanistan, and Iran (6 men and 6 women) of varying ages (from 23 years to 62 years). The demographic characteristics of the participants are presented in Table 1, along with their educational details, household details, ethnicity and language. It is important to note that the household size indicates the number of individuals migrating together as a family unit to Australia and living in a shared space. After receiving signed consent, participants took part in two consecutive stages of this research, each of which is explained below in detail.

Stage One.

Stage one comprised a photo diary task assigned to participants, which required them to document their living spaces and utilisation of goods provided by the service provider upon their arrival in Australia, over the course of 5-7 days. Diary studies are a well-established method used for capturing a wide range of information [38]. Typically, this method involves participants recording their experiences throughout the day using written descriptions, audio recordings, and pictures [2, 45]. Diary studies offer significant advantages by capturing data from the participant's perspective, using their preferred communication methods, and within real-world contexts, which is particularly effective for collecting

Table 6: Participant Demographics

Participant	Age Range	Gender	Educational Level	Household Size	Ethnicity & Language
P1	20s	M	Secondary	1	Afghan (Dari)
P2	30s	M	Secondary	1	Iranian (Farsi)
P3	40s	F	Tertiary	1	Iranian (Farsi)
P4	40s	M	Tertiary	1	Iranian (Farsi)
P5	60s	M	Secondary	6	Eritrean (Tigrinya)
P6	30s	F	Secondary	7	Eritrean (Tigrinya)
P7	20s	F	Secondary	2	Eritrean (Tigrinya)
P8	60s	F	Primary	3	Afghan (Dari)
P9	50s	M	Secondary	6	Afghan (Dari)
P10	30s	M	Tertiary	3	Syrian (Arabic)
P11	50s	M	Secondary	4	Syrian (Arabic)
P12	30s	F	Secondary	5	Syrian (Arabic)

subtle insights and nuanced details, especially for infrequent, sensitive, or hard-to-observe events [47]. Participants were asked to record responses to three major questions and photo shooting tasks every day for 5-7 days: 1) Item Usage: Choose an item from the basic essential package provided by the service provider, and record and discuss how it was used and incorporated into their daily lives, capturing photo evidence of its usage; 2) Perception of Services: Discuss a service provided by the service provider, how it facilitates the re-settlement or integration, and any suggestions on potential improvements, including taking a photo of the service if participants were receiving it during the photo-diary duration; 3) Accommodation and Personal Changes: Record any personal changes made to their current accommodations to meet their specific needs, any issues of their current homes and lives, and future expectations, including taking photos of their changes or modifications to their homes. Participants were empowered to select their preferred method for completing the photo diary, either digitally or via paper, based on their level of digital literacy or preference. Figure 1 shows examples of photo diaries from our participants. The photo diary submissions were made daily. Paper-based photo dairies were translated by interpreters and reviewed immediately before stage two of this research, i.e., the interview phase. Those opting for the digital format submitted their daily photo diary tasks via email, WhatsApp, or direct messaging the first author. The photo diaries completed in languages other than English were translated by interpreters. One elderly participant (P8) faced difficulty in completing the diaries or accurately expressing themselves due to their limited language literacy, so a young family member of hers assisted in completing the task.

Stage Two.

Upon completion of stage one, stage two involved semi-structured interviews accompanied by photo-elicitation with participants after they completed the stage-one photo diary. The photos that participants took from the stage one photo diary task served as a conversation catalyst for the interviews in stage

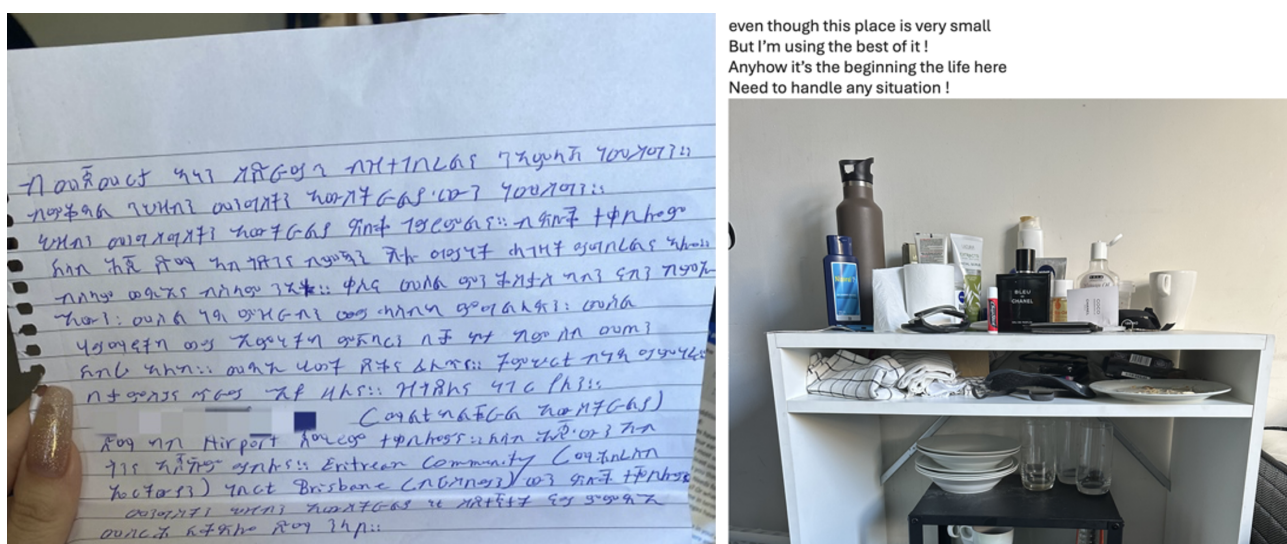


Figure 18: Examples of Photo Diary Collected; 1) Paper-based; 2) Digital, email-based

two, to inspire rich discussions about their personal experiences, emotions and associations related to their resettlement process and the support they received. Participants were empowered to choose the physical locations of their choice for the interviews. Therefore, the interviews took place in participants' homes or other locations that were convenient for them. During the interviews, participants who were confident in their English proficiency communicated in English, whereas others received assistance from interpreters.

.3.3 Data Collection & Analysis

Data are collected through the stage one photo diary study over 5 to 7 days, and stage two which comprised of semi-structured interviews, lasting on average of one hour. The former captured visual documentation of participants' living situations and interactions with the basic essential package, while the latter gathered in-depth insights guided by the photo diary. The collected data, including interview transcripts and photo diaries, underwent thorough thematic analysis [60]. This entailed comprehensive readings of the materials, followed by systematic text coding. An inductive coding approach was utilized to initially cluster the services, then pinpoint and categorize the needs of participants that fall into each service category [21]. Besides grouping services based on the timeframe, the initial development of the codebook involved labelling recurring words and phrases, followed by hierarchical grouping of similar codes. Subsequently, the codebook underwent multiple rounds of revision by the second and third authors before being further refined by the first author. Consensus meetings were held to resolve coding discrepancies and improve the reliability of the coding process. Through this process, emerging themes and patterns were identified thereby providing insights into participants' perceptions of the early-stage resettlement and their evaluation of the support received.

.4 Findings

This section presents the research findings, derived from an in-depth exploration of the multifaceted early-stage resettlement process for newly-arrived humanitarian entrants, where the authors identified a diverse range of services offered and associated challenges by individuals under the auspices of the local service provider. As depicted in Figure 2, the services are categorised based on the timing and duration of their provision to newly-arrived humanitarian entrants throughout their resettlement journey. There are three key stages of the refugee resettlement process, which include: immediate services upon arrival, initial settlement services, and ongoing services. Each of these stages represents a distinct phase in the resettlement journey, addressing specific needs and challenges encountered by newly-arrived refugees. The immediate services upon arrival focus on urgent needs, such as providing basic resources (e.g., transportation cards, SIM cards), airport pickup, and temporary accommodation

arrangements. The initial settlement services cover the initial integration steps, including access to essential public resources, language training, housing, and employment assistance. This stage helps refugees begin their adaptation to local systems and environments. The ongoing services reflect the longer-term needs of refugees, particularly in healthcare, financial stability, and emotional well-being. These services aim to support refugees' long-term independence and successful integration into the host society. Throughout each stage, various themes emerged, highlighting the critical role of service providers and the participants' evolving needs. These themes are discussed within each stage to offer a comprehensive view of refugees' resettlement experiences.

4.1 Immediate Services upon Arrival

Upon their arrival, newly-arrived humanitarian entrants are greeted by a bilingual case worker, who is tasked to assist with a range of services. These comprehensive services include airport pickup and support at both the arrival and transferring terminals, providing meals, facilitating hotel check-in, and property induction on the very first day upon arrival, along with a basic essential package provided for the first few days in Australia. Orientation to the local area is conducted on the second day. The basic essential package, a curated collection of indispensable items catering to daily necessities, encompasses a mobile phone with a SIM card, vouchers for shopping at supermarkets, and a local transportation card.

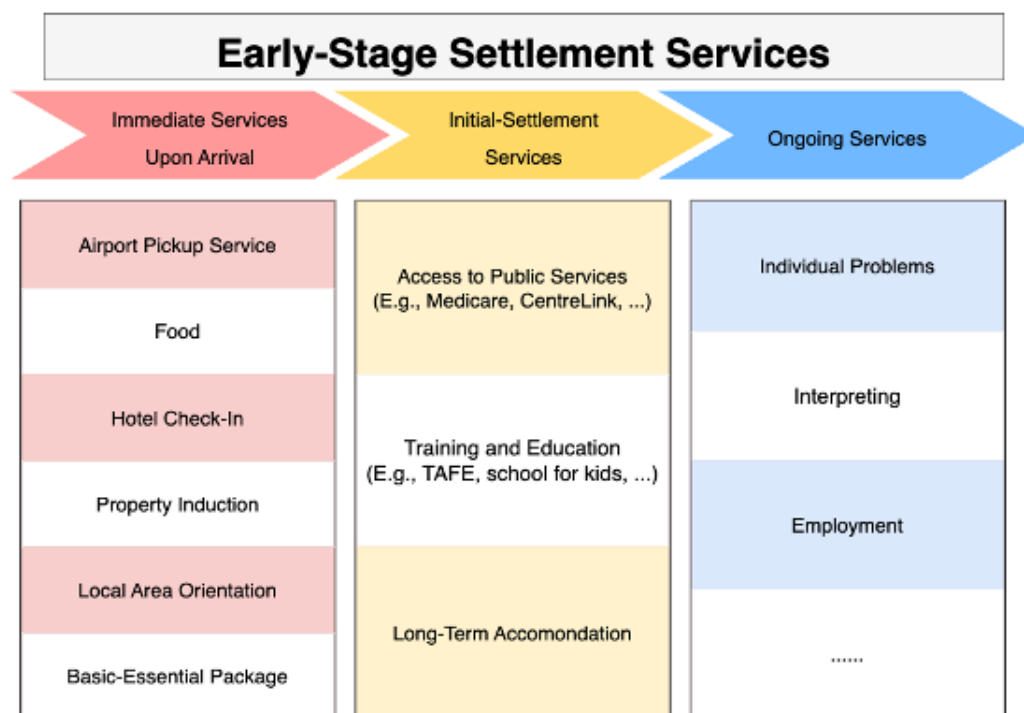


Figure 19: The array of services provided during various stages of resettlement.

Sense of Welcome and Reassurance

Hospitality is a core notion embodied in the initial-stage resettlement services provided to newly-arrived humanitarian entrants. Many services create an environment of hospitality and friendliness, helping newcomers feel embraced and develop a sense of reassurance in the new environment. Participants frequently highlighted their positive experiences with the welcoming atmosphere fostered by social workers. For example, P10 initially worried that his family might not be able to find the social worker at the airport. However, he easily identified the social worker holding a large placard at the arrival gate. P10 remarked: *“The person is almost, could say waiting for us at the gate of the airport. It was very, very easy to find him. And he guides us through the checkout, step by step. The person was very helpful. And we personally had a problem and he helped us to solve it. We couldn’t find our visa and he got us to the person who could help us, and he said wait here is normal procedure and they find our visa and re-enter immediately. It was very helpful.”* Additionally, the orientation service conducted on the second day of each participant’s arrival, which included a city tour and introduction to local facilities, further demonstrated the commitment to hospitality, ensuring newcomers felt cared for and supported. P11 expressed his joy about the city tour and emphasised its significance in giving newcomers a sense of welcome. P10 also highlighted this aspect of the orientation, stating: *“The second day they immediately met us in the morning, the guy took us for a tour in the city, showing the city council... They introduce the buses, the streets, the lights, things like that. Because everything is new for us, new rules. We don’t have it in our country. That’s why they introduced us to everything in the first two days.”*

Through participants’ responses, it is evident that the local area orientation service not only provided newcomers with an enjoyable experience of exploring the city, but also delivered feelings of hospitality, friendliness, and a sense of being embraced and accepted in their new home country and city. It familiarized them with the overall settings of the local area, local culture, and everyday practices, enabling them to integrate more effectively and quickly into the new country. One identified future improvement of the orientation service was the staffing level. In Participant P2’s case, the social worker was assigned to two families simultaneously, resulting in limited time for local area orientation after the bank appointments. Consequently, P12’s family was unable to receive information about essential information such as how to purchase groceries and use vouchers. Fortunately, P12 mentioned that a fellow hotel resident who spoke the same language assisted. This situation underscores the need for adequate staffing levels to ensure that all newcomers receive comprehensive orientation and support.

Tangible Support for Physiological needs

The initial-stage resettlement services effectively fulfil the basic physiological needs of newly-arrived humanitarian entrants, ensuring they have the essential resources required for daily living, such as food and shelter. It was learnt that newly-arrived humanitarian entrants were offered meals upon arrival, catering to their immediate nutritional requirements. Hot food was provided for participants who arrived during mealtime; otherwise, the service provider would offer bread and fruit. For example, P10 was served a chicken meal, whereas P4 received bread with jam and orange juice. Most participants expressed gratitude for the efforts taken - for example, P11 noted, *“The first meal when we arrived, it was so helpful, so help, because we don’t know where to find the restaurants”. The service provider accommodates newcomers at hotels before finding long-term housing solutions for them. Regarding the hotel check-in services, all participants reported that the process was quick. The social worker took them to the hotel immediately after picking them up from the airport, allowing them to rest on the first day. The provision of the basic essential package played a crucial role in meeting the basic needs of newcomers by providing transportation, access to information, technologies, and everyday goods. Many participants highlighted the importance of the transportation card in the package for navigating their new environment, and some participants still kept and continued using the transportation cards provided by the service provider till now. As P10 noted, “I’m still having the transportation card, you wanna see? Two transportation cards, one for me, one for my wife. I think the transportation card is the most useful one (among all the items in the basic essential package). The card helps you, especially at the beginning, when they learn how to use the public transportation, it helps a lot.”* Another highly regarded item was the SIM card. Several participants emphasized how this SIM card facilitated their lives. For instance, P4 highlighted the significance of staying connected, while P12 emphasized the role of the SIM card in overcoming weak internet signals during their hotel stay. Individuals or families with smaller households expressed contentment with the voucher’s value, finding it adequate for their needs. P3 could not remember the exact number of vouchers, but she told us there were two or three cards of \$50, and it was sufficient for her to buy food and groceries, as the service provider had already provided personal hygiene products such as shampoo, toothpaste, and other essential hygiene products. While some families with bigger households mentioned they received \$350 vouchers for the first two weeks, P8 and P5 noted that they were able to request more vouchers if it was insufficient. For example, in P5’s case, as Centrelink had a delay in processing their payments, so they asked for an extra \$200 voucher, *“So when they came they give us, as I told you, the voucher. It was like \$350. And also, we didn’t have Centrelink. Obviously, they got everything sorted like the bank and everything. But the Centrelink was delayed for a month and two weeks. We have to just keep waiting for the social worker to send us voucher again. So she will send like \$200 voucher for the Woolworths for us to go and get food or whatever.”*

These comprehensive efforts underscore the resettlement services’ dedication to ensuring that

newly-arrived humanitarian entrants have their basic and physiological needs met, facilitating a smoother transition and integration into their new environment.

Tailoring Support to Unique Needs

In addition, it is worth mentioning that besides conventional transportation and lodging provisions, another important aspect of the resettlement services is tailoring support to address individuals' unique needs. Each newcomer or newly-arrived family may have different physical or mental conditions, especially families with disabled members. For example, P12 shared a touching narrative of how the service provider's dedicated support made a profound difference in her family's transition journey. P12's family included members with severe disabilities, which required specialized attention. P12 mentioned that her family informed the service provider of their situation on short notice, yet the provider demonstrated exceptional commitment by arranging additional staff support in response to their needs. While the other family members were brought to the hotel, the disabled family members were taken to the hospital with medical assistance. Such personalized efforts were deeply appreciated by P12, who expressed her gratitude for the crucial role the service provider played during this critical phase of their lives. However, the hotel room provided to P12's family wasn't suitable for wheelchairs, due to the narrow doorways and stairs in the room. This example embodies a potential improvement for service providers. Another area for improvement is the provision of phones and vouchers. While some participants were satisfied with the mobile phones included in the essential package (Figure 3), others suggested that the quality and functionality of the phones could be improved. For example, P7 noted issues with the phone freezing and not working well: *"The phone didn't really work. So, we had a problem with a phone... it froze. It freezes, like if someone calls you, it just freezes, and you can't pick it up or like something"*. These concerns about device quality were common, especially since many participants had brought their own phones to Australia, rendering the provided devices redundant. In light of this feedback, P4 offered a constructive suggestion to improve the provision of mobile phones. He proposed that the service provider could give newcomers the option to choose between receiving a mobile phone or an equivalent monetary voucher. This approach would allow participants to tailor their choices based on their specific circumstances and preferences. P4 also emphasized the significance of being allocated a 'memorable' phone number to facilitate integration, highlighting the potential benefits of providing flexibility in phone selection and associated use within the chaos of initial settlement. Similar advice was also proposed by P5 regarding the vouchers, who shared a story about his children playing in the park and wanting to buy ice cream like the other kids who were enjoying treats. Nevertheless, he was unable to purchase the ice creams for them because the vouchers could only be used at the major supermarket chains. Hence, he proposed an improvement idea: providing monetary support to families in special situations. Overall, these examples suggest that it is important for service providers to empower newcomers to choose the support or services that

best meet their needs, ensuring a more personalized and effective resettlement experience.



Figure 20: The mobile phones provided to refugees by the organization.

.4.2 Initial Settlement Services

Once the newly-arrived humanitarian entrants settle in the hotel and receive immediate services upon arrival, the service provider continues to assist with initial settlement services. These services include helping them access local services and resources. The newcomers also receive training and education arranged by the service provider. Since the hotel is temporary accommodation, the service provider also assists newly-arrived humanitarian entrants in finding long-term housing. We identify and unfold the insights of participants on initial settlement services based on three perspectives as below.

Infrastructural and Social Adaptation.

To support the adaptation of newly-arrived humanitarian entrants to the local systems and environment, the service provider arranges for them to connect with essential services provided by Services Australia, an Australian Federal Government department. These government services include Centrelink, which provides income support and other payments, as well as Medicare, the health welfare program that offers Australian citizens and permanent residents access to healthcare. Additionally, the process includes opening bank accounts and completing other necessary steps for preparation. For instance, P12 noted that the service provider provided an interpreter to assist her with the bank appointment and all the paperwork needed. The service provider also held its own in-house training sessions for all newly-arrived humanitarian entrants to give them a comprehensive understanding of the local systems and environments. These sessions covered life skill topics and five major modules: transport, health, education, community participation, law, and Centrelink. The overall aim of these sessions was to provide an overview of the Australian systems and environments. These sessions were highly praised by all participants, and the information they acquired was found very beneficial for their daily lives thereafter. For example, the service provider not only introduced basic information about Australian

systems but also introduced Australia's culture and how to integrate into the local communities. As P9 told us, *"They told us how you contact with police when you need, how you contact with ambulance, triple zero, and how you contact emergency, contact number, and when you need an interpreter, what's the number you're calling, and everything. And that was very helpful for helpful. . . So the program was very helpful. They taught us about the Australian government program, and how you deal with your neighbours, the people, like with your family, like everything in Australian culture."* P10 informed us that the service provider provided interpreters for the sessions, catering to all different languages for newly-arrived humanitarian entrants. However, he proposed a piece of advice regarding the timing and duration of these sessions. He mentioned that currently, the sessions ran from 8 am to 2 pm, with a one-hour break. There was a possibility of people becoming distracted and fatigued, particularly when listening to unfamiliar languages while awaiting interpretation. He recommended breaking down the sessions into shorter durations and spanning them over two or three days. Participants also highlighted the critical need for social connectedness as an essential step for their integration into the Australian community. P10, who had relatives in Australia, informed us that in their culture, people tended to prioritize recommendations from friends or family due to their cultural background. This reflects a common resettlement challenge among refugees and their mistrust towards local service providers or the government. As a result, P10 initially attempted to address banking and Centrelink matters independently after seeking advice from their friends but encountered issues and subsequently sought assistance from the organization. *"When we make our account, like, my wife, I connected for her (to) Centrelink, I need to get connected too, but my own, there was a problem. I couldn't connect. Then they (the service provider) came and helped us with the matter. Also, they help us to connect it later."* Participant P9 emphasized the importance and need for connecting with people from the same cultural background as a crucial foundation for social integration. P9 shared that he and his family lacked social connections in Australia. He expressed their desire to connect with individuals or families who spoke the same language and shared similar resettlement experiences, especially given their ongoing process of learning English. Their neighbors were all native Australians, and the lack of English language proficiency was proving to be a communication barrier. P9 suggested that if the organization could arrange a service aimed at enhancing social connectedness among newly-arrived humanitarian entrants and those who have previously resettled and share a similar cultural background, it would be greatly appreciated.

Individual Development.

The service provider facilitated the individual development of newly-arrived humanitarian entrants by helping them register for English courses at Technical and Further Education (TAFE), Australia's largest vocational education and training provider. P3 expressed immense gratitude for the English training and mentioned that the financial support provided by the Australian government was sufficient

to cover her living expenses even without employment, allowing her the wonderful opportunity to dedicate herself to full-time English learning for an entire year. Additionally, the service provider assisted with enrolling children into school. For P10, who had a young child, the service provider arranged day-care services. Participant P8 highlighted that the organization tailored its approach to each child's situation. For her younger child with disabilities, the organization ensured enrolment in a special school. Participant P5 even expressed that he felt a renewed sense of hope for his family's future when he was asked about his outlook on their future life in Australia during the interview because his children were now able to receive education, *"So also, because the school here for the kids, they can study, they have a bright future, in the future, finishes school, look after themselves. So that's like, for us, that's a big thing. So, we can see a bright future for the kids, or either for us, the family."* Through these insights from participants, it is evident that the training sessions and education provided by the service provider were extremely beneficial for all refugees. These services not only accelerated their integration into the Australian environment and helped them overcome language barriers, but also brought hope to their lives and instilled in them a positive vision for their future in Australia.

