Older Adults as Digital Content Producers

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ABSTRACT
Older adults are normally characterized as consumers, rather than producers, of digital content. Current research concerning the design of technologies for older adults typically focuses on providing access to digital resources. Access is important, but is often insufficient, especially when establishing new social relationships. This paper investigates the nature and role of digital content that has been created by older adults, for the purpose of forging new relationships. We present a unique field study in which seven older adults (aged 71-92 years), who did not know each other, used a prototype iPad application (*Enmesh*) to create and share photographs and messages. The findings demonstrate that older adults, even those in the "oldest old" age group, embraced opportunities to express themselves creatively through digital content production. We show that self-expression and social engagement with peers can be realized when socio-technical systems are suitably designed to allow older adults to create and share their own digital content.

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H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
User-generated content has been the subject of much research and discourse in recent years. Most of this research has focused on young people, with older adults either overlooked or characterized as consumers, rather than active producers of content [1]. Even social technologies designed specifically for older adults often prioritize functions that allow users to easily *access* content produced by others, rather than to create and share their own digital media [e.g., 4, 6, 28].

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In this paper we demonstrate that creating and sharing personally meaningful digital content helps older adults build connections with their peers. Research into older adults' communication preferences suggests a need for social technologies that enable older people to express their individuality and to actively engage in reciprocal communications with others [14, 21]. While there has been some development in this area, with new tools encouraging older adults to share information with remote family members [e.g., 15], there has been little research exploring digital content production as a means for older adults to build new connections with their peers. Concerns about social isolation among older people, particularly for those who live independently with diminishing social networks and few opportunities to meet others, makes this an important area for research and development [6].

Our research contributes to a growing body of literature concerned with the design of technologies for older users. Much of this literature has focused on engaging older adults in participatory design [16, 30], evaluating older users' interactions with different interfaces [10, 26], or understanding older adults' attitudes towards new technologies [1, 13]. In this paper, we focus on older adults as content producers. This research builds on earlier work that developed a photo-sharing application to support grandparent and grandchild communications [29]. Here, we extend that work and introduce a new application for the iPad, *Enmesh*, that aims to support older adults build new connections within small peer communities.

We begin with a review of the relevant literature that has trialed social technologies for older adults and examined older adults' experiences and attitudes towards digital content production. We then describe the Enmesh application and present the results of a field study in which a small group of older adults, mostly aged in their 80s and 90s, used Enmesh to create and share digital photographs and messages. The findings demonstrate that digital content production provides older adults with opportunities to engage with others and share stories about their lives in personal and creative ways.

SOCIAL TECHNOLOGIES FOR OLDER ADULTS

There is a growing interest in the design of social technologies for older users. This is motivated, in part, by an underlying aim to address the needs of an ageing population, including helping to alleviate older people's experience of social isolation [4, 6, 8]. Much of the work in this field focuses on the use of technologies *to strengthen existing social connections*. For example, older adults who are housebound or living in nursing homes have been provided with digital photo frames so that family members can send photographs and messages to their relatives [4, 28]. However, older adults who are socially isolated may not have family and friends to communicate with. It is therefore important to also consider how technologies can be best used *to help older adults forge new social connections*.

One recent development in this field is found in the *Building Bridges* project [6]. Researchers developed