Sense of Home and Belonging.

Creating a sense of home and belonging is critical for the settlement of newly-arrived entrants. According to P12, she nourished a sense of home after residing in Australia, that she had never experienced before, *"We have been asking for asylum here in Australia since 2016, we waited for a long time. We didn't have a home since 2016, and until we moved here. That's like home, that's home for us. Even when we go to school now (learning English at TAFE), we are just waiting to come back to our home and close the door and we feel at home here."* P12 and her family were arranged a long-term accommodation by the service provider. As mentioned, since they had family members with disabilities, it would be inconvenient to live in an accommodation with stairs. The service provider made a special effort to identify and recommend one stair-free house. P12 and her family were very happy with the house that the service provider provided to them, which had been recently refurbished and featured adequate rooms and space. They also saved money to purchase new furniture and decorations for their home, including a large TV for the entire family to enjoy and two additional large sofas for the disabled family members to lie down. They regarded these practices as a way of establishing their new home in the host country, and found joy in the process, accompanied by a sense of accomplishment, and belonging. The authors were informed that newly-arrived humanitarian entrants are offered a maximum of a three-month free stay at the designated hotel and then transition to long-term accommodation after they connect to Centrelink. These newcomers had two options in seeking accommodation: 1) The first option was for the newcomers to search for rental properties on their own and apply for rental financial support from the service provider. Once the application is permitted, they can proceed to move in; 2) The second option was to allow the service provider

to arrange rental properties for them. While the social worker would provide basic information on the available properties, the newcomers would be unable to inspect the property physically. If the newcomers decided to move in, they must sign a lease for at least six months, which was binding. Since the rental period is at least six months, unlike the hotel where they initially stayed for only a few days, newcomers need more than just a place to sleep; they need a place to live, a place that feels like home. Therefore, the participants expressed their needs for a 'home' and their expectations that the rented house could meet their needs. Participants who were able to rent properties by themselves were mostly satisfied with their accommodation since they could physically inspect and select the properties. An example of this is P10, who rented property with the help of his relatives, *"This is the most difficult process, finding a house and applying for it. We have some relatives here; they know the owner of this house. So, we talked to the owner. And he said, okay if you want the house, no problem, we'll go through the paperwork. And when it came to the bond, they applied for a bond loan for us. The service provider applied for us, and we got a fast approval, saying they got the approval. Wow. That was very fast. And it was very, very helpful."* P11's family also opted to independently secure their current residence, as they preferred not to consider the second option due to its inspection restrictions, so they applied for rental financial support to pay for the bond. They told us they could afford their current rent and reported being very satisfied with their living conditions, as shown in Figure 4. Their current residence was a 2-storey house, with a large living area, kitchen, and a car park on the lower level, and three well-maintained bedrooms on the upper level. While the two children occupied a smaller bedroom each, the parents resided in the master room. They were all content with the overall size of the house, as well as the individual rooms.



Figure 21: Bedrooms of P11's current long-term accommodation: a) master room for parents; b) single room for children

While other participants lacked personal connections in Australia, they followed the service provider's accommodation arrangements. It was found that families with bigger households tended to be mostly pleased with the provided accommodation, as they have the support of their family members and their primary need for a home is to stay together with their loved ones. For example, Participant P8 expressed that her need for a home is fulfilled as long as she is staying with her two sons. Participant P9

also expressed his gratitude for the house he lives in with his family, emphasizing that it is a safe place for them. The support and presence of family members significantly contribute to their satisfaction with the accommodation. However, the leasing situation and the no-inspection policy led to certain challenges for individuals settling in Australia alone. Some participants who came to Australia alone expressed that the long-term accommodation has not met their needs for a home. Living in shared housing arrangements can be particularly challenging, as individuals need to communicate with their roommates and occasionally make compromises regarding their own needs. For instance, P3, who lived in a two-floor shared housing, mentioned that there was a minor issue with her flatmate who was sharing the bathroom with her. She told us that the cleanliness of the house is the most important to her among all other living conditions. However, her flatmate constantly left the bathroom uncleaned after use. Though she tried her best to adapt, she still found it challenging to cope with the situation and remained uncomfortable due to the hygiene conditions. A family with smaller households also encountered a similar issue, involving conflicts with the neighbors. Participant P7, a young female who came to Australia with her little sister, was assigned to a residence that she thought was located in an unsafe area. From her sociocultural standpoint, she was concerned because she felt that the particular neighborhood where she lived was frequented by intoxicated people, who did not welcome the newcomers and kept disrupting the peace. She shared, *“The neighbors were always drinking, drinking, drinking. So, when they get drunk, and like around 4 a.m., or whatever, they will throw the glass bottles on the house...And then we complained about it to the office and like to the social worker, they couldn’t do anything.”* Participants suggest that there is a need for enhancements in the procedures for assessing situations and revising policies, such as reconsidering inspection restrictions or adjusting leasing limitations for unique scenarios. This is particularly crucial for more vulnerable individuals, guaranteeing the well-being of recently arrived humanitarian entrants and ensuring that their needs for a home are met.

.4.3 Ongoing Services

Care and Empathy

After transitioning to their long-term accommodations, newly-arrived humanitarian entrants may continue to face individual issues, including booking appointments with a general practitioner (GP), handling emergencies, or overcoming language barriers. During this phase of their settlement, the social worker assigned to each family or individual will be responsible for assisting with these problems, and the newcomers heavily rely on the support from their assigned social workers. Many participants expressed appreciation for the efforts of their assigned social workers, emphasising their helpfulness and strong willingness to assist. Participant P3 specifically mentioned that her social worker was exceptionally warm-hearted. She passionately said that the help and support from her social worker

were more significant than any material support. In a particular instance, she was dealing with dental health problems and sought help from her social worker to assist her in scheduling an appointment with a dentist due to language and cultural barriers, *“She (refers to the social worker) followed up with a phone call, and we went to the clinic to do some blood tests and visit GP and they check everything and I’m, you know, satisfied about the medical services. And about that same dentist, I have an appointment, but in the next two months for the dentist, and she (the social worker) followed up to organise this.”* It can be seen that P3’s social worker’s support extended beyond P3’s initial request of booking the first appointment, but also cared for and assisted with the ongoing appointments. This level of commitment and personalised care from the social worker had an immensely positive impact on the well-being and successful integration. However, it came to the authors’ attention that a few social workers may not demonstrate sufficient empathy as expected. P1 expressed dissatisfaction with his social worker, who always ignored his phone calls or messages. He told us even though the social worker acknowledged his requests or needs, there was still no tangible assistance provided. This point was further discussed by P4, who highlighted the differences in the sense of responsibility among social workers, *“The first thing is about the social workers, they are different by case by case. For me, that social worker is like a friend, really responsible, and tries to provide me with everything I need in the short term, you know, very soon. But about the other friends of mine, it’s not true, because for example, the, maybe, the social worker doesn’t answer the phone.”* P4 shared that when he asked the organization to schedule a GP appointment, a social worker arrived without a vehicle to demonstrate how to take public transport to reach the clinic, which he already learned during the orientation. During his subsequent appointments, the organization repeatedly inquired if he required assistance in going to the clinic. This duplicated service was unnecessary for him. In contrast, while P4 received redundant services, P1 encountered a critical health situation and contacted his social worker for immediate assistance. Yet the social worker only told him to call the emergency himself, without offering any other support. Therefore, it is important that social workers consistently offer compassionate and effective assistance, to guarantee optimal outcomes for these newcomers. The service provider and stakeholders could formulate policies or assessments to evaluate the support provided by social workers to newly-arrived humanitarian entrants under their care, thereby ensuring the quality and consistency of the services.

Building Independence.

Most participants demonstrated a strong desire to work and become self-sufficient, rather than relying on government pensions. The service provider offers guidance in applying for work and some working opportunities. Participants who had a higher level of English proficiency found it easier to find jobs than those who were still learning English. For example, P1, who had basic English language proficiency, had been able to find work doing gardening. Likewise, according to P6, her family members with

sufficient English proficiency were able to secure employment soon after resettlement, *“So my husband and my brother-in-law, because they’re good at English, he used to do translating in Sudan, and he started working already. . . . So it’s good if you know English, you’re good. You can start your job like my husband.”* Yet, for participants with a lower level of English proficiency, it was challenging to secure employment. P3 had made a personal decision to go to Sydney in search of a job, but she faced difficulties and was unable to find employment, ultimately returning to Brisbane. Upon her return, her social worker assisted her in finding a new place to live. Participants with a higher level of educational background tended to discover that the job opportunities provided by the organization did not meet their expectations. According to P10, who was currently working as a part-time delivery driver, his previous occupation before coming to Australia was a chemical engineer, and used to work for a German healthcare company as a production manager, *“I’m doing delivery work right now, but when they say that you have to work as a casual, in one place, picker-packer. It’s not the job itself. The job is good. I’m not saying that I am not satisfied. That’s not my skills. My skills could be more capable, I’m giving you more things. That’s why I couldn’t accept it. They provide a lot of jobs. But for me, I couldn’t accept it.”* P10 sought advice from his relatives who resided in Australia for a longer time and realized if he wanted to look for a desired job, he needed to have a recognized degree and qualification assessment. Therefore, he was doing a diploma in IT with the hope of securing better employment in the future.

This study discussed lived experiences of newly arrived humanitarian entrants’ settlement journey. It draws on participant narratives to establish a holistic understanding of the services offered by the mediating service provider. While current literature on settlement services for refugees in CSCW or CHI tends to focus on specific services or support, for example, food [56, 58], health [55, 58], education [34], digital tools and technologies [14, 19, 46], and so on, our research draws on participant narratives and sheds light on the entirety of the services offered by mediating service providers. The research provides a comprehensive understanding of the critical role of mediating service providers in connecting refugees to a broad range of essential services. In our study, we categorize resettlement services into immediate, initial, and ongoing phases. This breakdown aligns with the Social Inclusion Theory’s focus on continuous and progressive support for refugees, ensuring their integration into the host society [64]. Moreover, in connecting our findings to the work by Dahya et al. [17], which proposes the framework of refugee women’s everyday socio-technical ecosystems, where they categorize refugee women’s interaction with technologies by the context, i.e., individual, social, or formal learning. Our framework for categorizing settlement services is distinct in its focus on a timely, progressive order, systematically addressing the evolving needs of refugees from their immediate arrival to long-term integration. This structured approach delineates services into three critical phases. Such categorization provides a structured approach that can contribute to HCI and CSCW research by offering clear stages for intervention and technological support. We discuss some of these implications

below.

.4.4 Design Implications

Understanding Individual Needs.

Based on our findings, service providers and organizations could prioritize and implement measures to enhance several critical aspects of their services. Firstly, service providers could aim to understand the individual needs of newcomers better and accordingly provide them with greater freedom in choosing the right and tailored services. For instance, P12, whose family members were disabled, was not provided with accessible hotel accommodation. The organization could try to understand the needs of newcomers better and communicate more effectively to avoid such problems. As McIntosh et al. [35] stated, that understanding the needs of refugees is a vital aspect of effectively welcoming and aiding in their resettlement. Consistent with their viewpoint, our research also demonstrated the importance of service providers being attentive to individual needs. For instance, P4, who was already familiar with the route to the clinic, was repeatedly asked if he needed assistance in getting to the clinic. This results in a situation where, while some newcomers did not receive sufficient support, P4 received redundant assistance. The organization should implement resource allocation strategies and enhance internal communication among staff to avoid duplication of services and ensure a more efficient and effective service delivery process. In line with Jewson et al. [29], the lack of service coordination and consultation with refugees are the barriers that negatively influence the effectiveness of services, service providers should adapt to refugees' needs, rather than expecting refugees to conform to their service delivery methods. The need for tailored services is further supported by Almohamed et al., who emphasize the importance of addressing the heterogeneity of refugees and asylum seekers (RAS) [8]. It suggests that understanding the various challenges faced by RAS, including their cultural, social, and displacement-related stressors, is crucial for designing effective support systems and technologies tailored to their individual needs [8]. The insights around the provision of mobile phones reinforce this point, where our participants recommended offering more options, such as allowing them to select their phones in-store or, for those who do not require a phone, providing equivalent voucher amounts. Hence, organizations and service providers could investigate adopting a more personalized approach, such as utilizing tools like checklists to gain insights into individual requirements, to avoid unnecessary or duplicative services, ultimately saving both time and resources, which could then be directed towards assisting others with more pressing needs. To address this, a more holistic approach to service navigation is required. Previous research suggested ICTs are commonly used technology among refugees, and they heavily rely on mobile communication such as Whatsapp [57]. Bhandari et al. also indicated that many asylum seekers were actively using the internet and various technologies to meet a range of needs, including accessing information about public benefits [14]. According to

our research findings, newly-arrived humanitarian entrants in the context of Australia are provided with mobile phones and widely use them – ensuring accessibility to ICT technologies. Similarly, Talhouk et al. propose that to lessen food insecurity among refugees, technologies can be used to facilitate better navigation about aid services and enable refugees to query and provide feedback on aid received [58]. Hence, based on the accessibility of ICT technologies among these newcomers, we propose the potential of utilizing ICT technologies for more conducive navigation around the services they would receive. With a clear picture of the overall service flow, the newcomers could identify their individual needs in advance and notify the service providers. This application could also include a digital checklist or questionnaire to capture the specific needs and preferences of newcomers upon arrival, ensuring that services are tailored accordingly. Instead of expecting refugees to request disability-friendly accommodations, service providers should proactively gather information about accessibility needs through initial assessments and ongoing communication with newcomers. With this kind of application, the service provider can identify refugees who have family members with disabilities, like P12, and proactively prepare for their need for disability-friendly accommodations and services upfront. Likewise, service providers can allocate resources more efficiently based on the actual demand and preferences of the individuals, reducing redundancy and waste. For example, for refugees who have their own mobile phones upon arrival, the service providers could save the cost and time of purchasing a new phone.

Fostering Empathy and Eliminating Discrimination.

Additionally, service providers could foster greater empathy among both social workers and the local community towards newly-arrived humanitarian entrants. Previous research has indicated that refugees often perceive discrimination from the local community, primarily due to negative stereotypes and the influence of political elements on social media [8, 29]. Our study similarly revealed inhospitable conditions in certain neighbourhoods, for instance, P7, who resided with her sister, experienced incidents like drunk neighbours throwing bottles at their walls during the night-time, while the social worker assigned to them failed to provide any assistance. As Üstübcici [63] states the pivotal role of service providers in bridging the gap between citizens and refugees, advocating for empathy emerges as a crucial strategy, he also suggested social contact may be beneficial for mutual understanding between native residents and refugees. While service providers educate new arrivals about Australian culture, there is also a need for the local population to learn more about the refugee journey and their culture, and for service providers to cultivate understanding and empathy within the local communities towards refugees. Viewing refugees as a burden impacts not only the interactions between refugees and host country citizens but also their interactions with service providers [54]. Talhouk et al. [57] revealed an instance in which a Syrian refugee woman encountered a negative attitude from healthcare service providers, where a nurse implied that Syrians have too many children. In our study, we did

not encounter any cases where social workers nor the organization showed discrimination against newly-arrived humanitarian entrants, however, it might be worthwhile to ensure the wellbeing of social workers who in many cases are former refugees themselves and may have workload issues and other general life worries.

Facilitating Social Connections among Ethnic Groups.

Thirdly, there could be attempts to facilitate social connections among refugees sharing common cultural backgrounds. Mistrust is another commonly shared issue of refugees towards the services or authorities in the host countries [7, 8]. In our study, while not many participants displayed mistrust toward the service provider, they preferred to place their trust in their relatives and friends who resided in Australia for a longer time, or individuals who shared their language or cultural background, over the service providers. This discovery aligns with Almohamed et al.'s [8] findings, highlighting refugees tend to avoid unreliable sources and seek information from individuals whose identities and personal information they know, and proposing to address this information provision gap through peer-to-peer knowledge exchange. As such, they suggest governments to support social events for refugees and their ethnic groups [8]. This point is further supported by the case of P10 in our study, who sought long-term accommodation with the assistance of relatives, instead of relying on the organization's arrangements. O'Higgins' [41] study indicated that the participation and engagement of young refugees can be enhanced through participatory group work, primarily due to their strong emphasis on peer support and forming friendships. In light of this, participant P9 suggested the idea of creating a session where newly-arrived humanitarian entrants and individuals with prior resettlement experience who share similar cultural backgrounds could come together to know one another and build social connections. This incident embodies the significance of establishing mentor-mentee relationships between newly-arrived humanitarian entrants and those who have successfully settled and share a common language. This is particularly crucial for those newcomers with limited proficiency in English. As highlighted by Fozdar and Hartley [25], humanitarian entrants exhibit notably higher levels of participation and engagement within their religious, cultural, and ethnic communities, and provide substantial support to one another, encompassing lending household items, offering transportation, aiding with shopping, providing meals, childcare assistance, and even offering financial loans. Hence, organizations and service providers could investigate the possibility of inviting previously resettled humanitarian entrants to participate in the orientation of newly-arrived humanitarian entrants, allowing them to share their own resettlement experiences and help the newcomers. Technologies can play a crucial role in facilitating social connections between newly-arrived humanitarian entrants and those who have already settled in the host country, particularly when they share similar ethnic or cultural backgrounds. As Talhouk et al. pointed out, sharing resources within households and communities is a common practice among refugees to cope with food insecurity, and emphasized the need for

information-sharing platforms that can support peer-to-peer exchange of experiences and knowledge, enhancing the community's overall resilience [58]. In our study, many participants mentioned the need to interact with previously settled humanitarian entrants or connect with someone from the same cultural background. However, they often lack access to platforms that would enable them to meet such individuals. Given the limited English proficiency among many newcomers, which restricts their access to mainstream social media platforms, there is an opportunity to create a dedicated platform aimed at assisting non-English speakers in connecting with their peers, storytelling and sharing experiences. This platform could feature a multilingual interface, community forums, and mentorship programs where newly-arrived humanitarian entrants can receive guidance and support from those who have successfully settled. As stated by Weibert et al., utilizing digital technologies, especially digital storytelling, provides platforms for personal expression, reflection, and building a digital biographical and collective memory [65]. By fostering these connections, the platform would help build social capital, facilitate knowledge exchange, and provide emotional support, thereby contributing to the holistic well-being and resilience of the newcomers. Additionally, the platform could host virtual events, cultural exchange programs, and peer support groups to further enhance community building and integration.

Nourishing a Sense of Home

Lastly, the leasing issue of long-term rental accommodation requires more attention, as argued by Sampson et al. [48], housing and a sense of place are crucial for fostering a sense of belonging, especially for refugees who have been denied access to a stable home of origin. Previous studies have suggested that suitable housing offers refugees a starting point for re-establishing a sense of 'home' [18, 25]. Consistent with this statement, we also discovered that participants derived enjoyment from the process of altering and decorating their living spaces. For instance, P12 considered home decoration practices as a means of establishing a sense of home and belonging in the host country. This example further reinforces the argument made by Nabil et al. [37], who observed that refugees transformed both public and private spaces within refugee camps through painting and decorating, thus creating a sense of home and fostering a feeling of identity and pride. Yet in our findings, the restriction on inspecting a property before renting or breaking the lease before the 6-month term ends impeded their ability to change and find suitable housing that was more aligned with their liking. Housing policies directly impact the ability of refugees to secure and maintain stable accommodation that meets their needs. Policies that limit the ability to inspect properties or terminate leases early can exacerbate feelings of instability and displacement. As Tachtler et al. stated living circumstances and accommodation can have a significant impact on unaccompanied migrant youth [53]. The lack of a stable, supportive environment hinders the ability of unaccompanied migrant youth to establish routines and feel secure [53]. While it might be impractical for organizations to secure perfect accommodation for newcomers

in every aspect, prioritizing and understanding newcomers' housing needs and evaluating the pros and cons of each property well in advance might result in a better match between newcomers and housing options. We propose a design implication of an online housing database that includes detailed information on available properties, such as the suburb, and number of roommates, and pictures of the accommodation, allowing refugees to select housing that best fits their needs and preferences. Additionally, implementing a flexible leasing policy that allows for property inspections before signing the lease and provides options for shorter-term leases can significantly enhance refugees' housing experiences. Collaborating with local housing authorities and community organizations to secure more suitable housing options and providing financial support for home modifications can further improve housing stability and satisfaction. By addressing these housing challenges, service providers can help refugees establish a sense of home and belonging, which is essential for their successful integration and overall well-being.

Ongoing Support and Integrated Health Services.

As the findings presented, many participants had long-term needs for future housing, healthcare, and employment services (e.g., P1, P3, P4, P10). However, they were often limited in addressing these needs individually due to challenges such as language barriers and unfamiliarity with local systems. In line with our findings, Ertl et al. highlighted several barriers refugees face in accessing psychiatric support and healthcare services [20]. These contain individual barriers such as language and cultural differences, and structural barriers including complex bureaucratic processes, lack of coordinated care, and social barriers, e.g., social stigma around mental health and lack of social support networks [20]. In our study, social workers took measures to assist participants with long-term issues. For example, participants P3 and P4 explained that social workers helped them book healthcare appointments and followed up on their upcoming treatments. Yet, P1 and P10 expressed their desire to live independently in Australia, particularly in terms of navigating through systems and achieving financial stability. To ensure sustainability and foster the independence of refugees, we propose that service providers adopt an integrated approach to health and well-being services, ensuring that the physical, mental, and emotional health needs of refugees are addressed comprehensively. This could include the development of a centralized health management system that tracks the medical history, appointments, and ongoing health needs of refugees. By employing this system, refugees can receive timely reminders for medical appointments, access telehealth services, and obtain information on available health resources in their native languages. Such support systems should be designed to foster resilience, enabling refugees to thrive independently while still having access to support when needed.

.4.5 Limitations

While this study provides insights into the early-stage resettlement experiences of newly-arrived humanitarian entrants in Australia, it has several limitations that should be acknowledged. Firstly, the sample size of 12 participants, though providing rich qualitative data, may not fully capture the diversity of experiences across different refugee populations. Additionally, the study focuses on refugees in Australia, which may limit the generalizability of the findings to other geographical and socio-political contexts. The reliance on self-reported data from photo diaries and interviews could also introduce biases, as participants may present their experiences in a manner influenced by social desirability or recall inaccuracies. Furthermore, the study emphasizes the role of a single mediating service provider, which may not reflect the practices and challenges faced by other organizations or regions. Finally, the dynamic nature of resettlement processes means that the findings represent a snapshot in time and may not account for longer-term adaptation and integration challenges faced by refugees. Future research could benefit from a larger, more diverse sample and longitudinal approaches to better understand the evolving needs and experiences of refugees.

.5 Conclusion

In this exploratory study, the researchers delved into the experiences of newly-arrived humanitarian entrants towards the resettlement services provided by non-governmental organizations. The authors conducted both photo diary studies and semi-structured interviews with a cohort of 12 recently arrived humanitarian entrants. Through a comprehensive thematic analysis, we presented an overview of the service framework and presented our findings by categorizing them into three distinct service domains: immediate services upon arrival, initial settlement services, and ongoing services. Drawing upon the feedback received from the participants, we identified the needs of the participants and areas of improvement. Additionally, we put forth design implications to enhance the services provided.

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Appendix B

Exploring Place-Belongingness through Magic Machine Workshops in Refugee Communities

Song, P., Hebbani, A., and Vyas, D. Exploring place-belongingness through magic machine workshops in refugee communities. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems (2025)*, pp. 1–15. [65]

Abstract

Upon displacement, it becomes challenging for refugees to build a sense of home in a new environment due to the traumatic experiences they have endured. To unpack factors that are important in developing a sense of home and belonging in refugee communities, we lean on the theoretical concept of 'place-belongingness' - we did this by conducting 6 co-design workshops involving 15 refugee participants, via the 'Magic Machine' workshop approach. From the workshops, we uncovered how cultural identity and memory, life stability and normalcy, security and privacy, resilience and ingenuity, and social connections are central to their sense of home. This research contributes to HCI by building on the theoretical concept of place-belongingness in the context of forced displacement, proposing design implications that address refugees' needs for home from cultural and social dimensions, and design considerations for refugees' domestic settings.

.6 Introduction

United Nations High Commissioner for Refugees (UNHCR) estimates that forced displacement has continued to increase in 2024 and is likely to exceed 120 million by the end of the year, due to ongoing wars and conflicts in regions such as South Sudan, Palestine, Afghanistan, Ukraine, Middle East and other crisis areas [1]. Displaced individuals are facing significant humanitarian challenges, with respect to various aspects of settlement such as adequate housing, access to healthcare, education, and employment opportunities [4]. The US government set a refugee admissions goal of 125,000 for fiscal year 2024 [70]. In Australia, the refugee intake for 2024, set at 20,000, is governed by the country's humanitarian program [52]. The indicators of integration framework developed by UK Home Office lists various domains that are of central importance to migrants and refugees' integration

in a new country, such as housing, stability, social bonds, culture, among others [53]. In Australia, the Australian Humanitarian Settlement Program (HSP) provides various forms of support, including assistance with housing, education, employment, and navigating Australian systems. However, Brown and Choi [20] highlighted that these services are limited to the first 6–18 months after settlement. Refugees continue to face significant barriers to achieving a sense of home and belonging, such as cultural adaptation, social exclusion, and prolonged post-traumatic stress. Antonsich theorizes belonging in two dimensions, i.e., subjective aspect and external aspect [10], where the subjective aspect is conceptualised as place-belongingness, also refers to an individual's intimate feeling of being 'at home' [76]. Desjardins et al. [22] argue that in HCI, domestic technologies and smart home topics are overwhelmingly discussed, whereas the exploration of values associated with home have received significantly less attention. Similarly, Sabie et al. [61] explore how immigrants' cultural values and memories are brought to life through the process of sketching the physical spaces of their homes. Going beyond the functional needs, the authors argue to focus on emotional and cultural aspects of homes that are vital for long-term settlement and well-being.

HCI researchers have explored the challenges refugees face during the resettlement process, such as mistrust, cultural barriers, displacement trauma, and lack of social resources [3, 4, 14]. Additionally, they have examined the role of technology in supporting the integration of refugees [7, 15, 21, 56, 67]. However, most of these studies primarily focus on the provision of information and support for refugees' physiological and practical needs. In the context of long-term integration, researchers have highlighted the importance of inclusive and culturally sensitive design [39], as well as the need for social activities and rebuilding social capital [5]. Nabil et al. demonstrated how the decorating practices of Syrian refugees in a refugee camp can enhance well-being, rebuild a sense of home, and restore lost identities and leisure, even in resource-limited and challenging settings [48]. Despite these valuable contributions, there remains a significant gap in research on the sense of home and place-belongingness for refugees, particularly in how technological interventions can be designed to foster the feeling of being 'at home' within the HCI field.

This research aims to fill this gap by understanding what constitutes a sense of home or place-belongingness for refugees, and exploring how can technologies be utilized to foster it. The research question guiding this study is: *How do refugees develop a sense of home within the context of resettlement?* To achieve this, we conducted a set of 'magic machines' workshops [9] involving 15 participants who were refugees and had been in Australia for 2-5 years. Magic machine workshop is an effective participatory design (PD) approach, where participants are asked to envision innovative technological ideas that could incorporate 'magical' features, fulfilling their needs and desires. The resulting ideas are not supposed to be fully implemented, rather, the values participants place into those ideas lead to engaging and provocative discussions. It is an accessible approach to scaffold participation among members from vulnerable communities and has been shown to be an effective brainstorming

and needs finding method for refugee communities [8] Through magic machines workshops, we provided agency to our participants where they could imagine innovative, magic-like technologies that would help them develop a sense of home. Using thematic analysis [18], we uncover critical insights into refugees' sense of home, revealing their aspirations for cultural identities and memories, life normalcy and stability, security and privacy, social connections, and resilience and ingenuity.

Our paper makes two contributions to the field of HCI. First, our findings extend the theoretical concept of place-belongingness [10] by providing context-based insights from the refugee community. We argue that place-belongingness under displacement is a fluid and multifaceted experience, despite the factors already explored in its original work, it is also shaped and influenced by privacy and autonomy, cross-border family connections, tangible and material culture, and the ongoing negotiation of identity between past and present. This highlights the need for HCI researchers to design technological interventions that address the cultural and social dimensions of place-belongingness, to foster a sense of home for refugees in a new environment. Second, we propose a set of design implications - the potential of technologies to preserve culture and memories, enhance cross-border connections, and facilitate stability and normalcy; and additional design considerations for employing the Magic Machine Workshop approach with refugees.

.7 Background

.7.1 Place-Belongingness

Home is defined as a "*socio-spatial entity, a psycho-spatial entity, and an emotional 'warehouse'*" [25], which involves personal, social, physical, psychological, and politically related connotations [45]. Dated notions of home often refer to a fixed and bounded place [13], yet recent studies have argued for a re-conceptualization of home as something messy, mobile, and blurred, particularly for migrants [51, 58]. Due to the process of resettlement, migrants frequently negotiate belonging across multiple homes in an inter-subjective manner [54]. Papastergiadis [54] analyzes the cultural and socio-political dimensions of migration in an increasingly globalized world, and emphasizes that globalization have deterritorialized belonging, making it less about national boundaries and more about relational, transnational, and hybrid identities. Ignatieff [37] emphasizes how nationalism satisfies the need for identity and a sense of belonging to a larger community, and argues that the belonging is rooted in shared history, language, culture, and often ethnicity, which form the basis for people's sense of identity and origin. Antonsich [10] theorizes an analytical framework of belonging in two dimensions, i.e., subjective aspect and external aspect. The subjective aspect is an individual intimate feeling of being 'at home' composing of five key factors: autobiographical, relational, cultural, economic, and legal [10]. This is also conceptualised as 'place-belongingness'. The external aspect refers to the

socio-political structures that define who is included or excluded from a place or community [10]. The sense of home, more specifically place-belongingness, is the emotional attachment one feels toward a specific place, where home symbolizes security, familiarity, comfort, and refuge [35, 76]. Yee et al. [74] build upon the place-belongingness framework by Antonsich [10], where they include an additional ancestral and historical dimension to capture the Pacific Island context, and outline that place-belongingness as a critical factor influences why the residents of Togoru choose to stay in their coastal village despite the increasing threats posed by climate change. Mohseni et al. [47] clarify how place-belongingness manifests in real-life context through systematical literature review. Their paper categorizes the practical meanings of place-belongingness, such as feeling at home, feeling of being accepted, security, comfort, emotional attachment, or empowerment. They also discuss the factors contributing to place-belongingness into personal elements (like memories and experiences), connections (including social and physical bonds), resources (such as material, economic, educational, and legal), and cultural factors [47]. Moreover, they emphasize the role of information technologies in enhancing place-belongingness and suggests a need for future research into this area [47]. Ralph et al. [58] emphasize the need to acknowledge both the fluid and sedentary aspects of home, as they work together to shape migrants' sense of home and belonging. They highlight that experiences in both the country of origin and the destination shape identities, while material and social anchors strengthen the sense of belonging. As Tolia-Kelly [68] argued, material possessions and artifacts enact as connectors to identities and memories, helping to buffer against exterior cultural barriers while also fostering a sense of belonging. Wernesjö [73], on the other hand, emphasized that young refugees in rural Sweden primarily build their sense of home and belonging through social connections .

Within the field of HCI, Desjardins et al. [22] examined the prevalent themes related to the home, which encompass social routines within the home, ongoing domestic practices, home as a testing ground, smart home technologies, contested values associated with the home, home as a space for interpretation, and speculative visions of the home. Wallace et al. [71] study the role of IoT and sensor-based technologies in creating a sense of home and well-being in residential care settings for patients with dementia, highlighting the importance of designing technologies that not only meet functional needs but also foster emotional comfort and belonging. They also discuss how personal possessions, like artifacts, play a crucial role in maintaining identity and a sense of home [71]. Similarly, Lindley et al. [44] conducted research with seven older adults who were going through transitions of moving into their new homes in England. They stated that older adults maintain a sense of continuity in their lives by bringing familiar possessions and routines into their new homes, which helps them preserve their identity and sense of belonging. While possessions play a crucial role in establishing a sense of home, serving as physical reminders of one's life course, identity, and legacy, social connections and routines also contribute to the feeling of being "in place," with the new home becoming a site to maintain relationships and continue meaningful activities [44]. Shklovski et al. [38] argue that in the

context of transnationalism, home and belonging are not confined to physical places but are instead shaped by the dynamic interactions between people, technology, and multiple geographic locations.

Extending this discourse, Sabie et al. [61] highlights the importance of understanding the cultural and emotional dimensions of home for immigrants. By employing a paper-based home sketching tool to engage 13 Middle Eastern immigrants residing in Canada in the design of their ideal homes, they showed that home design can serve as a powerful tool for reconnecting with cultural identity and fostering a sense of belonging in a new environment [61]. Further, Nabil et al. [48] examined how refugees in the Zaatari camp actively create a sense of home through the decoration and customization of their living spaces. Refugees transform their pre-fabricated shelters with limited resources into personalized spaces that reflect their identities and cultural heritage. This act of decorating serves as an emotional escape from the realities of displacement, allowing refugees to maintain their dignity and pride, also creating a sense of agency and freedom [48]. The study highlights that the sense of home for refugees is deeply connected to the ability to personalize and control one's environment, fostering a sense of identity, dignity, and belonging [48]. Mohseni et al. [46] proposed a research design and plan for developing the scale to measure digitally enhanced place-belongingness, and outlined the structures of the scale including the feeling of being at home, social acceptance, sense of security and mental comfort. These studies provide valuable insights into the notions of home and highlight the need to design technologies for migrants' and refugees' homes beyond the functional level. Our work expands current HCI research on home and belonging by providing a refugee-focused understanding of the diverse dimensions of home. Through co-design with refugees, we will explore these dimensions in-depth, offering technology implications that are informed by the voices of refugees themselves.

.7.2 Refugees in HCI

In recent years, a rich body of literature has explored various aspects of challenges refugees encountered during their resettlement and designed technological solutions to support them. The aspects include language barriers, social connections, mental health, and accessibility to services such as housing, healthcare, and education [3, 4]. In the Australian context, Brown and Choi [20] explored co-creative design practices as a means to support recently-settled refugees in fostering post-traumatic growth (PTG) through care-based design. They pointed out while the Australian Humanitarian Settlement Program (HSP) provided assistance with housing, education, employment, and navigating Australian systems, yet only lasting for the first 6 to 18 months of settlement. As such, they emphasized the need for ongoing care and support beyond this initial period to address long-term challenges refugees face, and highlighted critical obstacles affecting refugees' integration and belongingness, including prolonged post-traumatic stress, racism, structural barriers, and homesickness. The researcher also sought technological and design solutions to tackle these challenges. For instance, Brown et al. [21] designed and deployed Rivrtran, a messaging platform that facilitates human-in-the-loop translation to

support communication between resettling refugee families in the United States and their American mentors. Baranoff et al. [15] developed Lantern system operating through Near Field Communication (NFC) which uses tags to provide information in the refugee's preferred language. This technology assisted refugees with accessible, community-generated guidance to navigate their new environments. Through 21 semi-structured interviews, Noh et al. [50] examined the critical needs, challenges, and the role digital technology, particularly social media, plays in helping North Korea defectors navigate their transition, reconstruct their identities, and integrate into South Korean society. Bhandari et al. [16] explored the informational needs and challenges faced by asylum applicants in the U.S. when accessing legal and healthcare information through digital tools, and identified four primary challenges including information uncertainty, accessibility, emotional barriers, and contextual sensitivity. Talhouk et al. [67] investigated how digital interventions, particularly through smartphones, could be designed to improve access to antenatal care among Syrian refugee women in Lebanon. Weibert et al. [72] designed a digital language-course wizard through participatory design to help refugees and migrants in Germany navigate the complex process of finding suitable language courses, addressing legal, financial, and administrative barriers. Jensen et al. [39] highlighted the challenges refugees faced due to the digitisation of resettlement services in Sweden, identifying how digital tools can worsen barriers and cause problems in social support. These explorations and design solutions provide valuable insights and support to refugees' immediate needs during their early-stage transitions into new country, while there is a shift in focus within the field from meeting immediate needs to addressing the more complex political and emotional dimensions of mobility in the long term [60].

In terms of refugee's long-term needs, building social connections in the new country is an important aspect. Almohamed et al. [6] employed participatory design approach to investigate how refugees from Iraq and Syria in Australia can rebuild their social capital through cultural adjustment, organizational support, and social activities. Their study also suggested that ICT technologies played a critical role in helping refugees integrate into their new communities by improving access to resources like health, housing, and employment. Neuenhaus et al. [49] explored the use of a geo-location-based mobile game to foster empathy between Syrian refugees and German youths - this game was designed to bridge cultural gaps and reduce prejudices, guides players through a virtual experience that mirrored real-world interactions with Syrian culture. The study found that the game successfully encouraged emotional connections and positive face-to-face interactions between German players and Syrian refugees, and significantly improved the willingness of German youths to engage and help refugees. Lastly, Fisher et al. [27] presented ethnographic research with Syrian refugees at Za'atari Camp, and highlighted the significance of food in maintaining cultural identity, supporting well-being, and fostering social cohesion among the refugee community. These studies provide constructive implications of designing for refugees' long-term transition to current HCI research. However, there's a notable gap that very few research studies have delved into the role that the 'home' plays for refugees

during their resettlement.

.7.3 Participatory Design with Vulnerable Communities

Participatory Design (PD) historically focused on improving the quality of working life through the active collaboration of designers and users [63]. Over the years, it has become a useful approach to design that involves various stakeholders, especially users, actively in the design process. PD has since evolved and expanded beyond its original workplace environments into new scenarios such as healthcare [2, 59, 66], and social media [12, 43, 57]. In addition, PD is commonly employed in projects targeting vulnerable groups, such as children [41, 75], individuals with disabilities [26, 30], older adults [69, 77], migrants [42, 61], and refugees [6, 24], due to the agency and empowerment it bring to users [23, 36]. By actively involving users as 'design partners', PD shifts the traditional power dynamics of design [32], by giving users a voice in the co-design of technologies that impact their lives. For instance, Sharmil et al. [64] explored the co-design of a participatory action research methodology with Aboriginal communities, which combined Western participatory action research methods with Indigenous knowledge-sharing practices, fostering a sense of ownership among Aboriginal community members. Moreover, the resulting designs of PD are more contextually relevant and culturally sensitive. In the context of refugee studies, Duarte et al. [24] reported on the application of PD and participatory research (PR) with young forced migrants, and highlighted that PD and PR facilitated intercultural collaborations and built trust among participants. These papers collectively underscore the importance of PD in designing for vulnerable communities.

However, while PD aspires to balance power, there are certain challenges that create power imbalances. Bratteteig and Wagner [17] examined a participatory urban planning project using a Mixed Reality Tent (MR-Tent) to facilitate collaborative design with participants including urban planners, laypeople, politicians, and analyzed them through the lens of power. It was identified that power imbalances in PD arise from structural mechanisms like agenda control, resource allocation, and expert dominance, which limit participants' influence and embed designers' values and decisions into material outcomes, often sidelining broader stakeholder contributions [17]. In addition to exacerbating power imbalance, Gautam and Tatar [29] revealed risks associated with PD when working with participants from vulnerable backgrounds, based on their five-year engagement with survivors of sex trafficking in Nepal and anti-trafficking organizations. They pointed out that PD could potentially reinforce the dependency of participants, cause harm from conflict due to the agonistic approaches in PD, and impact emotional well-being of participants while employing deficit-focused approaches [29]. As such, they proposed approaches to minimize the harm to the vulnerable participants, including adopting incremental changes to avoid destabilizing support systems, using asset-based approaches where the strengths of participants would be emphasized rather than their deficits, building mutual trust and conducting ethical reflexivity [29]. Krüger et al. [40] discussed the adaptations of PD in

the context of migration and globalization, where there case studies were presented: setting up a computer club under postcolonial conditions in Morocco, empowering refugees in the Arab region by co-designing advocacy tools, and building digital tools for migrants in German to navigate bureaucracy. They identified that the challenges of using PD methods with refugees include heterogeneous internal community politics and expectations, and lack to motivation to participate due to daily survival struggles [40]. Therefore, they highlighted the significance of researchers serving as mediators also actively taking political stance of empowering refugees and disseminating research findings in ways that could drive systemic changes [40].

To address the power imbalance in PD, Bray et al. [19] designed and evaluated a speculative design toolkit for Black and brown communities, arguing that it could empower marginalized groups by mitigating power dynamics, fostering autonomous participation, and enabling participants to envision equitable futures. There are growing interest among HCI community in adopting speculative approaches in PD to engage participants in conceiving possible future technologies that promote ideal social environments [31]. Harrington et al. [31] employed speculative design fictions with Black young adults to address societal challenges such as racism, poverty, inequality, and imagine futures free from these constraints. They highlighted speculative PD can empower marginalized communities by validating their experiences and fostering inclusive narratives; however, they noted the challenge that participants struggled to imagine futures devoid of current social issues, reflecting how systemic challenges like racism shape their visions [31]. The challenge of imagination beyond present realities is a common issue in speculative PD. This difficulty was also observed in other work of Harrington et al. [33], which employed a community-based PD approach with underserved African American older adults to share their health concerns and participate in collaborative discussions, thereby promoting their views and addressing systematic inequalities [33]. While participants were encouraged in 'blue sky ideation', they still dismissed 'blue sky' ideas as impractical or unrealistic, focusing instead on feasible and familiar solutions, and those who proposed more unconventional or imaginative ideas were sometimes mocked by others, further discouraging creative exploration. [33]. Magic machine workshop [9] is also one of the speculative approaches that encourages participants to imagine and prototype "magical" devices that address challenges in their lives, yet emphasizing individual creativity and personal expression over collective consensus. Such a focus allows for a broad range of ideas, including those that might be considered impractical or unconventional, to emerge without immediate judgment [9]. Thus, the magic machine workshop alleviate the risk of dismissing innovative ideas noted by Harrington et al. during the "blue sky ideation". This approach has also been proven effective in engaging vulnerable communities in HCI, such as refugees and older adults [8, 62]. Therefore, this study uses "magic machine workshops" to engage refugees in a PD activity, due to its empowering and creative nature.

.8 The Study

Our research took place in a metro city in Australia. and strictly followed the ethical guidelines approved by the authors' institution prior to the study.

.8.1 Participants

We recruited participants by collaborating with various refugee-focused settlement service providers and participating in the events they organized for refugees. We left flyers of our project to enable opt in process of recruitment, and where possible we engaged directly with participants so that we could explain our research in detail and answer questions. We handed out flyers and through the snowball sampling approach [55] we recruited our participants. The data for this study was collected through a series of co-design workshops informed by the magic machine approach described above [9]. We engaged with 15 former humanitarian migrants who have been in Australia for at least 2 to 5 years. This was done to ensure that participants would have developed some insights around a sense of home. Table 1 provide details of our participants. We aimed to include participants from a diverse range of ethnicities.

Table 7: Participants' Demographics

Participant	Workshop	Gender	Age	Country of Origin
P1	W1	F	18	Syria
P2		F	18	Iraq
P3		F	35	Papua New Guinea
P4	W2	M	61	Iran
P5		F	52	Iran
P6	W3	M	28	Uganda
P7		M	26	Uganda
P8		F	30	Uganda
P9	W4	F	41	Iran
P10		F	50	Iran
P11	W5	M	22	Senegal
P12		M	25	Congo
P13	W6	F	41	Iran
P14		F	38	Iran
P15		F	25	Iran

.8.2 Methods

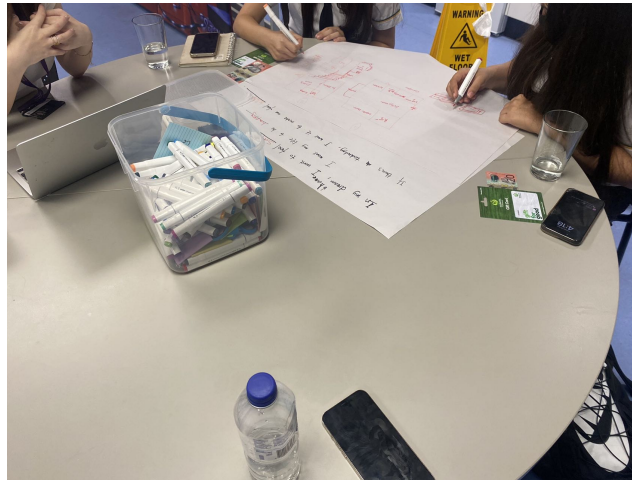


Figure 22: Magic machine workshop picture

The first image is a photo of the scene when the authors were conducting magic machine workshops

Our engagement with participants started with them reading through the ethical consent form and signing the same. We made it clear to our participants that this was their participation in workshops was completely voluntary. We also assured them that we would de-identify their data prior to processing and would ensure that their privacy was protected.

We primarily used magic machine workshops [9] as a way to engage with our participants in a co-design activity. Magic machine workshops provide a speculative approach to support imaginative thinking in participants to envision futuristic technologies. These workshops do not yield concepts and ideas that are immediately design-able, but they provide a platform for open discussions around technological futures and participants' lives.

We started with some ice-breaker questions, where participants were asked some open-ended questions designed to elicit detailed narratives about participants' experiences of displacement and resettlement journey in Australia. We also asked questions focused on their understanding of home, both in their country of origin and in Australia. Questions explored topics such as memories with the home countries, current living situations, and the evolution of their sense of home since arriving in Australia.

Next, we introduced the idea of the magic machine workshops to our participants. While previous studies that used magic machines utilised a multi-modal approach where cardboard boxes and similar maker tools were used [6, 9], we took a more simpler approach where participants were given a set of drawing papers and marker pens to draw ideas. We believed that this approach would work with a more diverse participant group. Figure 1 shows three participants working in a magic machine workshop. Participants were invited to design their ideal homes that would have magical elements to enable a sense of home. We especially suggested to conceptualize technologies that would have the magical powers. Participants were guided by a set of pre-prepared, fill-in-the-blank prompts designed

to stimulate creative thinking and articulate their aspirations for a sense of home. Examples of these prompts included: '*In my dream home, I want to feel _____, I want my life to be _____,*' and '*If there's a magic technology or machine, I want it to be / do _____*'. These prompts were deliberately open-ended to allow participants to focus on their prioritized needs while engaging participants to express their ideas and preferences regarding their living environments in a tangible and imaginative way. Data was collected through audio recordings of the discussion, which were later transcribed, and the photos of sketched ideal homes and magic machine drawings were co-interpreted within the research team. At the end of workshops each participants were given a AUD 20 gift vouchers as a token reimbursement for their time.

.8.3 Data Analysis

The collected data underwent thorough thematic analysis [18]. This entailed comprehensive readings of the materials, followed by systematic textual coding. As the authors adapted the theoretical framework of belonging by Antonsich [10], both inductive and deductive coding approaches were employed to initially cluster the services [11], then pinpoint and categorize the notions of home or feeling 'at home' that fell into each service category. The initial development of the codebook involved labelling recurring words and phrases, followed by hierarchical grouping of similar codes. Subsequently, the codebook underwent multiple rounds of revision by the second and third authors before being further refined by the first author. Consensus meetings were held to resolve coding discrepancies and improve the reliability of the coding process. Through this process, emerging themes and patterns were identified thereby providing insights into participants' feelings and sense of home.

.9 Findings

Our research revealed that the sense of home for refugees was multifaceted, encompassing elements of cultural identity and memory, life stability, security and privacy, social connections and family togetherness. The Magic Machine workshop, which engaged 15 participants who had been resettled in Australia for 2-5 years, provided deep insights into how these individuals perceive and articulate their sense of home.

.9.1 Cultural Identities and Memories

The theme of cultural heritage and aesthetics was a frequently discussed element associated with feeling 'at home'. Participants tended to stress making an effort to stay connected with the cultures they come from through the decoration and organization of their homes. One such example was when a participant P9 described the worth of traditional handmade carpets: "*We very care about carpets, and*

we also have rules, no shoes on carpet. We have actually special, traditional carpets from handmade that are very, very expensive, special, and historic for our country. Sometimes we just hang it on the wall". Participant P10 described how she would like her home arranged so that there were spaces set aside for her to freely express her culture or religion: *"I want to have some corner or front of the house or something like (to) show that culture or that part of religion"*. P9 and P10 designed a magic screen to display traditional carpets, allowing them to freely choose or change the colors and patterns, as purchasing handmade carpets was beyond their budget. Similarly, participant P12 wanted to have a statue of the president from his home country, who he always admired - *"I think it is really important (to have a statue or other cultural elements), because it makes it feel like home, like, oh, okay, so this is African, I used to live there, the memory and say, not gonna make me feel lonely...Yeah, and remember something as well"*. This kind of personalization through culturally significant aesthetics allows the maintenance of identity and a sense of continuity, as cultural artifacts are not merely decorative but hold historical and emotional significance, serving as tangible links to participants' homelands.

Another important way to add a personal touch and make one's house feel like home was through the use of colors and other artistic expressions to reflect individual tastes, past experiences, and memories. As P10 indicated, she also liked to design the wall of rooms in her desired colour, and P1 and P2 expressed their longing to decorate their rooms through painting the walls. The aesthetic choices they make are not merely about decoration but are integral to bridging the past with the present, making them feel 'at home'. According to P2, *"The area that I live in, like, it's very quiet and safe, like, but just like the house that we live in. It doesn't feel like home. It doesn't has like memories. It doesn't like it doesn't feel warm."* Past experiences also shaped individuals' aesthetics in home decoration. For example, P10, who was unable to go outdoors during her time in detention, designed a magic ceiling that could turn transparent or display the scenes of nature. She emphasized that the feeling of being in the nature brought her peace of mind and greatly contributed to her mental well-being.

.9.2 Life Normalcy and Stability

Participants who take on the role of the 'provider' in their families prioritize life stability as the foundation for building a sense of home and belonging. According to Participant P9, who was raising her daughter alone, *"I learned home (is) to do just normal life"*. Her interpretation of 'normal life' included having planned daily routines, achieving financial independence, understanding how bureaucratic systems work in Australia, and having knowledge of, as well as access to, services and resources. Both participants agreed on the difficulties of achieving their perceptions of life stability for refugees - the lack of systematic navigation and education in accessing resources. As P9 pointed out,

" They (Refugees) need to have computers, yeah, and also they should have an email address, and they work with computer and media, and then also, they have to have English

talking. They need to know English a lot. And they need to have a computer to work with. This is a really important for technology. They need to know technology also, because a lot of people are of other countries, they don't even access to computer. They don't know how they can have an email. They need to know that, and they have to have a driver license and everything like legal documents, legal language, access to technologies"

P13 argued that she was unable to feel a sense of home without having a stable job and income. She explained her mindset before coming to Australia was, first establish a stable life, then focus on self-improvements and achieving her life goals. However, her current situation has forced her to prioritize secure any job first, and only if she's successful, then she can think about a job that suits her interest. Without a stable job, she felt that her life was unstable and lacked even the minimum standard of living. Similarly, P12 highlighted the sense of home for him was to see opportunities and hope in life, *"Home, I can describe it as, the most important part, I think, place of opportunities"*. Furthermore, P4 highlighted the difficulties many refugees faced in finding employment, particularly the complex process of having their skills and knowledge recognized. Companies in Australia often did not recognize degrees and certificates from their home countries, where there were different education systems, as argued by P4, *"For example, now refugees of Hong Kong, everything for them is easy, University, licenses, everything, but for Iranian, they can't take license for any job. And me, about 30 years, working (as) the technician in Iran. In Australia, I was going to find this job, but they tell me, I have to going in the college again, you take license for Australia, after that, you can go work in the market"*. Getting support with respect to bureaucratic processes was also a challenge to many refugees. P6, P7 and P8 discussed the issue of agencies shirking responsibilities to others when they sought services and assistance. In response, they designed a phone specifically for refugees to connect with various services, with each button corresponding to a specific agency, clearly labeling each agency's responsibilities and the range of services they provide. Similarly, P4 designed the website containing all sorts of information and educational resources that could prepare refugees with certificates, *"I want to make a technology for us, (that contains) job, university, freedom of all"*.

.9.3 Security and Privacy

Security and safety are essential concerns for refugees as they resettle in new environments. For instance, participants noted that they had come from backgrounds marked by wars and conflicts and expressed being grateful for now living in a safe environment. As P12 stated, *"I think 'peace' is the major one, because in my (home) country, like, there's no peace. And I think everyone wants peace to call that area as a home, because that's the reason why we left"*. P4 and P5 pointed that driving was not safe in their home country. However, in Australia, they found that people were kind, and they felt secure doing everyday activities outside such as shopping for groceries, without concerns for

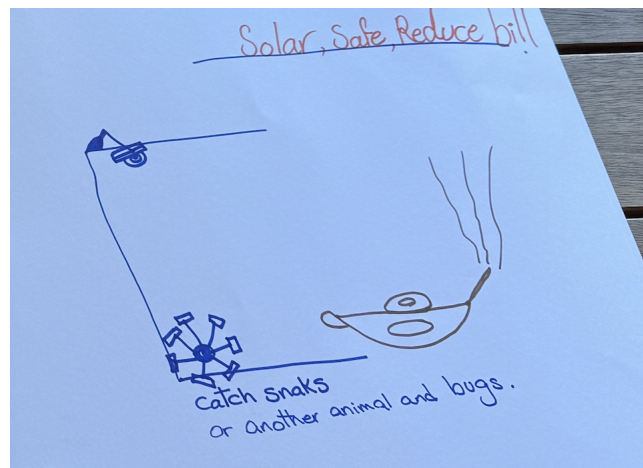


Figure 23: P9 and P10's design of insect / snake catching machine

The third image is the design of insect or snake catching machine designed by P9 and P10, which has a spider-like shape

their safety. The need for security around the living area was also reflected in the technology designs created during the workshop. P9 and P10 collaboratively designed a monitor-robot, which was similar in shape and size to a small, crawling animal (figure 2). They explained that it was intended to catch wild animals or insects that could potentially harm humans in their yards, given that Australia had many wild animals or insects they hardly encountered in their homelands.

Ownership and autonomy of the living spaces also emerged as being crucial for establishing a sense of security. As participant P13 noted, *"Home means a place that you are the only person that has the key and has your own bathroom and kitchen,"* underscoring the value placed on personal autonomy and control over one's environment. Many participants, like P4 and P5, set a goal of working and saving money to buy their own properties in the future. Participant P3 had achieved this goal after settling in Australia for 5 years - she had bought land, and her house was currently under construction. Participants emphasized the importance of having control over their own spaces - however, they felt that renting limited and compromised their freedom and daily routines. P2 mentioned they had some restrictions in making sounds in their rented accommodation. Likewise, P9 stated, *"I don't have home here. It's renting, renting from some company"*. P9 shared with the author that her house was rented through a refugee-focused service provider, which schedules mandatory monthly property checkups even when nothing is broken and all electronics are functioning well. These inspections disrupt her daily routines and plans, and significantly affect her mental well-being:

"They gave us the house, but controlling it. And they come in every once a month to check everything, furniture, what issue you have in your house. You know, this is annoying for us. We had always, once a month knocked at door, 'Hello, inspection'. It feels tired. You know it is. Actually especially for us, we released after long term of detention. They (do) not really understand the pain. But we came from pain. We don't need more pain anyway, for all refugees, (we) need safe house and support"

Having their own privacy was also a critical aspect of feeling safe and secure, especially for individuals living in shared accommodations. The ability to retreat to a private space where one can be alone and undisturbed was seen as being essential for mental well-being and a sense of safety. Participants frequently mentioned the stress and discomfort caused by the lack of privacy in shared living arrangements. For example, P15 was a transgender woman who emphasized the inconvenience of sharing accommodations with other refugees two years ago when she newly arrived in Australia. She frequently experienced hatred from her roommates because of her gender identity, faced judgment, and was concerned about her privacy due to others' curiosity about her body. In addition, P10 shared his own experience, "For my first house accommodation, just one bathroom and there were four people living together. All the time they knocked the door and say: Come out, it is my time. I need to use the toilet," illustrating the challenges of shared resources and the impact on personal privacy. Ensuring that refugees have secure and private living environments appeared to be vital to build their sense of home and belonging. This included not only physical safety from external threats but also the psychological comfort of having a personal, secure space. The narratives tell us that technological interventions can play a significant role in enhancing the security and privacy of refugees, helping them to feel more at home in their new environments.

.9.4 Social Connections

Family Togetherness

Social connections emerged as a fundamental aspect of their sense of home and belonging. Participants deeply valued their familial and social ties, and embodied their love for friends and family in the design of their ideal homes and technologies. For instance, participant P2 also stated, "*It's like for me, home is, any place that my family lives in...When I lived in Lebanon, I was just looking for a safer place to live in. That was the main idea of home for me. But now I feel like I just want to be with my family, like in any place, it doesn't matter anymore*". Family togetherness was what most participants longed for. Participant P3 described home as a place where she could live happily with her children, and she designed the magic machine that displayed different shapes and images on the wall for her children and family engagements. Likewise, participant P9 who regarded her daughter as the hope and motivation for her to striving for a better life, designed the ideal home with great considerations and care for her daughter,

"I wanted to have a comfortable house. I wanted to have a good, colorful life, because I didn't have these all my life. My father passed away when I was nine year old, and we lost five children. We always have something to share together. I never had my bedroom for myself, or school stuff. I had dream of having my own stuff from school. That's why this

age, I love school stuff. I love writing, reading, painting, toys. I like everything, but I didn't have a good quality of life when I was child. But now my child, I'm really, really upset for that if my child doesn't have any good quality of life too, because this is not fair.....You know, I had a hard life, hard time. I don't want my daughter have this experience too. I don't want my daughter, when she's my age, She's thinking about this, how she had a hard time life, from long time ago, from when she was child."

Participant P12 included a kids' room for his siblings in the design of his ideal home. He also showed concern for a friend with a disability, who came from a refugee background like him, when designing magic machines. He created a virtual learning and job-seeking device in the form of a helmet, allowing his friend to learn English and work remotely from home.

Preserving Cross-Border Connections

Establishing and preserving cross-border social connections with family members remaining in participants' countries of origin was also a significant focus among participants. P2 argued that the sense of home wasn't necessarily tied to a place but was closely connected to the people who mattered to her. P2's grandmother didn't move to Australia with her and the rest of the family. To bridge this gap, participants designed a magic projector (figure 3) that could display a person in real-life size with 3D effects,

" (P1:) you will feel it like, when you come back to this, like, you will see, oh, I saw my grandma here, you know. (P2:) It may be like, it may be like you're gonna stay at the same at this room with this projector, like giving with, like a shapes, not a review, that will... (P1:) make more memories for the house, yeah."

Similar design ideas were also proposed by other participants like P11 and P9. P11, the only child who grew up in a large family with his cousins in Senegal, moved to Australia with only his parents. He suggested designing a real-time, wall-sized screen at home, allowing him and his cousins to see and check in each other just like the past time of living together, providing a sense of reassurance. Participant P9, on the other hand, gave birth to her daughter alone in a detention center. Her husband was deported before their daughter was born, so the 5-year-old little girl has never had a chance to see her father in real person. She outlined the importance of imaginary technologies like 3D projectors that could provide an immersive experience, that would allow her daughter to interact more closely with her father, not only through video calls on the mobile phone screen.

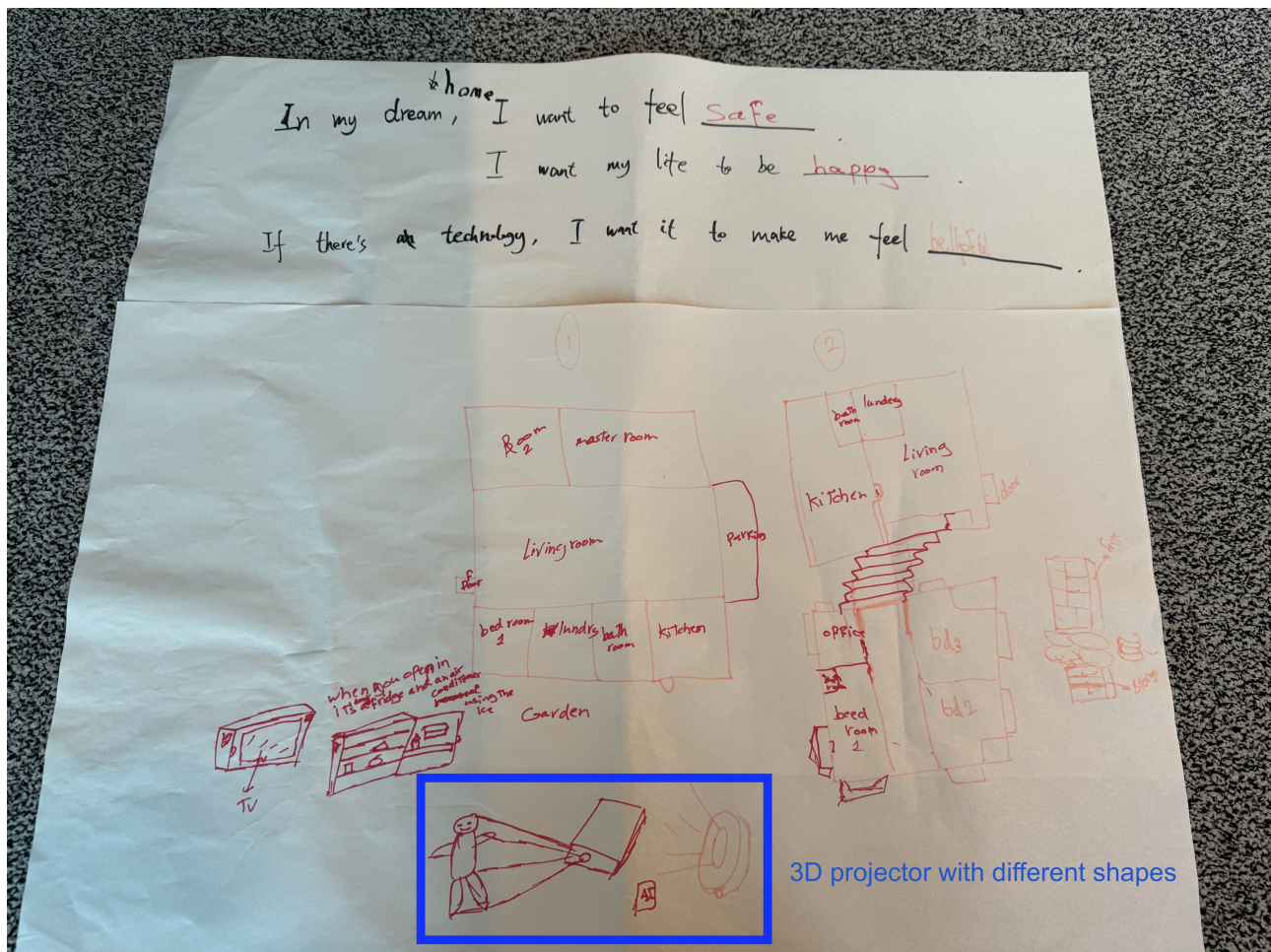


Figure 24: P1, P2, P3's design on the 3D projector in different shapes

The second image is the 3D projector sketched by participants P1, P2 and P3, where there are squared and round shapes, also a 3D model of a person is projected

Forming New Local Connections

In addition to maintaining social bonds with family and friends from similar backgrounds, participants also regarded building social bridges with local communities and forming social links with organizations as important aspects of creating a sense of home and belonging. According to P11 and P12, who had overcome language barriers, made local friends, and pursued higher education, they emphasized the importance of building and maintaining social bridges. They joined local sports clubs, such as the local football club, where they shared common interests with local people and could meet up peers of the same age. Similarly, P3 noted, "I feel that like people here, they're really good at communicate with people and understand people, and they treat us like all of us are, like, equal.". Participants indicated that their turning points for their sense of belonging were where they felt accepted and began to integrate into the community. P4 and P5 highlighted the kindness of people in Australia as a key factor in accelerating their sense of belonging and integration. However, while most participants expressed feeling comfortable building social connections with locals and highly praised Australia's social and multicultural environment, P6 and P7, male refugees from Uganda, emphasized

the discrimination for them as men of color, due to the negative stereotypes and perceptions that portray them as aggressive and dangerous. P7 shared an experience when he was searching for accommodation. In comparison to P8, a woman of color who was in a similar situation, it was notably harder for him to find accommodation as an African man, reflecting the additional barriers they encounter due to these prejudices.

.9.5 Resilience and Ingenuity

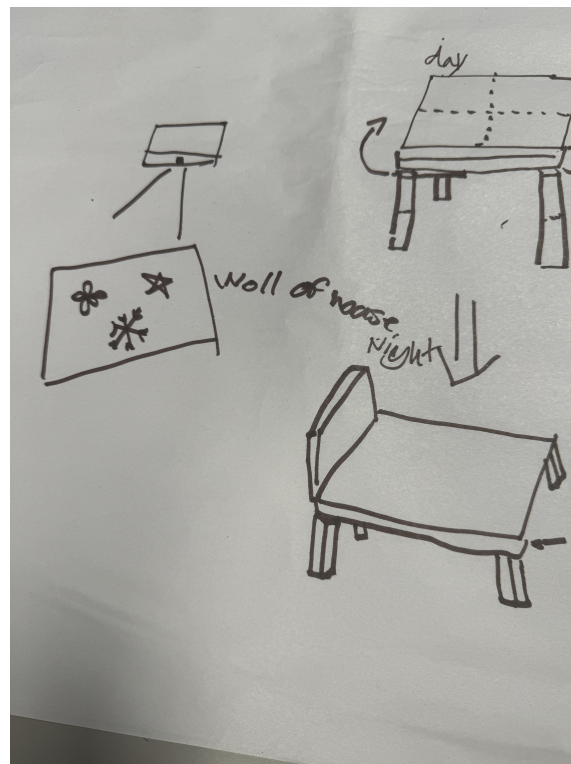


Figure 25: P3's design on the foldable bed (night-time) to table (day-time)

The fourth image is the sketched fold-able bed sketched by P3, it can be folded into a table during the daytime

The availability of sufficient resources within the home to meet one's basic and physiological needs was necessary for cultivating a sense of home, however, the limitation of resources was a common problem faced by refugees. P10 is a single mother living in a shared accommodation with her daughter, the water heater in their home did not have enough storage to meet the usage needs of the number of residents,

"In the first house where I stayed, there was only one bathroom for 4 people. People were constantly knocking on the door, telling me to hurry up because it was their turn to use the toilet, it was incredibly uncomfortable. That's why I really wanted to have my own separate bathroom, ideally with a single toilet just for me in the master bedroom. Whenever I tried to take a shower, the water would suddenly turn cold, especially when it

was my turn to shower. As a mother, I always put my daughter first and made sure others were taken care of before thinking about myself. But when it was finally my time, I'd often find myself shivering in the cold water during winter. It was an awful experience, and I just couldn't believe how difficult and uncomfortable it was."

Many participants encountered similar issues in shared accommodations. P14 and P15, due to their religious beliefs, did not eat pork and even experienced allergic reactions when they smelt it. However, they shared a kitchen with others who frequently cooked pork. To address this issue, they brainstormed a magic mask that would block the unpleasant smell. Participants like P1, P2, and P3, who experienced a lack of space in their homes, came up with design solutions to maximize space efficiency. For instance, Participant P1 designed a tall, wall-mounted storage unit combined with a fridge, P2 envisioned an all-in-one electronic device that functions as a TV, air conditioner, and fridge, and P3 designed a foldable bed (figure 4) that could be transformed into a table during the day, allowing her kids to do their homework without buying an additional table. Financial constraints also influenced the living experiences of refugees. P10 noted the most important technologies at home was solar, as the electricity bills were too expensive for newly-settled refugees who did not have stable income, *"Electricity bill is too expensive. I have a friend, she even can't turn on the heater in the winter because she has to pay lots of money to warm up her house. But when they have a solar they don't have problems using the power...Technology for home is internet, and solar, for electricity"*.

.9.6 The Role of Time and Proactive Integration

Time plays a significant role in shaping participants' sense of home and belonging throughout their resettlement journeys. Our findings revealed that participants' needs evolve over time, with some challenges being resolved as they adapt, though proactive efforts are often required to address these issues. During the initial adjustment period, participants primarily focused on overcoming practical and material barriers; fundamental needs such as housing, employment, and navigating bureaucratic systems, were central concerns during the early to mid-integration period. For instance, P11 and P12 overcame language barriers through active social participation in local activities and interactions with local people. Similarly, P4 obtained a driver's license and secured employment at a local supermarket to deliver food, where the financial and bureaucratic barriers were addressed. Once these basic material needs were met, participants began to prioritize emotional, social and other higher level needs. For example, participants like P13, P14, and P15, who are still in the early stages of resettlement, designed their magic machines with the purpose of security and privacy, due to living in shared housing, limited English proficiency, and unstable financial situations. In contrast, participants like P11 and P12, who had progressed further in their integration, focused their designs of magic machines on fostering connections with family members or enhancing their own relaxation and entertainment at home.

Likewise, P10 mentioned that during the initial stage of her resettlement, she struggled with basic living resources in shared accommodation, such as access to hot water for bathing. Now, she aspired to include cultural decorations in her new home. This progression demonstrates how participants' sense of home and belonging evolves over time, moving from addressing physiological needs to fulfilling individual aspirations as they integrate more deeply into their new environments. Participant P3 now considered herself successfully integrated after five years in Australia, having bought land and begun building a house for her family. Reflecting on her journey, she remarked, *"Some people, they worry too much. I feel sad too, because that's what I was doing, like in my situation. 'Oh my gosh, there's no hope,' I was thinking. There was no hope in Australia. But now, I can see there's hope. It's just a (matter of) time; when it's the right time, you eventually will be good"*. This sentiment underscores the transformative role of time in resettlement, as participants gradually move from initial struggles to achieving a sense of belonging and optimism for the future.

.10 Discussions

.10.1 Place-Belongingness in the Refugee Context

Our empirical findings further extend the research framework provided by Antonsich [10] on the subjective dimension of belonging - place-belongingness, as shown in Table 2. According to Antonsich [10], the personal feeling of being at home is composed of five key factors: autobiographical, relational, cultural, economic, and legal. The politics of belonging, meanwhile, involves membership in a group and ownership of a place. While Antonsich's research addresses general real-life settings, our research focuses on forced displacement and refugees, we extend the theoretical concept of place-belongingness by offering more context-specific insights. For example, Mohseni et al. categorized the practical meaning of place-belongingness through systematic literature review, including feeling at home, secure, empowered, accepted, emotionally attached, and comfort. Despite researchers agreeing that security is a crucial aspect of belonging [74], perspectives vary. Ignatieff [37] suggests that *"where you belong is where you are safe; and where you are safe is where you belong,"* framed within inter-ethnic violence, thereby seeing belonging as protection against violence. Antonsich, on the other hand, asserts that legal status and citizenship are the main factors influencing individual security and belonging [10]. In line with this, Papastergiadis highlights how precarious legal statuses and exploitation heighten insecurity for migrants, exacerbating marginalization, while increased border control and surveillance technologies further compromise migrants' privacy in the name of security. [54]. While these political and systematic factors are crucial, we argue that, at a micro-level, privacy and autonomy are equally vital, especially for refugees in shared accommodations during their early stages of integration. For example, P9 felt uneasy when her roommate invited men over during her

pregnancy, and P15, a transgender woman, reported discomfort due to her roommates' intrusive curiosity about her body. These examples underscore that privacy and control over personal living spaces are critical for establishing a secure and stable sense of home, complementing the broader structural factors highlighted by Antonsich and Papastergiadis.

Table 8: Extensions on Antonsich's Framework of Place-belongingness

Key Factor	Antonsich's Framework of Place-Belongingness	Extensions in the Context of Forced Migration
Autobiographical Factors	Attachment through personal history, childhood memories, and ancestral ties to a place.	Refugees' sense of home is dynamic and shaped by both positive and negative past experiences, not just static ties to origin.
Relational Factors	Social ties with family, friends, and weak ties in public spaces.	Refugees also aspire to maintain cross-border family connections disrupted by displacement beyond local relational ties.
Cultural Factors	Shared language and cultural practices as core elements of belonging.	Tangible and material artifacts (e.g., traditional carpets, food practices) as key to recreating a sense of home.
Economic Factors	Stable material conditions and integration into the local economy.	Stressed the importance of job stability, access to systemic resources, and financial independence for achieving a sense of stability.
Legal Factors	Legal status and citizenship as primary contributors to security and belonging.	Emphasized privacy and autonomy as equally critical for security, particularly in shared living spaces during the early resettlement phases.

The other context-based insight relates to the need for refugees to maintain and continue social connections that were disrupted due to forced migration. Many participants had close family members left behind in their home countries, some of whom they used to live with. These relationships were once central to their daily lives, and had become fragmented due to displacement. In Antonsich's framework [10], the relational factor includes connections with family and friends, as well as "weak ties," such as occasional interactions with strangers sharing public spaces. However, our study highlights a deeper and more specific need among refugees to preserve and sustain the strong ties they had with family members left behind, instead of the everyday weak ties that are often transient or circumstantial. For instance, P11, who lived with his cousins before migrating, shared the memories of living with his cousins back in his home country, and expressed how much he missed them, especially during the early stage of his resettlement. Similarly, P2 spoke about how her sense of home felt incomplete

without her grandmother. Thus, while Antonsich's framework [10] acknowledges the importance of relational ties, our research extends this by emphasizing the essential role of maintaining cross-border family connections in fostering a sense of place-belongingness for refugees. This aligns with Papastergiadis [54], who argues that the modern sense of belonging relies less on geographic proximity or physical contact. The expansion of media technologies facilitates cross-border communication, enabling cultural displacement to occur without the physical movement of people [54].

The same goes for the cultural dimension in Antonsich's framework, where there is an emphasis on language as the most crucial part of cultural dimensions. We do agree that languages are very important to a refugee's integration, yet we supplement that the cultural aspect of place-belongingness are also linked with one's aesthetics and practices, which can be reflected through material and tangible artifacts. According to Tolia-Kelly [68], these artefacts act as "precipitates of re-memory," carrying personal and collective histories that shape a sense of belonging across time and space. In our study, participants demonstrated a similar process of using objects to navigate their cultural identity and sense of place. P9 and P10's desire to place traditional Iranian carpets in their home, for example, can be seen not just as a reflection of cultural identity, but also as a way to re-create a sense of home and re-memory through these objects, connecting past and present experiences of belonging. Participants P14, P15, who had Halal food restrictions, mentioned their unpleasant feeling when they smelled their roommates cooking pork. These examples underscore how material culture — such as food and home decorations — can significantly contribute to feelings of place-belongingness, offering a tangible connection to one's cultural roots even when displaced. This finding is line with Ralph et al. [58], who highlight that migrants often anchor themselves in new environments through familiar objects and cultural practices, which offer a sense of continuity amid displacement and therefore foster a sense of home and belonging.

Antonsich [10] also emphasizes autobiographical factors in place-belongingness, highlighting personal history, experiences, relationships, and memories, with childhood memories playing a key role in forming these connections. Antonsich [10] states that birthplace often holds deep emotional significance throughout one's life, and manifests this by quoting from bell Hooks [34], who describes the Kentucky hills from her childhood as her "*true home*", where she feels a strong sense of belonging and self-identity. Family and ancestral memories further strengthen this emotional connection to place [34]. However, bell Hooks [34] grew up in a Black community that fostered belonging despite societal racism and exclusion. Her family environment provided a nurturing and loving foundation. While many participants (e.g., P1, P2, P11, P12) had positive family environments in childhood, some others did not. P9, for instance, mentioned that she lacked her own room, clothes, or stationery, always using hand-me-downs from her siblings. Thus, she was trying her best to look for jobs as she wanted her daughter to enjoy her childhood. Furthermore, participant P10 envisioned a technology with a magical ceiling that could display the night sky or scenes of nature, inspired by her time in a detention center

where she was unable to go outdoors.

We posit that the sense of home or place-belongingness is not solely determined by one's birthplace or origin but it is a dynamic and fluid concept, especially for refugees. Their sense of home is continually negotiated between past and present memories of both their home and host countries. Traumatic experiences during forced displacement can also reshape their needs for home and belonging. In contrast to Antonsich's autobiographical dimension of place-belongingness, which appears to be more static [10], our insights are in line with Papastergiadis [54], who argues that the globalization and migration of people has weakened the link between identity and a fixed location, leading to a sense of displacement and fluidity in cultural and social identities. With the development of global forces like economic integration, technological advances, and political change, this concept of deterritorialization challenges the notion of a stable national or cultural identity, and the traditional ideas of attachment to a fixed place or community [54]. Migrants often form hybrid identities, which reflect multiple layers of belonging. These hybrid identities can include elements from both the migrant's origin and host cultures, creating complex forms of attachment that resist simple categorization [54]. In our study, P11 and P12 participated in local sports events and joined local sports clubs. They advocated that other refugees ought to explore and adapt to local culture and activities, and they both pointed out that they felt belonged to Australia and regarded Australia as home while saw their country of origin as home too. Both the results from our study and insights from Papastergiadis [54] suggest that belonging is a shifting and dynamic experience for migrants and refugees, shaped by a mix of global flows, cultural hybridity, and the challenges of displacement.

.10.2 Design Implications

The Role of Technology

Much of the existing HCI literature has explored the potential of technologies in stable, resource-rich environments, such as smart home systems [22]. However, our research highlights the unique design opportunities to foster a sense of home and place-belongingness for refugees in contexts of mobility, traumatic experiences, and resource constraints. One of the most significant insights from our study is the critical role that technology can play in **supporting cultural and memorial preservation** for refugees. In line with our study, previous HCI studies on the transition of moving into new living environments showed the importance of physical artifacts in fostering familiarity, maintaining personal and cultural identity, and creating a sense of place-belongingness [44, 71]. However, refugees often lose or relinquish their possessions during forced displacement and prioritize necessities over familiar objects that carry emotional significance or memories when travelling to the host country. This is where digital technologies can play an essential role in recreating those lost physical artifacts in a virtual form. As Sabie et al. suggested[61], it is important to enable migrants to reflect on their cultural

pasts through tools like "*Our Home Sketcher*", i.e., the 3D printing technologies convert sketching of a house into 3D models. A digital artifact designing platforms can offer opportunities for refugees to recreate and display digital artifacts, images, and cultural symbols that are important to them. The artifact designing platform should have rich personalisation choices. As Nabil et al. emphasize [48], who note the need to develop low-cost, DIY toolkits that empower refugees to craft and personalize their spaces, customization helps refugees maintain dignity, identity, and emotional well-being, even in temporary and resource-limited environments. As such, developing an artifact DIY and display platform incorporating Augmented Reality (AR) technology could effectively blend digital designs into physical environments, addressing the limited personalization options in rented spaces. For example, participants P9 and P10's concept of a 'magic screen' displaying traditional Iranian handmade carpets could be realized through such a platform.

Another design opportunity is to **enhancing cross-border social connections**. While there are multiple video communication tools like *WhatsApp* or *Zoom*, participants were longing for a more immersive and imperceptible way of maintaining those strong ties. For example, the 3D projector designed by P1 and P2 to display 3D real-world size family members, and the wall-size screen by P11 to show the real-time video of his cousins back in his country of origin, reflect the needs for participants to have more emotionally engaging and lifelike communication experiences that go beyond the conventional video call format. The 3D projector designed by P1 and P2 to display life-size family members embodies this concept of telepresence, where individuals can experience real-time, immersive interactions with remote family members. One promising direction to utilizing Virtual Reality (VR) or Mixed Reality (MR) technologies, due to its nature of creating a sense of "being there" and presence. However, one challenge of using these technologies is when some family members are in the same physical location and others are remote, using VR to engage with distant family members could lead to an situation where those present in the same physical space also have to immerse themselves separately in a virtual environment with individual headsets to participate in the same interaction. Another pain point is the avatar technology in VR is still under-development to accurately replicate the real-time facial expressions, body language, and subtle emotional cues of a person. Many VR systems rely on stylized, cartoonish avatars or low-fidelity 3D models, which fall short of creating a true-to-life experience.

Technology can also play a crucial role in **facilitating stability and normalcy**. Our findings suggest that refugees often face barriers in accessing resources due to unfamiliarity with local bureaucratic systems, and digital illiteracy. Participants emphasized the importance of stability as a foundation for building a sense of home. Hence, developing tools such as a digital navigation platform can facilitate refugees' digital literacy, access to education, employment, and social services, while also providing essential knowledge for navigating bureaucratic processes. For example, the magic navigating phone designed by P6, P7, and P8 with only buttons dedicated to specific service providers, reflects the

need for simplified access to essential resources. These tools should include features like multilingual support and clear categorization of responsibilities for different organizations, along with detailed listings of services and contact information for each entity, while the user interface should be minimal and easy to understand.

The study also revealed refugee-focused design considerations. Many refugees have suggested **designing for shared and resource-limited spaces**. Participants, such as P3, P9, and P10, proposed designs like foldable beds and solar-powered systems, showcasing the practical and financial constraints they face. Space limitations were a critical factor to consider in the design of technology for refugees, especially for those who reside in shared and crowded conditions, hence technologies designed for these contexts need to be compact, portable, and multi-functional. Modular designs that allow refugees to reconfigure or re-purpose technology based on their current needs would also be highly valuable. Additionally, power-efficient and cost-effective solutions are important considering the financial status of refugees during their early-stage resettlement. In line with our findings, similar design ideas such as solar-charging devices were also proposed by refugee youths in the study by Fisher et al. [28]. In summary, designing for refugees requires a comprehensive approach that addresses the challenges of space, power, and financial constraints.

Magic Machine Workshops with Refugees

The authors adopted 'Magic Machine' workshops to stimulate participants' imagination. In comparison to other speculative PD approaches, the terms 'magic' and 'machine' were easy for participants to grasp, as it encouraged them to imagine infeasible and impractical machines or technologies without being bound by real-life constraints. Therefore, the authors did not encounter the challenges observed in previous studies by Harrington et al. where non-existent design solutions were often dismissed or mocked by other participants[31] [33]. However, a few participants initially misinterpreted the concept and created designs based purely on magic. For example, P10 drew an '*Aladdin and His Wonderful Lamp*' at the beginning, which was inspired by her cultural background; she explained that it symbolized a magical device capable of manifesting everything she needed. Therefore, we argue that it is important for researchers to provide a clearer explanation to distinguish between "purely magical" devices from fairy tales and "magic-like" devices grounded in speculative design. For example, to address the issue of participants misinterpreting the concept of "magic" in magic machine workshops, we conducted brief group discussions before design sessions where participants practice distinguishing between purely fantastical ideas and speculative designs rooted in addressing everyday needs. In addition, previous research by Andersen et al. [9] reveals that balancing participant autonomy with structured progress can be challenging in magic machine workshops. As such, we utilized open-ended fill-in-the-blank prompts guiding participants' designs, to make sure participants felt empowered while ensuring that discussions remained focused on workshop goals.

.10.3 Limitation

Although the study includes refugees from various backgrounds, the use of snowball sampling resulted in participants inviting friends who often shared similar cultural backgrounds. This may have introduced biases into the study and limited the diversity of perspectives. This study included participants from diverse cultural and demographic backgrounds, which enriched the findings but also introduced complexities. The heterogeneity may affect how sense of home and belonging were perceived. For example, younger participants tended to design for social engagement and aesthetic expressions, older participants prioritized solving practical challenges such as designing systems for accessing services, achieving financial independence. While the aim was to uncover broadly-applicable and generic frameworks for fostering a sense of home among refugees, these variations highlight the need for future research to explore how demographic factors influence the utility and applicability of such frameworks. The workshops were conducted over a short period of time, thus future longitudinal research would provide a deeper understanding of how place-belongingness evolves over time as refugees settle into their new environments. In addition, the study mainly focuses on technological solutions to foster place-belongingness. While technology is a powerful tool, there are political factors also contribute to refugees' place-belongingness. The authors suggest that future research should explore demographic and political factors in shaping place-belongingness and adopt longitudinal approaches to understand how this evolves over time as refugees resettle.

.11 Conclusion

This study builds upon the theoretical concept of place-belongingness, and sheds light on refugees' sense of home in the host country. By engaging 15 refugees, who have been resettled in Australia for two to five years, in Magic Machine co-design workshops, we conclude that cultural identities and memories, life normalcy and stability, security and privacy, social connections, and resilience and ingenuity are important factors to foster a sense of home and belonging for them. The study expands the theoretical concept of place-belongingness, by highlighting the fluid and evolving nature of home, especially in the context of forced displacement. This research contributes to the growing body of work in HCI by proposing refugee-focused design implications in enabling cultural and memorial preservation, maintaining cross-border social bonds, and navigating essential services and information for refugees to establish familiarity and stability in their new environments.

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Appendix C

Culture Link: Supporting a Sense of Home through Digital Storytelling

Song, P., Yadav, A., and Vyas, D. Culture Link: Supporting a Sense of Home through Digital Storytelling. Submitted to *Proceedings of the 2026 CHI Conference on Human Factors in Computing Systems (2026)*. [65]

Abstract

Building a sense of home is vital to refugees' well-being and integration during resettlement. While prior HCI research has highlighted the significance of cultural identity and family bonds in shaping this sense of home, few studies have explored how digital technologies can actively support these dimensions. Informed by ambiguous loss theory, this paper presents a study of *Culture Link*, a collaborative AI image-generation platform with playful features, designed to foster storytelling and engagement among refugee families in Australia. Seven families participated in a ten-day field trial, where they co-created visual stories by sharing images and narratives. Through thematic analysis of interviews and in-app activities, we identified five aspects of how the platform facilitated the sense of home: memory preservation, cultural transmission, creativity, family engagement, and generational identity divergence. Our findings extend ambiguous loss theory in displacement contexts and contribute to HCI research by demonstrating generative AI as a probe for storytelling.

Refugees often encounter numerous challenges following resettlement. Refugees in Australia receive a range of support services, including basic necessities, accommodation, and access to education [3]. However, these services are often short-term and primarily designed to meet practical needs [34, 66]. The process of re-making *home* extends beyond housing. It entails rebuilding psychological belonging, that is often disrupted by trauma and the ambiguous loss of identity and place [9, 10, 14]. Ambiguous Loss Theory, developed by Pauline Boss [10], is a psychological and family therapy concept. It identifies two types of loss: (1) physical absence with psychological presence, and (2) physical presence with psychological absence. It refers to losses that are unclear and lack closure. Although the theory originated around absent/present persons, displacement research extends it to non-human attachments, including loss of self, identity, home, and belonging [14, 52]. Belonging is

a critical aspect of integration. The personal sense of belonging is shaped through memories, social relations, and cultural identity [2, 44]. Prior research in Human-Computer Interaction (HCI), drawing on Antonsich’s framework of belonging and situated in displacement contexts [2], has extended the importance of cultural identity, memory, and social connections in shaping refugees’ sense of home [65]. As carriers of memory and cultural heritage, artifacts help people sustain identity, mitigate cultural barriers, and enable continuity in daily life [39, 71]. For refugees, many of whom lose their material possessions [32], practices such as making and decorating in their new homes enable them to compensate for the loss and rebuild a sense of home [47].

Storytelling is a well-established practice in HCI with vulnerable communities [25, 60]. Prior work has shown how storytelling enables transmitting culture, reconstructing identity, and rebuilding social capitals in the context of forced displacement [53, 67]. Storytelling empowers refugee youths to process experiences of loss and displacement [25]. In family settings, photo-sharing and interactive media can scaffold these practices [67]. Researchers also highlight the importance of collaborative storytelling. Narratives should be co-created and shared reciprocally, not treated as a one-sided activity [59]. Emerging media further enrich storytelling [29, 61], and recent work suggests that generative artificial intelligence (GenAI) may further facilitate these practices by fostering collaboration and reciprocity [41]. GenAI can lower skill barriers and invite broader participation by children and novice creators [15, 31, 57, 70]. GenAI has also been explored as a catalyst for family co-creation [37], collaborative arts therapy [40], and community-based storytelling [30], demonstrating its potential to cultivate creativity, engagement, and multi-modal meaning-making across diverse contexts. For migrants and other marginalized populations, AI-mediated tools have also been explored as supports for communication, cultural adaptation, and information-seeking practices [7, 38, 72, 77]. Despite growing interest in storytelling within HCI, there is limited understanding of how inter-generational storytelling and co-created narratives might help refugee families negotiate the ambiguous loss of home. This gap motivates our exploration of storytelling as a shared, identity-reconstructive practice for refugee families.

To address this gap, our study is guided by the research question: How do inter-generational collaborative storytelling practices enable refugee families to negotiate the ambiguous loss of home, and co-reconstruct identity and belonging in resettlement contexts? Informed by ambiguous loss theory [9], and its prior applications in forced displacement contexts [14, 52], we designed *Culture Link*, a collaborative platform that uses image-to-image GenAI to create composite images. The platform allows each family member upload a personally meaningful image and then composes them into a single shared image that prompts narration. The focus of the system is not replacing the factual record, but co-composing a single artifact when no canonical photo exists, e.g., dispersed people, animals, objects, and places. We position the system as a supportive catalyst: the generated artifact invites participation and co-creation, but does not substitute for the family’s own stories or for the accuracy of

original photographs. We conducted a ten-day field trial of *Culture Link* with seven refugee families in Australia, followed up with semi-structured interviews. Through thematic analysis, we provide empirical insights into how collaborative, AI-mediated storytelling supports a sense of home across five dimensions: memory preservation, cultural transmission, children’s creative expression, family engagement, and inter-generational negotiation of belonging.

Our work makes two key contributions to the HCI field of research. First, we make theoretical contribution by extending ambiguous loss theory in displacement. We show that the ambiguous loss of home is not only cyclical and relational but also generationally divergent, and we demonstrate how collaborative storytelling supported by a shared visual artifact redistributes memory across family members. This shifts memory work from an individual responsibility to a reciprocal, inter-generational practice. Through the creation of a daily storytelling ritual, families collectively weave together past experiences, present circumstances, and imagined futures into a single symbolic frame. This process enables reinterpretation rather than strict recollection, fostering moments of vicarious resilience as children’s playful or hopeful re-imaginings invite parents to renegotiate their own sense of home. Second, we provide design implications of how GenAI can scaffold this co-authored narrative work by providing a participatory prompt rather than a fidelity-oriented record. We position this work as exploratory. Its value lies in opening new design directions for family-centered, AI-mediated storytelling rather than claiming broad generalization.

.11.1 Refugees and the Loss of Home

For refugees who experience forced displacement, resettlement requires more than material support. Although food, housing, healthcare, and education are essential in the early stages, such services typically address only immediate needs[66]. A long-term challenge of displacement lies in reconstructing a sense of self, place, and belonging [74], which is deeply tied to identity, culture, and social connectedness [2, 65]. The disruption of forced migration, combined with trauma, frequently produces ambiguous loss, whereby home and identity remain suspended in a state of uncertainty, that is neither fully retained nor entirely lost [11, 50].

The Ambiguous Loss Theory

Ambiguous loss is a family systems theory conceptualized by Pauline Boss [8, 9]. It identifies two primary forms: 1) physical presence coupled with psychological absence, as in dementia or addiction; and 2) psychological presence coupled with physical absence, e.g., individuals missing due to war, migration, or human trafficking. Unlike a clear-cut death, an ambiguous loss lacks official verification and the accompanying rituals of support, leaving families without closure [11]. Because it lacks

closure and blurs boundaries around who is considered part of the family system, ambiguous loss is viewed as one of the most stressful forms of loss [43].

The theory has since broadened to include losses of roles, objects, and attachments. Perez's study of Cuban American exiles illustrates how homeland loss becomes a lifelong, unresolved condition, marked by long-term family separation, disrupted identities, and nostalgia for a place that remains psychologically present but physically unreachable [52]. This highlights how displacement produces chronic grief that cannot be resolved through traditional rituals of mourning. Bunn et al. [14] examined the ambiguous loss of home among Syrian refugees in Jordan, proposing a process model comprising four interrelated dimensions: safety and security, social connections and identities, connection to place, and imagined futures. Their grounded theory analysis shows that refugees move between grieving losses and remaking home through cultural practices, faith, new relationships, and children's adaptation, highlighting home as a multidimensional and cyclical construct. However, their study focused mainly on married adults and called for work with youths. Crooks et al. [18] instead centre newcomer youth, showing that peer relationships and peer-based interventions are critical to immigrant and refugee students' sense of inclusion. Likewise, McGillicuddy and Machowska-Kosiack [42] show how migrant and minority-ethnic children negotiate identity and belonging, identifying classrooms and peer groups as key sites.

In the context of voluntary migration, Solheim et al. [63, 64] demonstrate that although families may gain economic or safety benefits, they still endure persistent grief, shifting family roles, and ambiguous futures. Their work emphasizes agency, costs–benefits trade-offs, and the mediating role of communication technologies in sustaining transnational ties, showing that ambiguous loss is not limited to forced displacement but also shapes families navigating globalization. Scholars have identified coping strategies for dealing with the ambiguous loss of home, including finding meaning, adjusting mastery, maintaining while redefining identity, normalizing ambivalence, revising attachment, and cultivating new hope [14, 52]. In addition, narrative therapy has emerged as a culturally sensitive approach [10, 52]. Rather than pushing individuals toward closure, it encourages them to creatively re-interpret their life experiences [51]. For immigrant populations, narrative approaches that center on relationships with loved ones may be especially effective [75].

Recreating a Sense of Home

Ambiguous loss complicates integration, as belonging cannot be achieved solely through structural support but also requires psychological and cultural reconstruction. Scholars have long conceptualized home as more than a physical dwelling [20]. Antonsich's two-dimensional framework distinguishes between a personal sense of belonging and a political dimension [2]. An individual's sense of home and belonging is shaped by the interplay of memories, lived experiences, social ties, and cultural identity [44].

Building on this, Song et al. conducted six Magic Machine workshops with fifteen refugees in Australia, revealing the importance of cultural identity and family relationships in sustaining refugees' sense of home [65]. For migrants experiencing mobility, home, identity, and belonging are simultaneously dynamic and grounded [56, 65]. They are shaped by fluid transnational ties as well as stable place-based attachments, social recognition, and power relations [56]. Lee et al. [38] designed conversational AI to support young migrants in cultural adaptation, emphasizing that integration involves more than one-sided assimilation; rather, it is a dynamic negotiation across both home and host cultures, which AI should help to balance.

Memory is central to how migrant families preserve identity and continuity across displacement. Material possessions and artifacts act as anchors to the past, enabling re-memorizing processes that reconnect individuals with their cultural heritage [71]. Artifacts help buffer against cultural barriers and foster a sense of home [71]. Lindley et al. [39] further argue that while artifacts function as carriers of past memories that sustain self-identity, they also support continuity by being incorporated into everyday routines. However, material objects are often transient, and for refugees this transience is intensified as many lose their possessions during displacement [32, 71]. Nabil et al. [47] demonstrate that decorating, painting, and do-it-yourself (DIY) practices among Syrian refugees in the Za'atari refugee camp served as a way to compensate for the loss of their homes and cultivate a renewed sense of home. The practices of memory keeping is often experienced as meaningful and relational. Basso's work [6] on indigenous communities show that elders' storytelling ties moral guidance to named landscapes, positioning them as honored keepers of place-based wisdom. Similarly, Tibau et al.'s FamilySong project [69] focuses on internationally distributed families who use shared musical rituals to maintain intimacy and cultural connection, framing memory as joyful, collective participation rather than heavy responsibility. Moreover, Jones and Ackerman [35] highlight the role of younger generations in these practices. They depict family histories as "mosaics" co-constructed by storytellers and listeners across generations. This framing challenges one-way transmission models and emphasizes how younger family members investigate, question, and reinterpret stories. However, recent work foregrounds the politics and labor of these practices. Chowdhury et al. [17] illustrate how certain family members—often women—are implicitly assigned the role of memory-keepers in transnational migrant households, tasked with sustaining family history and kinship ties. Yet this memory work entails continuous, invisible, and often politicized labor. It is frequently gendered, imposed, and emotionally exhausting [17]. Technology can inadvertently amplify this burden by introducing new responsibilities such as organizing digital artifacts, retelling stories, maintaining *WhatsApp* groups, finding "tickets-to-talk," and holding together separated families. They argue that technologies which channel family history through these individuals can "impose more labor" and create a "burden of memory-keeping" rather than distributing this work, highlighting that the role is sometimes imposed rather than chosen [17].

Digital technologies also serve as promising mediators of belonging. Sabie et al. [58] introduced *Our Home Sketcher*, a paper-based probe using 3D printing to help newcomers express cultural values and spatial preferences. They showed that memory-evoking design can support and reshape immigrants' cultural identities in domestic settings. However, the tool focused mainly on wall or space layout, and some participants felt uncomfortable with hand-drawing, limiting expressivity and uptake.

.11.2 Digital Storytelling in the Refugee Discourse

In HCI, researchers have designed for many challenges around refugee resettlement, including access and information seeking [26, 33], health and well-being [36, 68], education and skills acquisition [16, 27, 45], and language barriers [13]. Alongside these efforts, storytelling has emerged as a vital research approach with refugee communities. Sawhney [60] demonstrated that digital storytelling workshops can empower marginalized refugee youth by fostering creative expression, cultural agency, and civic engagement. Fisher et al. [25] engaged Syrian youth in Za'atari camp through LEGO and storytelling workshops, showing that storytelling functioned not only as a data collection method but also as a cathartic outlet, enabling youth to express traumatic memories of war and camp life alongside moments of hope and care.

Storytelling is a meaning-making social practice that recounts events while constructing shared understandings and normative claims within cultural and institutional contexts [54]. It preserves culture, builds social capital, transmits values, and sustains identity while balancing integration in contexts of displacement [53, 67]. Narratives enable refugees to interpret their past, reclaim identity, exercise agency, foster solidarity, and pursue justice [21]. They are not only expressions of suffering but also tools for survival, continuity, and transformation [21]. Through stories, memories of the past intertwine with present experiences, enabling individuals to situate themselves within new cultural and social environments. Strelakova et al. [67] argue that children from refugee backgrounds view family storytelling as essential for cultural continuity, moral development, and language retention. Despite assimilation pressures, they show agency in sustaining and adapting these practices, offering powerful counternarratives to reductive refugee representations.

AI-mediated Communication and Storytelling

In HCI, technologies have been explored to support storytelling through social media [24], virtual reality [29], augmented reality [61], and video platforms [28]. Photographs play a central role in facilitating storytelling [5]. Study shows that photo-sharing platforms, family archives, and interactive media can mediate inter-generational connections and help marginalized groups sustain ties to cultural identity [73]. These systems position technology not merely as a repository of memory, but as an active mediator shaping how memories are shared, interpreted, and re-imagined. By centering voice,

creativity, and collective reflection, digital storytelling emerges as both a critical pedagogical practice and a transformative strategy for migrant representation [1]. Generative AI has emerged as a powerful tool for digital storytelling and communication, encompassing modalities such as text-to-speech [22, 78], text-to-image [41, 55], speech-to-image [23, 76] and image-to-image [40]. These tools enable diverse forms of visual and narrative co-creation, particularly for users with limited technical or artistic skills. Qin et al. [55] demonstrate how *StoryNode*'s integration of node graph visualization and multimodal generative AI supports moral reflection, productivity, and cross-cultural storytelling, while also highlighting the need for personalization and careful design. Liu et al. [40] show that image-to-image generative AI can be integrated into family expressive arts therapy through multimaterial storymaking, not intended as a replacement for physical materials but as a complementary tool that empowers children, deepens family communication, and enriches therapeutic practice. Martinez et al. [41] examine how text-to-image generative AI reshapes documentary storytelling by shifting representational agency from the photographer's gaze toward community-driven image-making. They speculate that generative AI may offer new opportunities in protecting privacy, decolonizing narratives, and enabling speculative storytelling, it also risks producing emotionally hollow or misleading images [41]. Ethical use therefore requires transparency, critical visual literacy, and community co-design.

For migrants and refugees, AI-mediated communication tools have also been explored in institutional counselling settings [72]. Moreover, Zhang et al. [77] explore how immigrants use an LLM-powered chatbot to read local housing news. While migrants can benefit from AI in accessing and interpreting local information, they argue that the risk that AI interfaces may deepen sense-making gaps between immigrants and locals. Similarly, Lee et al. [38] identify that AI-generated content often creates idealized or stereotypical cultural images, which may clash with lived reality and cause disappointment. At a broader humanitarian scale, Bhatnagar et al. [7] propose an HCI-informed framework for responsible AI adoption, foregrounding inclusivity as a core principle. They argue that AI systems in crisis and displacement contexts must be adaptable to diverse user groups with varying technological literacy, and should be governed through participatory, value-sensitive, and dignity-preserving practices rather than purely technical optimization [7]. Similarly, Avellan's research emphasizes that AI systems must be designed accessible to users with varied abilities and backgrounds [4]. Such inclusion is critical because non-inclusive systems risk amplifying existing inequities [4]. In contrast, Munn cautions that the wider turn to high-level AI ethics principles has largely been "meaningless, isolated, and toothless," enabling ethics-washing while leaving underlying power structures and material harms intact [46].

Prior HCI work has also emphasized the collaborative dimension of storytelling. By scripting and enacting rituals from both immigrants and non-immigrants, Sabie et al. [59] show that cultural exchange in HCI can be reciprocal rather than one-directional. Rather than casting migrants only as learners, the system enabled participants to share and engage with each other's practices, making

belonging a co-created process. This is particularly relevant for refugee families, where parents use storytelling to pass on memories of their homeland, while younger generations reinterpret these narratives in line with their current environments and emerging identities [19]. In this way, storytelling is not a one-way transmission from parent to child but a reciprocal process in which children also influence and reshape family narratives.

Although growing research examines generative AI for storytelling, its role in supporting reciprocal, inter-generational exchanges remains underexplored. Our work addresses this gap by introducing an image-to-image AI platform that enables co-creation to facilitate memory work and reciprocal storytelling within refugee families.

The study was conducted in a metropolitan city in Australia. All participants were informed about the purpose and procedures of the research. The researchers initiated the engagement with participants following their review and endorsement of the informed consent form. Our project was approved by our university’s human ethics committee (approval number removed for anonymised review). We ensured that the participation was completely voluntary and participants could opt-out of the study without any concerns raised. We were also aware that the *Culture Link* platform may evoke past memories in our participants and hence provided contact details for the university’s health services. We explained to our participants as well as the collaborating organizations that all collected data would be de-identified and stored securely on university servers, following institutional data-management protocols.

.11.3 Culture Link Platform

Informed by ambiguous loss theory [10, 14] and existing research on ambiguous loss of home [14, 52], which frames the unresolved and cyclical nature of losing and remaking home in forced displacement, we developed *Culture Link*, a web-based platform for sharing AI-generated images. Specifically, *Culture Link* uses the dimensions of social connections and identities, connection to place, and imagined futures [14] by leveraging AI image-generation technology with playful features, enabling users to co-create a composite image generated through the *OpenAI* API. *Culture Link* is designed to foster a sense of home and belonging among refugee families through preserving memories, sharing culture, storytelling, and promoting conversations between family members. The platform allows multiple users to create or join a room with the same code, where each person is allowed to upload an image of personal or cultural significance, e.g., a photo of loved ones, a childhood memory, a historical place, or a favorite character. The system then combines significant features from each image into a single, AI-generated image. This resulting image output is available to all users, and is intended to facilitate conversation, elicit memory work, and foster family engagement, particularly across generations. Designed to be mobile-friendly and accessible on commonly available smartphones,

Culture Link incorporates playful features and cartoon-style visuals to engage children, while also fostering storytelling and strengthening connections among family members.

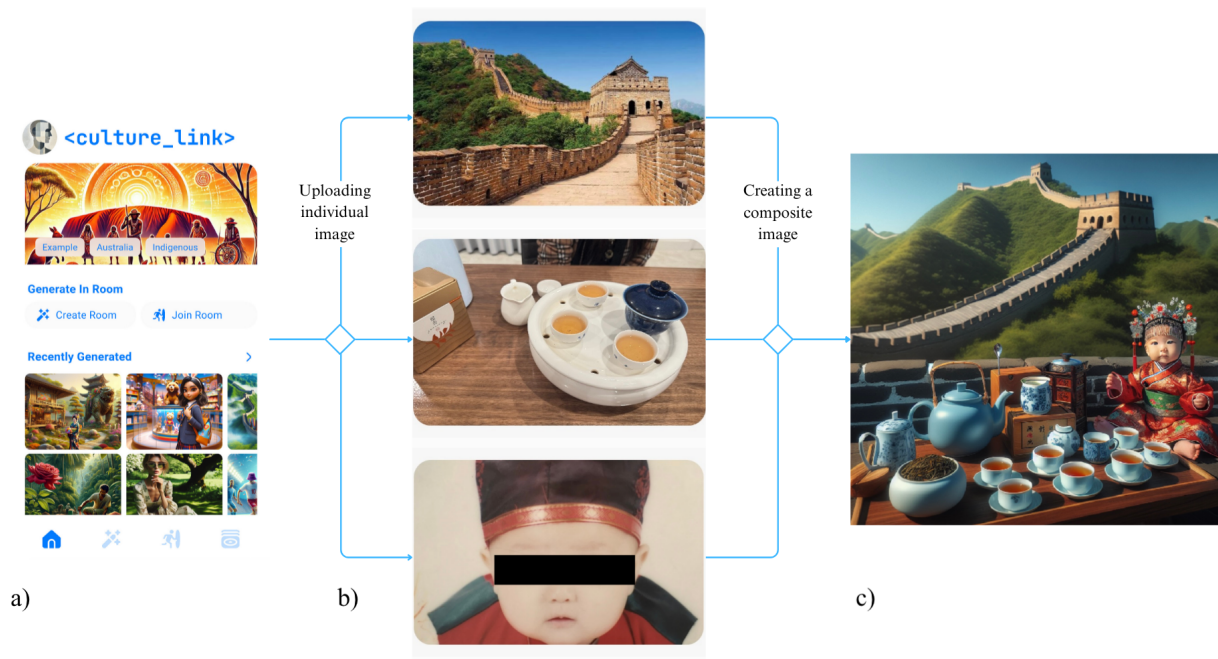


Figure 26: Workflow of Culture Link: a) Home screen of the platform, where users can create or join a room; b) Family members upload individual images of cultural or personal significance; c) The system generates a composite image that integrates these contributions, serving as a prompt for storytelling and family dialogue.

add description

11.4 Participants Recruitment

The authors collaborated with an Australian not-for-profit organization that helps and supports refugee families for over 25 years. We visited the managers of this organization and gave a demonstration of *Culture Link*. We sought participation from refugee families with children who possessed basic English proficiency and digital literacy. The organization assisted us in identifying and reaching out to suitable families. Through handing out posters and project information sheets, seven families volunteered to take part in the study. The study required consistent participation from entire families. We recognized the significant time and commitment this entailed. As a token of appreciation, participating families received AUD\$100 gift vouchers at local supermarkets upon completing the study.

Although households included infants and toddlers, we did not treat these very young children as research participants. They were present during family interactions but did not engage with the platform independently, did not provide data, and were not included in analysis. Only family members who meaningfully interacted with *Culture Link* and/or participated in interviews contributed data to this study.

Overall, participants had limited prior exposure to AI technologies, particularly genAI for images. Among parents, only Family F7 reported prior experience with automated image-editing tools; all other families had not previously used genAI. Some parents, such as those in Family F1, were aware of AI and had a rough sense of what image-based GenAI could achieve but had never tried it. While most children had little knowledge of AI, one exception was Family F2's 12-year-old eldest daughter, who reported using ChatGPT for text-based learning and information seeking. Each family represented a distinct cultural background, contributing to the diversity of perspectives in our findings. The demographic characteristics of the participants are presented in Table 1, along with their country of origin and their length of stay in Australia.

Table 9: Demographics of Participating Families. Note: All household members are listed for context.

Family	Family Members (Role + Age + Gender)	Country of Origin	Length of Stay in Australia
F1	Father 39M; Mother 34F; Son 6M; Daughter 1.5F	Syria	3 years
F2	Father 49M; Mother 39F; Daughter 12F; Daughter 10F; Daughter 9F; Son 6M; Son 4M; Daughter 0.25F	Sri Lanka	11 years
F3	Father 40M; Mother 36F; Daughter 9F; Son 7M	Afghanistan (Hazara community)	6 months
F4	Father 47M; Mother 40F; Son 12M; Daughter 9F	Cameroon	Father 7 years; Others 2 months
F5	Mother 54F; Daughter 14F; Daughter 11F	Papua New Guinea	2.5 years
F6	Mother 44F; Son 7M; Son 4M	Mongolia	2 years
F7	Father 35M; Mother 30F; Daughter 10F; Daughter 7F	Afghanistan	1.5 years

.11.5 Study Methods and Analysis

The study comprised two phases: 1) a ten-day field trial of *Culture Link*; and 2) a follow-up semi-structured interview. Families recruited through our collaborator firstly attended an introduction session held at the organization's head office, where we provided an overview of the study. This included guidance on logging in with researcher-provided accounts, creating or joining a room, uploading

images, and sharing stories about those images. Then, a pilot task was given to participants where they practiced uploading images and sharing stories to familiarize themselves with the platform. We also provided printed step-by-step instructions for using *Culture Link*, so that families had a clear reference guide when engaging with the platform at home. We created a *WhatsApp* group for participating families to ask questions and also established direct contact with one member in each family to provide timely technical support.

Phase 1.

Following the introduction, each family participated in a ten-day field trial of *Culture Link*. As the platform was designed to promote interaction among multiple users within a family, households lacking at least two mobile phones were provided with additional devices. Children used the platform under the supervision and guidance of their parents. For younger children or those with limited digital literacy, parents assisted them in uploading their chosen images. During the trial, families were encouraged to share the personal significance of each image and to reflect on the final AI-generated image after each round. While we did not enforce a minimum or maximum number of sessions, we encouraged families to engage with the platform regularly over the 10-day period; in practice, each family generated between 5 and 10 composite images. For each round of image generation, *Culture Link* took up to two minutes to produce a composite output; the time spent selecting images and narrating stories varied by family, but participants commonly reported completing a session within approximately 15 minutes.

Phase 2.

Upon completion of the trial, we conducted semi-structured interviews with the families. While all parents were encouraged to participate, their attendance was not mandatory. Each family interview lasted approximately one hour and took place either at the collaborating organization or at a location chosen by the family. For those with limited English proficiency, other family members with stronger language skills voluntarily assisted with interpretation. The researchers collected all image data uploaded by families by accessing and downloading it from the application's backend storage on the *Firestore* database. The images were employed as elicitation prompts during the interviews to facilitate rich narratives about participants' engagement with *Culture Link* and to surface the stories associated with each image. The semi-structured interview guide focused on four areas: 1) meanings behind the uploaded images; 2) family interactions with *Culture Link*; 3) emotional reactions and conversations following the composite images; and 4) broader reflections on home, culture, and family bonds. Example questions included: "Can you tell me the story behind this uploaded image?", "How did you use *Culture Link* as a family?", "What did you talk about when you saw this generated image?", and "In what ways, if any, did this activity make you think differently about home?".

The interviews were audio-recorded and transcribed, while the image data were rendered into textual descriptions aligned with participants' narratives for subsequent analysis. The collected data underwent thorough thematic analysis [12]. The codebook was initially developed by labeling recurring words and phrases and grouping similar codes hierarchically. It then underwent multiple rounds of revision by the second and third authors, before being refined by the first author. Consensus meetings were held to resolve coding discrepancies and strengthen reliability. This process led to the identification of emerging themes and patterns, providing insights into participants' experiences with *Culture Link* and its role in mediating the ambiguous loss of home.

Through thematic analysis, five key themes emerged. This section presents findings across five dimensions showing how the AI-mediated storytelling tool supported refugees in negotiating ambiguous loss and developing a sense of home: memory preservation and reinterpretation, inter-generational transmission of culture, children's creativity and imagination, family engagement, and generational divergence.

.11.6 Memory Preservation and Reinterpretation

Through the uploaded images and stories, participants underscored the role of preserving family memories in maintaining ties to their past and strengthening bonds during resettlement. For instance, the parents of Family F4 shared photos of Saturday Ranch, the site of their honeymoon, but the AI-generated version appeared far more glamorous. Their 12-year-old son joked that he might be disappointed if he saw the real place. As the mother elaborated, the image diverged from the real setting: *"When they saw the photos, my son said, 'Is this for real?' But again, it looks nicer and they like it... And again, the (place name) where we went for a honeymoon (was) very beautiful... we share these memories with them... to tell that how we liked each other, we met each other, our journey...".* Although there was a lack of fidelity, the aesthetics of images stimulated children's curiosity and questioning. These questions further prompted parents to reflect on the emotional significance and personal histories tied to the image, rather than disrupting remembrance.

At the same time, families used *Culture Link* to imaginatively re-stage and recombine these memories, producing new visual narratives that sometimes departed from what actually happened in reality. Family F2 is originally from Sri Lanka, where the parents met before moving to India for several years and later settling in Australia after their first daughter was born. Although the mother never visited the Taj Mahal, she uploaded an image of it, viewing the monument—learned about during her time in India—as a symbol of true love. The image reminded her of her joyful marriage, and her eldest daughter recalled the story her mother had shared: *'We haven't been to the Taj Mahal, but... she asked my dad, if we had a visa, could we go to the Taj Mahal and visit it, because there's this guy called Sarge, and there's a girl... they loved each other. And Shah Jahan built this Taj Mahal just for her. And my dad and mom also had a love marriage. So my mom always wanted to visit it'.* While the

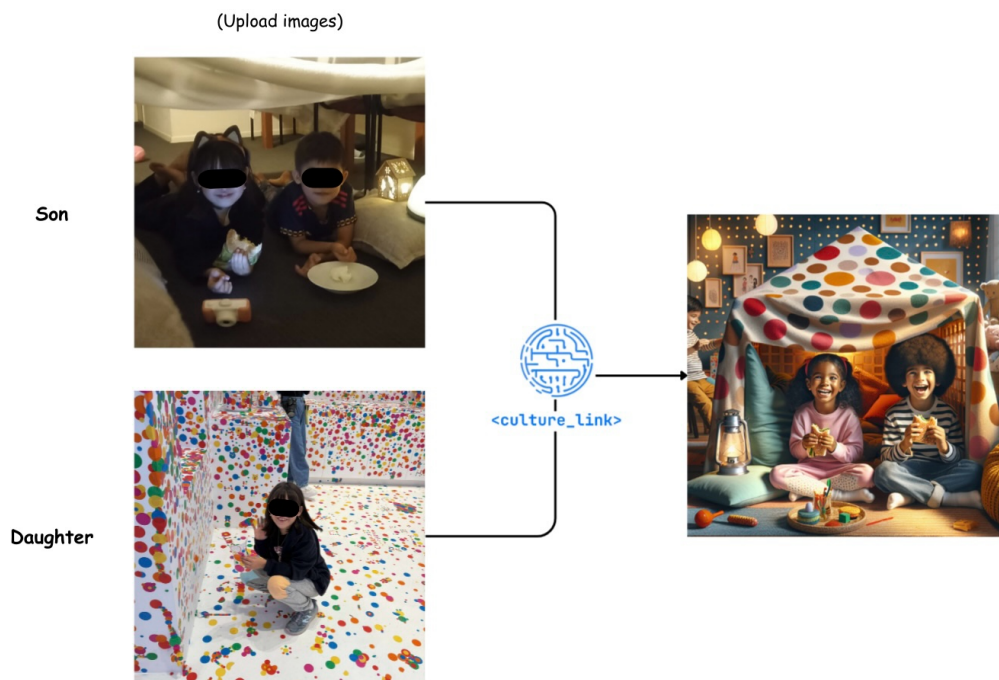


Figure 27: AI-generated image created by Family F3, combining photos of their children visiting a gallery and camping indoors in a homemade tent.

"The original photos: 1) one of the daughter visiting a gallery with colorful dot-covered walls, and 2) both children camping indoors in a DIY white tent, were creatively combined into a vibrant image of a colorful tent camping scene.

Taj Mahal does not document a past event, it symbolically extends their love story into a place they hope to visit, blending remembered stories and imagined futures.

Participants also co-constructed composite representations that bridged separate people, places and objects through *Culture Link*. For example, in Family F1, the father had visited a theme park with his son before the daughter was born. To create a shared memory, they merged a photo from that day with a later selfie of the mother and daughter. The generated image showed the mother holding the baby daughter in front of a circus. As described by F1 Father: 'One photo was the circus. The other photo was F1 Mother and F1 Daughter... They put the background (as) the circus, and took [F1 Mother] and [F1 Daughter] and put it in that. Very successful'. By merging photos taken years apart into a single composite that never occurred in reality, the family re-imagined themselves to be present together, turning separate memories into a new, shared scene. Likewise, Family F3 uploaded photos of their children enjoying special moments. In one notable co-creation, they combined two images: one of their daughter at an art gallery with colorful dotted walls, and another of an indoor camping scene where the children had built a tent from a white bedsheet and were happily lying inside. Rather than simply recalling each outing on its own, this co-created image foregrounded togetherness over chronological accuracy.

Children also used the tool to revisit meaningful childhood memories. Family F7's 10-year-old daughter uploaded photos of her cousins in Afghanistan, while the younger daughter in Family F5 uploaded an image of a pet cat left behind in Papua New Guinea, and her mother added a photo of

the river near their former village. The daughter recalled the cat as her best friend when she was three or four, with fluffy white fur and ginger patches; lacking a real photo, she searched online for a similar one. The generated image placed the cat by the riverside, prompting the family to imagine it catching fish. Despite this fictional detail, the daughter found the AI-generated result very satisfying: *'It seems like the way I think it is...the picture they generate with AI, it looks the same as the cat... and the cat got two children. The other one was black and white, but I don't know what they're doing right now'*. In selecting an online picture that looked like her cat and placing it beside the river from her mother's memory, she was not reconstructing an exact scene, but composing how she wished to remember the cat in relation to their former home. Across families, children also appropriated the tool to deliberately re-imagine and interpret their parents' stories in humorous ways. Family F3's mother, for instance, uploaded a photo of their village and tried to explain its history, but her children insisted on turning it into "a cat family" scene instead: *'For this one, I explained our village, but they (the children) said, "Mom, it's more funny to have a cat family... So cat families are in our village."* The final image layered playful animal characters onto a place that was emotionally charged for the parent, allowing the children to participate on their own terms through fantasy. Taken together, these examples show that Culture Link supported both the preservation of family histories and their active reinterpretation, enabling families to stitch together past, present, and imagined futures into new, shared visual memories.



Figure 28: AI-generated image of Family F5's daughter's pet cat, placed beside a river in their home village in Papua New Guinea.

AI-generated image of a white and ginger cat sitting beside a river, representing a childhood memory of a participant.

.11.7 Inter-Generational Transmission of Culture

Participants expressed a strong desire to pass down cultural traditions and values, seeing this transmission as vital for preserving identity in a new cultural environment. In Family F3, both parents and children are fluent in English, but the parents, who fled Afghanistan, spent about 10 years in an Indonesian refugee camp and 20 years in Iran, and whose children were born abroad, strictly upheld a “no English at home” rule to maintain their mother tongue. Family F7 echoed this concern, noting that their 7-year-old daughter had begun mixing English and Dari and was already forgetting some native vocabulary. Family F1 parents were originally from Syria, where they left the country when their son was four months old and moved to Iraq - *“We use like, because our children, both of them, they never visit the country, like [F1 son] lived all his life outside. Yeah. [F1 daughter] born here (Australia). So they we didn’t have much photos for (their country of origin), so we bring very old photos of our country, and we try to merge it with some photo of children”*. However, F1 also noted certain drawbacks of the generative AI tool in processing human images. People in the generated photos sometimes looked noticeably different, and the outputs occasionally failed to align with participants’ expectations. For instance, F1 mother uploaded an image of a famous spot, the waterwheel of Hama from their hometown, where both children had never visited. F1 father, on the other hand, uploaded a photo of his children with the expectation that the AI would place them prominently in front of the waterwheel. However, the generated image instead displayed a group of generic children playing near the wheel. None of the figures had recognizable features of his own children. This illustrates both the potential and limitation of *Culture Link*, that the tool can erase specificity by producing generic outputs. While the tool protects participants’ identities, the results sometimes fall short of expectations for unique representations of their families.

Important festivals were another focus for participants. Family F4’s father, who had left his home country Cameroon for around seven and a half years, uploaded several images of end-of-year cultural homecoming festivals in his hometown. As he revisited the images, he recalled vivid details from his village’s cultural celebrations, including masquerades dancing on tall stilts and the annual gatherings where people, especially those living abroad, would return home to celebrate their heritage. For him, these festivals were a powerful representation of cultural identity and community connection. Traditional clothing and food served as tangible anchors for connecting to participants’ cultures of origin. Almost all participants uploaded images related to their traditional recipes. In particular, Family F5’s mother uploaded two images illustrating the process of making sago starch. One image showed the beginning of the process, where a group of women sitting around a felled sago tree. The other image depicted the filtered and dried wet starch sediment. She described this as a communal task in her culture that men would cut down the tree, while women would sit by the river to process it together. Reflecting on her experiences and the cultural meaning behind cooking sago, she shared:

"All the hard work of chopping that sago tree down around, beating, scrubbing, squeezing, putting it aside, and I enjoy my hard work...The water of the sago, the liquid with where you sit there, your legs and hands will get black. Oh, that's one thing disgusting. Sometimes I don't like... I pay that, ask the girls to do it for me, because I don't like that... This sago, oh, even it comes all the way to Australia. We have international workers in my country, Australia owned company operating in my country, Santos. So those expert rights, those Australian internationals, they buy sago from my village, they uplift the sago... We already have teaching them to make sago, cultivate the land... They must know where they come from... God created me differently with my culture and my custom... something unique, and God has placed in me."

Family F5's mother spoke with deep pride about her culture, land, and the hard work behind their traditional way of living. Describing how they grew food in their garden in Papua New Guinea, she grew visibly animated, viewing it as both a core part of their identity and a healthier, more organic lifestyle she hopes to pass on to her children.

(Upload images)

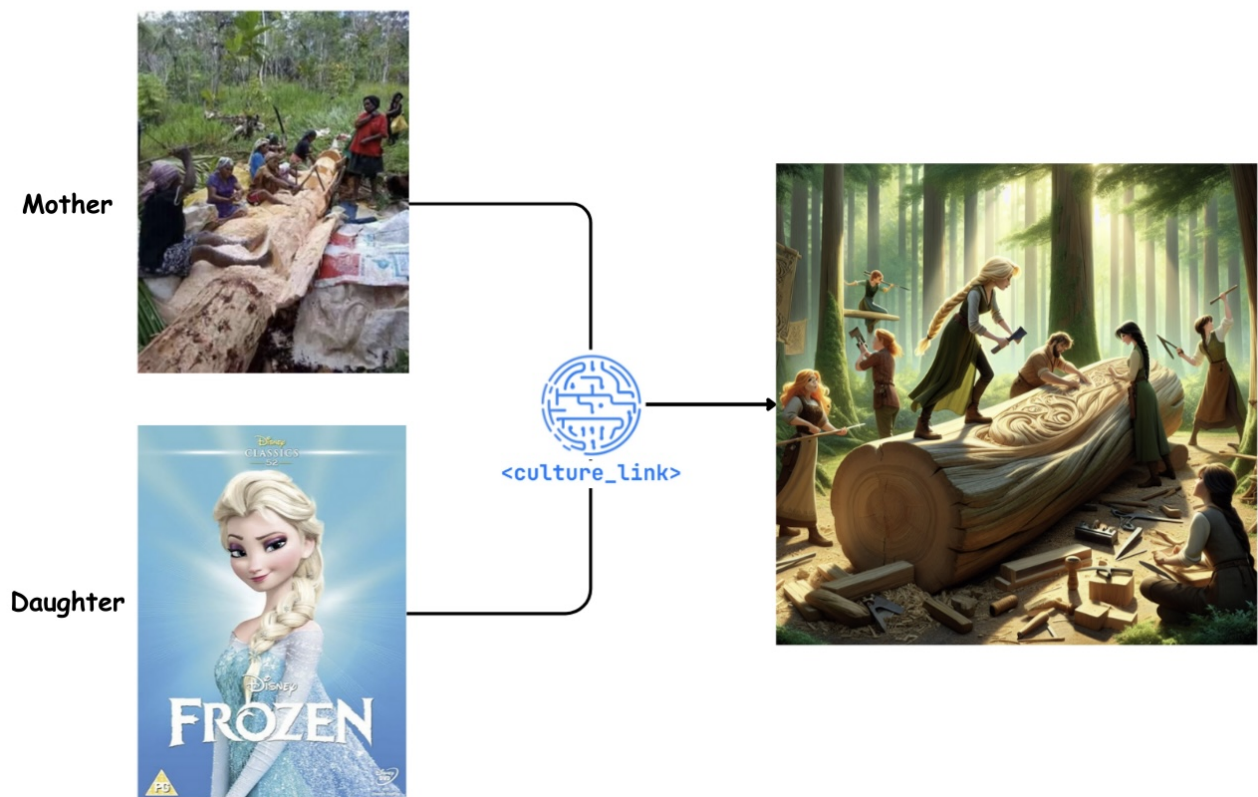


Figure 29: Images uploaded and generated by Family F5's mother, depicting the traditional communal process of making sago starch in Papua New Guinea.

"The original photos: a) Ladies processing a chopped down sago tree together; and b) The generated image of a) and an image of Elsa from the Frozen uploaded by F5 daughters; c) Dried and collected sago starch; d) The generated image of c) mixing a rose image uploaded by F5 daughters.

Family F5's daughter uploaded images of Elsa and roses alongside their mother's photos of traditional sago processing. Here, *Culture Link* facilitated a shared visual space where popular children's media and cultural heritage coexisted, prompting cross-generational dialogue around origins and identity.

.11.8 Creativity and Playfulness

Children expressed great excitement and enjoyment while interacting with *Culture Link*. For all but one family, this was their first encounter with GenAI for image processing. Children's excitement often centred on seeing their own photos transformed in surprising, sometimes 'magic' ways into shared composite scenes. Parents, by contrast, were more attuned to the new form of interaction that *Culture Link* afforded. For example, F6's mother, who had not previously used to genAI tools, highlighted that this turn-by-turn co-creation was a novel at-home activity with children. Similarly, F7's father, who had used genAI before, contrasted *Culture Link* with their usual board and card games at home, highlighting how uploading images from separate devices and waiting together for an unknown composite created a new kind of shared anticipation. In this sense, the platform acted not only as a first-time AI experience, but also as a scaffold for playful, creative interactions within the family.

Children also used the platform as a way for self-expression. Family F5's younger daughter, who was 11 years old, uploaded an image of the Eiffel Tower to express her desire to visit Paris and her strong interest in French culture, while her mother contributed a photo of traditional men's dress from Papua New Guinea. She particularly liked the generated image, which portrayed a man in traditional attire playing billiards in front of the Eiffel Tower. Likewise, the oldest daughter in Family F2, aged 12, chose a photo depicting a traditional dance in Sri Lanka. She explained, "*That's a traditional dance in Sri Lanka. I'm learning a dance piece for Christmas.*". Family F3's mother shared that her children, who were 9 and 7 years old, uploaded images of their favorite animals or cartoon characters to the platform, and during the image generation process, they would excitedly speculate and discuss what the final result might look like, "*Maybe because of their age, they prefer to choose (photos) that make this story funny. They say, 'Mom, let's choose this and this, so we can have something flying', so we choose Spider Man from this picture and Pikachu from this, and the result is there...*".



Figure 30: AI-generated image by Family F3’s children showing Superman flying alongside Pikachu, blending cultural icons with imaginative play.

Moreover, family F3’s children demonstrated an emerging understanding of the underlying logic of the image generation process. According to family F3’s mother, “...Because the only one who wore this dress, it was just me, yeah. But the result with four, so you can see a little pattern in each one, like this one, this one and this one. So from this, they realized that with this application, we can have something to share, like the same pattern of clothes or something like that”. They noticed in one activity that when a family photo showed only the mother in traditional clothing, the generated image reproduced similar patterns across all figures. This insight helped them make more intentional creative choices—selecting images to shape the visual output and highlight familial or cultural themes. For instance, in Figure 1, the children blended the white tent with the gallery’s dotted patterns to create a colorful version. They later uploaded another pair of photos, a Pikachu image and one of themselves looking at a cat, and the platform generated a merged scene where the cat had Pikachu-like features, appearing as a flying magical creature they were observing. In these cases, children did not treat *Culture Link* as a black box; they experimented with how different inputs would be combined, and learned to “bend” the model’s behavior toward the playful scenes they wanted to create.

The platform also served as a catalyst for storytelling, encouraging children to learn about their family’s histories and cultural narratives from their parents. Compared to plain language, the visual nature of these images more effectively stimulated children’s imagination and fostered a more immersive storytelling experience. The platform’s playful, cartoon-like aesthetic was particularly effective in capturing children’s attention. Beyond the final outputs, the process of using the app also sparked curiosity and promoted active engagement. Children brainstormed ideas and speculated about what the final image might look like. As F1’s father observed, “It’s fun, especially when you get the result that you are expecting. It’s actually pretty fun, yeah, and the photo is beautiful, AI-generated photo

is actually very beautiful, we had too much fun... [F1 son] He would listen, he would be happy, be enthusiasm". Similarly, Family F4's children expressed a strong desire to visit their mother's hometown after an image was generated using a photo she uploaded of the village where she used to live in Cameroon: "this generation or this era...children, they don't, they hardly go back home, yeah, or go back to the villages to learn about the culture. When you generate some of these images, and you tell the story behind them...they like it and start imagining, 'Oh, Mom, I want to go back someday and see what you were doing.'".

However, not all results were satisfying. Family F7, originally from Afghanistan, consisted of four members, including two daughters aged 7 and 10, who both had digital literacy and access to mobile phones. In one round of the activity, they uploaded portraits of grandparents, parents and uncles in the hope of producing "one big family photo". The generated image included only two of the relatives, while others appeared merely in the background as framed wall hangings. Although the outcome was aesthetically pleasing and described as "nice," the family expressed disappointment, as they had hoped all relatives would be depicted together. The parents noted that it did not achieve the sense of being fully "all together" that they had imagined. The father later speculated about a future version of *Culture Link* where relatives spread across Afghanistan, Europe and Australia could each upload their own photo and have them all meaningfully presented in one image. This revealed an aspiration of participants for digitally staged reunion across borders.

.11.9 Family Engagement

Culture Link cultivated small, repeated moments of "being together" that many parents described as feeling like home. Multiple participants expressed that the collaborative nature of the storytelling activities through *Culture Link* was highly engaging. As Family F2's mother commented, *"This app is very good...it brings (us) back home, and plus, you're also telling your children about the history behind it...how we lived in Sri Lanka and stuff (like that)"*. Family F3 mother expressed her perceptions of the application, *'It's not about the reality ... more like engagement with children'*. Rather than evaluating the accuracy of the output, they positioned *Culture Link* as a shared activity that legitimized time spent talking with children about memories and feelings. *Culture Link* also provided an opportunity for routinized family engagement. The parents from Family F1 greatly enjoyed the activities and revisited old memories while selecting images to upload. *'In the evening, we have, like, game time... that's actually what we did. Yeah, we dug into very old photos. Actually, we used to forget them. It helped us to dig up some old memories of our hometown,'* F1 father reflected. The practices of selecting, re-interpreting, and narrating images drew family members together. Individual recollections were turned into a shared, playful activity of remembering and articulating what "home" now means in Australia.

Participants also reflected that home and belonging were reconstituted through new support

structures from local communities, and how belonging can span dual cultural identities. *Culture Link* facilitated moments of such hybrid identity expression. As Family F5 mother shared, “*We came to Australia to seek protection. Even though half of my heart [is] back in PNG, I miss my traditional way of cooking, it is so healthy. Now I feel it’s safe, I’m with my two daughters. Church members here they pray together with me, help me, support me financially, spiritually, intellectually. They are my family now...Australia is our home now. We have two cultures: PNG and Australian culture... both are my home*”. Her story showed how memories of pre-displacement life, new relationships in church, and day-to-day family routines are woven together into a multi-sited sense of home. *Culture Link* provided a venue to visualize and narrate this dual belonging to her daughters.

Maintaining cross-border family connections was seen as a deeply significant aspect of home for many participants. For example, the father from Family F2, a former military serviceman from Sri Lanka, continues to carry unresolved trauma from his past. The oldest daughter shared, “*Sometimes my dad talks about his home and how he feels...we also understand and stuff. So we don’t really like make him upset and we comfort him*”. The family also reflected on the emotional toll of long-term separation. One father had not seen his elderly mother for over 25 years, and the father in Family F4 described being apart from his wife and children for seven and a half years after arriving in Australia as an asylum seeker in 2017. Reunited only two months ago, he noted how this prolonged separation deeply affected his emotional well-being, identity, and sense of home and family. “*Living without my family, all the anxieties and the depression and the trauma... Especially for an asylum seeker, is so, so daunting and difficult. I left my daughter when she was just like, one and a half years old. Sometimes I will cry, I’ll wipe my tears, I miss them so much.*” He described relying on technology to stay connected, making daily video calls and celebrating important dates and festivals online despite the distance. For his birthday, for instance, his wife and children would bake a cake, call him on video, and his son would cut the cake on his behalf so they could celebrate together across continents. These practices illustrate how digital media help families maintain a sense of co-presence despite physical separation. Reflecting on these experiences, he imagined that if a tool like *Culture Link* had been available during his time apart from his family, it would have offered a more engaging way to share photos and everyday moments, further facilitating cross-border family connections and emotional closeness. *Culture Link* is imagined as an additional shared artifact that could have helped the family visualize “being together” during years of enforced distance.

.11.10 Generational divergence in identities

The uploaded images on *Culture Link* revealed marked differences in preferences between parents and children. As Family F6’s mother, who was from Mongolia, expressed that home is still deeply rooted in her past: “*Home means the place where I was born and raised. Although I’m in a foreign country now, many things remind me of my own history, culture, and old memories. Essentially, I think*

of home as the place where I was born". Parents tended to upload photos tied to their countries of origin, reflecting identities deeply rooted in the past and shaped by nostalgia. In contrast, children more often selected images from their current lives, highlighting their ongoing identity formation within the new cultural environment. At the same time, some parents with higher language proficiency and familiarity with Australian cultural norms gradually came to see both Australia and their country of origin as parts of their homes. Parents of families F4 and F5, who were both Christian, shared how participating in church communities helped them build a sense of belonging. As F5's mother described, they received support "financially, spiritually, intellectually" and she noted, "I have met new family members, especially in the church members. They are my family now." Similarly, F4's mother reflected on the comfort found in their church: "A home is where you find comfort...especially here in Australia, where we found ourselves in a church community where everybody - we see ourselves as a family...we look after each other, we have each other's problems in mind, and we pray together and study together. So I find it a wholesome place to be." Together, these accounts show how parents stitch together memories of the homeland with new relational anchors in Australia, constructing home as a network of people and practices across locations. Integration into local communities emerged as an important way of building belonging in a new place, not just for parents, but also for children. However, the process was not always smooth. For instance, Family F3's daughter expressed discomfort at school due to difficulties making new friends. While she had some good classmates, she still did not feel she had formed close friendships in her new environment. The example highlights that children's sense of home is also negotiated through peer relationships, which are not easily visible in family narratives or images.

Age also shaped how refugee children experienced integration. As Family F6's mother explained, her four-year-old son had not yet formed a concept of home or understood the distinction between home and host countries, whereas her seven-year-old was beginning to grasp these ideas: "*My seven-year-old still says he misses Mongolia and wants to go back. He understands we are in a foreign country. But my younger child doesn't really know where we are, since he hasn't traveled far and is still very young*". Families F1 and F2 also observed the same pattern during field trials of *Culture Link*: younger children, particularly those under the age of five, were primarily captivated by the visually appealing outputs. However, they paid little attention to the stories shared by other family members. As the eldest sister in Family F2 noted, while the older siblings engaged with the narratives, the younger ones were more focused on the images themselves: "*They're just looking at (the pictures)... They listen, but don't memorize... This app might be better for a little bit older children*". These observations suggest that while very young children may enjoy the visual novelty of generative outputs, they are less able to participate in the reflective, narrative work that *Culture Link* is intended to scaffold.

Children around the age of 10 appeared to be the most suitable users of *Culture Link*, as they showed both excitement toward the generative AI experience and the ability to understand and discuss

the deeper meanings behind the images. In contrast, older children around 15, like Family F4's son and Family F5's eldest daughter, were noticeably less engaged than their younger siblings. For example, the 14-year-old daughter in Family F5 engaged only minimally with the platform, possibly reflecting a developmental shift in interests common among teenagers. Similarly, while Family F4's son did enjoy the activity to some extent, he questioned the authenticity of the generated image, remarking, "*Is this for real? It doesn't really look real...*". His skepticism points to a different kind of engagement, where older adolescents may be more inclined to critically evaluate the realism and legitimacy of AI outputs. However, this skeptical stance distances them from the playful, imaginative way of engaging that younger children adopt. For middle-childhood participants, their developmental readiness for both imagination and reflection aligns with the platform's aims of co-constructing stories about home.

.11.11 Extending Ambiguous Loss Theory

Ambiguous loss theory [11] offers a framework for understanding the unresolved, cyclical nature of forced displacement. It has been adopted to displacement contexts to describe how the loss of home, identity, and belonging can remain suspended between presence and absence [52]. Prior work shows how refugees simultaneously grieve and remake home through memory, cultural transmission, and place-making practices [14, 52, 64]. Building on this work, we argue that the ambiguous loss of home is not only cyclical and relational but also generationally divergent. We propose that collaborative family storytelling, organised around a co-created visual artifact, has the potential to help refugee families negotiate ambiguous loss. In our deployment of *Culture Link*, memories and narratives were distributed and co-authored between generations. It enabled simple, repeated rituals of selecting images together, interpreting the resulting composites, and talking about what "home" means now. These practices wove past experiences, present circumstances, and imagined futures into a shared symbolic frame, inviting reinterpretation rather than strict recollection and opening moments of vicarious resilience.

Generational Divergence in Ambiguous Loss of Home

Bunn's conceptual model [14] depicts ambiguous loss of home as cyclical and relational: families move back and forth between grieving what has been lost and remaking home through cultural practices, faith and relationships. Our findings resonate with this concept, as participants expressed longing not only for family members who remained in the home country, but also for non-human objects and practices. However, our data suggest that this process is also generationally divergent. Parents and children did not simply share a single sense of loss; they attached different times, places and relationships to "home," and co-created images became a site where these differences were surfaced and negotiated.

Parents' uploads were often anchored in their countries of origin and long histories of struggle and resilience. F6's mother, for example, described Mongolia as her only home, 'where I was born and raised', even while living in Australia, and selected images that foregrounded Mongolian landscapes and traditions. Such accounts align with work showing that homeland loss can become a lifelong, unresolved condition shaped by nostalgia, disrupted roles and enduring attachments to place [14, 52]. In contrast, children more frequently chose images tied to their present lives, imagination and speculated futures. F5's younger daughter used images of the Eiffel Tower to express a desire to visit Paris and a strong interest in French culture, while F2's eldest daughter foregrounded a traditional Sri Lankan dance she was preparing for a school Christmas performance. For children who were born or raised outside their parents' home countries, "home" appeared less as a singular lost place and more as a hybrid of current routines, aspirations and cultural reference points in Australia. This resonates with findings by Crooks et al. [18] and McGillicuddy et al. [42] showing that migrant and refugee children negotiate belonging across both transnational ties and local peer contexts, and that recognition in school and peer settings shapes their emerging sense of belonging and identity.

The composite images generated by *Culture Link* made these divergent orientations materially visible. Parents and children placed their respective attachments—distant homelands, present commitments, and hoped-for futures—into the same frame. Rather than collapsing differences into a single narrative, the shared artefact made it possible to hold multiple temporalities of home side by side. In doing so, our study extends ambiguous loss theory in displacement contexts by highlighting how the loss of home is experienced differently across generations within the same family, and how a co-created visual artifact can provide a concrete locus for negotiating these differences.

Negotiate Loss through Shared Narrative Ritual

Perez [52] documents how memorabilia, rituals and storytelling help Cuban American exiles negotiate the ambiguous loss of home by finding meaning, sustaining cultural identity and revising attachments. Our findings similarly show how families used *Culture Link* as a small, repeated narrative ritual that kept memories of "home" active and shareable with children. For F1, parents described turning the field-trial sessions into an evening "game time," digging into forgotten photos of their hometown and laughing together about earlier stages of family life. The image uploads and composite reveals became a repeatable sequence: gather phones, choose pictures, wait for the output, then comment and reminisce. This echoes Tibau et al.'s [69] account of shared musical activities that operate as gentle, low-stakes rituals for sustaining intimacy and cultural connection over time. In F4, the father who had endured years of separation from his family, connected *Culture Link* to longer-standing practices of celebrating festivals and birthdays online. During separation, he used video calls and cakes baked in his absence to mark such dates; in the trial, revisiting festival images and narrating them with his now co-located family became a way to stitch those dispersed experiences into a new, shared practice.

F7's father explicitly compared *Culture Link* to the family's usual board and card games, emphasising that uploading images from separate devices and waiting together for the composite created a different kind of shared anticipation. Instead of competing over scores, family members were jointly curious about "what it will look like this time," anchoring talk about past places and relationships in a light, playful format. Taken together, these episodes show how co-creating images gave families a bounded, repeatable script for revisiting difficult or distant places. In line with Basso's [6] and Perez's [52] discussions of ritualized remembering, *Culture Link* did not resolve ambiguous loss but inserted small narrative rituals into everyday life, offering familiar rhythms through which memories of home could be safely approached, shared and gently reworked.

.11.12 Design Implications for AI-mediated family storytelling

Our findings also shed light on how AI-mediated tools can be designed for family storytelling in displacement contexts. Rather than treating generative AI as a stand-alone image-processing technology, *Culture Link* functioned as a participatory prompt that reorganized who could speak, how stories were co-authored, and how narratives were distributed across generations. In this section, we discuss four design implications: 1) supporting symbolic representation for open-ended re-interpretation; 2) redistributing memory work; and 3) lowering production barriers for shared creativity, and 4) ethical considerations of designing AI for the marginalized community.

Symbolic Representation for Open-Ended Re-interpretation

Our findings show that engagement between family happens not necessarily because high-fidelity images, but through the combined contribution between the tool generation. In Family F4, the AI rendered the place of F4 parents' honeymoon as more glamorous than it is in reality, prompting the 12-year-old to ask whether the image was "for real." This visual excess did not confuse the family about what had actually happened; instead, it invited the mother to expand on why that modest place mattered, i.e., how it marked their honeymoon, their early relationship, and the journey that led to their current life in Australia. This dynamic also contrasts with recent CHI work by Pataranutaporn et al. [49], which shows that AI-edited images can induce false memories when they mimic authentic records and subtly alter factual details. In our study, families never interpreted the composites as evidentiary photographs. Whereas prior false-memory research relies on highly photorealistic edits intended to pass as genuine images, *Culture Link*'s outputs are stylised, fantastical, and often physically impossible. Participants, such as F3's mother, immediately recognised the "cartoon-like" qualities of the images and used these differences to clarify what had actually happened. This suggests a design opportunity in intentionally using low-fidelity generative imagery with memory work to invite

comparison, imagination, and reinterpretation, rather than risking the memory overwriting associated with photorealistic outputs.

Similarly, in Family F1 the parents combined an old photo of the father and son at a theme park with a later selfie of the mother and daughter, producing a composite in which the mother appears holding the baby in front of a circus. The father described this as “very successful” not because the scene was historically accurate, but because it captured the feeling of everyone being there together. In both cases, the composite operates as an “as-if” image that holds multiple times and absences in a single frame. Rather than creating false memories, these outputs functioned as prompts that made family members articulate what really happened, what was missing, and what they wished could have been.

These examples align with the study by Lindley et al., showing that digital mementos and designed artifacts invite people to continually rework the meanings of the past instead of freezing them in place [39]. They also echo Jones et al.’s [35] framing of family stories as mosaics assembled through many small contributions, where each generation reconstructs received narratives rather than merely preserving them. Instead of designing a system as fidelity-oriented records, a tool for symbolic re-composition brings has the potential to foster more flexible and open-ended interpretations. This may be particularly valuable under displacement settings, where the closure of ambiguous loss is impossible and meaning-making requires ongoing reinterpretation.

Redistributing Memory Work

While memory work in migrant and refugee families has been described both as meaningful yet burdensome in certain contexts, *Culture Link* facilitated a more shared and co-constructed form of remembrance. Basso’s work with Indigenous communities shows elders as honoured keepers of place-based stories, tying moral guidance to named landscapes [6]. Projects like Tibau et al.’s FamilySong similarly frame shared musical practices as joyful collective memory-making [69]. At the same time, Chowdhury et al. [17] highlight how, in many transnational households, specific family members are implicitly assigned the ongoing role of “memory-keeper”. The member is often tasked with maintaining archives, managing digital channels and providing “tickets-to-talk” [17]. Such role can be imposed, gendered and emotionally exhausting, and technologies that mediate memory work can also amplify the burden of memory work [17].

Our study does not overturn these structural dynamics, but it shows micro-moments where memory-keeping became more shared and less individually concentrated during the ten-day field trial. The interaction of *Culture Link* actively engage children in contributing to shared artifact, that encourages children to initiate and shape storytelling, rather than waiting for adults to decide what and when to recount the past. In F5, the younger daughter’s choice to represent a left-behind cat with a similar-looking image from the internet, and to place it next to the river from her mother’s childhood, effectively

staged a new way of remembering the animal and their former village together. Another example is while F2's mother was telling her children "how we lived in Sri Lanka", her eldest daughter also spoke about comforting her father when memories of war surfaced, indicating that children were not just listeners but emotional contributors in these conversations. These episodes resonate with Jones and Ackerman's [35] account of younger generations who question, remix and extend family narratives rather than passively inheriting them. At the same time, parents remained central storytellers. F5's mother's long, proud explanation of sago processing, or F4's detailed account of celebrating festivals online during years of separation from his family, embody the local culture and deep knowledge that only adults could provide.

What changed in our probe was not who "owned" the stories, but how they were activated. The sessions were structured in the way where all family members had the opportunity to showcase and speak about their narratives. This aligns closely with Jones et al.'s [35] framing that both "tellers" and "listeners" are active agents who discover, decipher, and reconstruct family stories together. Design for family storytelling should support multi-agent, co-constructive interaction rather than with a system where one person organize the archive for everyone else [17, 35].

Lowering Production Barriers for Shared Creativity

The composite-image workflow lowered entry barriers for both adults and children to propose imaginative scenes without needing drawing or photo-editing skills. F3 Children were empowered to suggest combinations such as "Spider-Man and Pikachu flying" or "a cat family in our village" and see them realized through curating existing photos or web images, as in F3's playful re-compositions. Parents similarly combined old family photos, landmarks and cultural symbols into scenes they might struggle to sketch by hand. This echoes prior work showing that generative AI tools can widen participation by decoupling idea quality from representational skill, enabling novice creators and children to explore rich concepts without producing polished drawings [15, 31, 40, 57, 70]. It also contrasts with earlier systems by Sabie et al. [58] where hand-drawing limited some migrants' ability or willingness to participate.

In our deployment, the low-effort interaction allowed children to easily lead the creative process, with parents responding or helping when needed. This dynamic aligns with recent work on family co-creation and youth-centred AI experiences, where children's ideas shape the direction of AI-mediated artifacts and activities [30, 37]. For refugee families, many of whom have limited language proficiency and digital literacy, design efforts should therefore prioritize simple interfaces and little learning costs.

AI Ethics for Inclusiveness and Privacy Protection

Concerns about the use of AI in marginalized communities underscore a key design imperative: technologies must minimize potential harms, and ensure that users can access and engage with them easily. We applied this principle directly in the design of *Culture Link*, through generic human-image generation and image-based interaction.

The rapid expansion of AI into everyday life has raised concerns in HCI about unnecessary and unexamined deployment [62]. These issues become more critical in refugee settings, where the use of non-open-source generative models heightens questions of privacy, data governance, and representational fidelity [7]. While such critiques underscore the importance of transparency and accountability, they do not suggest that AI should be withheld from marginalized communities. On the contrary, Avellan et al. [4] argue that AI becomes exclusionary when marginalized groups are not treated as legitimate users, and systems must therefore be designed to be genuinely accessible to underserved communities. Recent work in CHI also shows AI's emerging role in assisting refugees and migrants in counseling interactions, navigating local information, and negotiating cultural adaptation [38, 77]. In line with existing research, our findings show how participants without prior AI experiences successfully engage with *Culture Link*. Such as F6's mother, encountered AI for the first time and expressed both shock and excitement at what it could do. We therefore interpret the limited prior engagement with AI not as reluctance or incapacity, but as a consequence of structural gaps in access and digital inclusion. Designers need to prioritize low-friction, visually driven interfaces and multi-user workflows like *Culture Link*'s composite-image mechanism, so that marginalised communities with limited literacy can appropriate AI on their own terms rather than being excluded by systemic barriers. In designing and deploying *Culture Link*, we responded to this call in several ways. First, the platform is web-based, mobile-friendly, and runs on commonly available smartphones rather than specialized hardware, lowering infrastructural barriers for families with limited devices. As shown in Fig. 1, the interface contains minimal text and pairs buttons with intuitive icons to accommodate users with limited language proficiency. The simple image-to-image workflow, where both input and output are images, further reduces the barriers of digital literacy, and supports accessible interaction.

To safeguard participants' privacy while still supporting meaningful storytelling, *Culture Link* intentionally generates generic human representations rather than reconstructing identifiable likenesses. As Martinez et al. [41] argue in the context of documentary photography, generative AI can open up new opportunities for protecting subjects' privacy by breaking the direct indexical link between images and real individuals while still supporting community-driven storytelling. This design choice prevents the appearance of real faces in the composite image and reduces risks associated with storing children's photos on external AI servers. As part of our ethics protocol, we advised participants to avoid uploading identifiable personal images and highlighted the potential risks of sharing human photos with third-party AI providers. Nevertheless, some families intentionally used their own faces because

they wanted the outputs to reflect their unique features and expressed little concern about these risks. As seen in Family F1's waterwheel example, they wanted to create an image specifically representing their children, yet the system produced non-identifiable children, which parents recognized as both a limitation and a protective feature. By abstracting identity in this way, *Culture Link* enables families to share memories safely, engage in creative reinterpretation, and participate without fear of exposing sensitive personal images.

.11.13 Limitations

While our study offers new insights into how generative AI can mediate the ambiguous loss of home for refugee families, it also has several limitations. First, the study was conducted with a small sample of seven families in Australia, limiting the generalizability of findings to broader refugee populations. However, we posit that given the commitment required for this study from a family 'as a whole', where multiple members from each family contributed to daily practices, we believe that our study contains rich dataset. We also highlight that we attempted to bring a stronger diversity in our dataset with all seven families coming out of different cultures. Second, participation required basic digital literacy and access to mobile devices, which may have excluded more vulnerable families with limited technological resources. Third, although we attempted to minimize researcher influence, the introduction session and researcher guidance may have shaped participants' engagement and responses. Finally, *Culture Link* relied exclusively on *OpenAI*'s image-to-image model at the time of the study, and we position the generated images as symbolic representations. More recent models, such as the *Nano Banana* model [48], released after the study concluded, are reported to specialize in photorealism and achieve higher character consistency. Future work could examine how high-level fidelity shapes narrative practices and emotional responses. Moreover, the short-term nature of the field trial limited our ability to assess the long-term sustainability of AI-mediated storytelling practices and their impact on family dynamics. These limitations underscore the need for longitudinal and cross-cultural studies to deepen understanding of how digital technologies can scaffold belonging in contexts of displacement.

This paper examined how refugee families engaged with *Culture Link*, an AI-mediated storytelling system that create composite images from family members' photos. Through a ten-day field deployment with seven families, we showed how the platform supported memory preservation and reinterpretation, inter-generational cultural transmission, children's creative play, everyday family engagement, and the negotiation of generationally divergent identities. Rather than treating AI as a tool for faithful reconstruction, families used composite images as symbolic prompts to weave together memories of homeland, present routines in Australia, and imagined futures, thereby negotiating the ambiguous loss of home. Building on these findings, we argue that the ambiguous loss of home is not only cyclical and relational but also shaped by generational position, and that AI-mediated storytelling can foster

narrative rituals to redistribute and reinterpret memory work across family members. We also showed that designing for symbolic recomposition, enabling more evenly distributed memory work, lowering production barriers through visually driven, mobile-friendly interactions, and foregrounding ethical considerations around privacy, transparency, and data governance together support the development of AI-mediated storytelling systems for refugee families.

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Appendix D

Ethics Approval

Human Research Ethics Approval

Project Number: 2021/HE001331

Project Title: DIY Home: Understanding what home means to low SES communities and newly arrived humanitarian entrants, by using Virtual Reality technology as a research tool

Version: 2.02

Chief Investigator: Dr Dhaval Vyas
School of Electrical Engineering and Computer Science

Co-Investigator(s) Dr Aparna Hebbani
Mr Aaditya Yadav
Ms Chi-Hsuan Wu
Miss Haolin Zhou
Mr Hongyi Tao
Ms Pinyao Song
Mr Peter Wei
Mr Varun Sinha

Funding Body (UQ ref#):

Approving Committee: EAIT LNR

Approval End Date: 01 Apr 2026

Date of Approval: Tuesday, 25 March, 2025

EAIT LNR confirms that this project meets the requirements of the National Statement on Ethical Conduct in Human Research (2023). The University's human research ethics committees are organised and operate in accordance with the National Statement on Ethical Conduct in Human Research (2023).

Approved Documents

Document Type	File Name	Document Title	Application Version	Document Version	Last Modified
Change Tracking	2021_HE001331 v2_01 - v2_02 Changes.pdf	2021/HE001331 v2_01 - v2_02 Changes	2.02	1	24/03/2025 5:54:16 PM
Application Attachment	HE001331_240225 - Consent.docx	Consent Form	2.02	2	24/03/2025 5:54:14 PM
Project Protocol	HE001331 - Project Details 2.docx	HE001331 - Project Details 2.docx	2.02	2	24/03/2025 5:54:13 PM

Application Attachment	HE001331_150325 - Info Sheet.docx	Information Sheet	2.02	2	24/03/2025 5:54:14 PM
Application	Output Form.pdf	Output Form	2.02	4	24/03/2025 5:54:13 PM
Application Attachment	2021_HE001331 - Photography Form.pdf	Photography Form	2.01	1	24/03/2025 5:54:14 PM
Application Attachment	HE001331 - Project Details 2.docx	Project Description	2.02	1	24/03/2025 5:54:14 PM

Ethics committee

EAIT LNR

The University of Queensland

Additional Notes to HREC Approval

1. The University of Queensland HREC is constituted and operates in accordance with the National Health and Medical Research Council's *National Statement on Ethical Conduct in Human Research (2023)*, NHMRC and Universities Australia *Australian Code for the Responsible Conduct of Research (2018)* and the CPMP/ICH *Note for Guidance on Good Clinical Practice*.
2. If a Public Health Act (PHA) application is applicable, please visit the Health and Medical Research Unit website at:
http://www.health.qld.gov.au/ohmr/html/regu/aces_conf_hth_info.asp
Researchers are reminded that they require a current ethics application to utilise data provided through a PHA application.
3. In accordance with Section 5.5.6 (b) of the National Statement, the Chief Investigator will report to the HREC annually for the duration of the project. A final report is to be submitted on completion of the study.
4. The Chief Investigator will immediately report anything that might warrant review of ethical approval of the project, in the specified format, including:
 - Unforeseen events that might affect continued ethical acceptability of the project.
 - Serious Adverse Events that materially impact on the continued ethical acceptability of the project.

Any other incident attributable to the research affecting the welfare and/or health of participants or researchers should be promptly reported through UQSafe and the relevant reviewing HREC.

5. Amendments to any part of the approved protocol (including change of Investigator/s), documents, or questionnaires attached to the clearance must be submitted to the HREC and approval granted before the changes are implemented.
6. All clinical trials need to be registered on a World Health Organization (WHO) approved clinical trials registry (for example <http://www.anzctr.org.au>).
7. The Chief Investigator must determine whether the study needs to be declared/notified to UQ Insurance Services as per Fact Sheet on [Insurance Services website](#) (refer flow chart at Appendix 1).¹
8. The Chief Investigator is responsible and accountable for full compliance of the protocol by all investigators including the collection, use, storage and disclosure of data as required by UQ policies and procedures.
9. The HREC reserves the right to visit the research site and view materials at any time, and to conduct a full audit of the project.

¹ Despite international and disciplinary norms, a wide range of studies involving humans can be considered a "Clinical Trial" for insurance purposes at UQ. E.g., in some cases, this can include epidemiological surveys, population level studies, blood sampling studies (e.g., seroprevalence), psychophysiological outcome studies, and parenting intervention evaluations.

Additional Notes to LNR Panel Approval

1. Research reviewed and approved by LNR Panel meets National Statement Requirements as per s5.1.18 – s5.1.21
2. In accordance with Section 5.5.6 (b) of the National Statement, the Chief Investigator will report to the LNR Panel annually for the duration of the project. A final report is to be submitted on completion of the study.
3. The Chief Investigator will immediately report anything which might warrant review of ethical approval of the project, in the specified format, including:
 - Unforeseen events that might affect continued ethical acceptability of the project.
 - Serious Adverse Events that materially impact on the continued ethical acceptability of the project.

Any other incident attributable to the research affecting the welfare and/or health of participants or researchers should be promptly reported through UQSafe and the relevant LNR Panel.

4. Amendments to any part of the approved project description (including change of Investigator/s), documents, or questionnaires attached to the application must be submitted to the HREC and approval granted before the changes are implemented.
5. The Chief Investigator is responsible and accountable for full compliance of the protocol by all investigators including the collection, use, storage and disclosure of data as required by UQ policies and procedures.
6. The LNR Panel reserves the right to visit the research site and view materials at any time, and to conduct a full audit of the project.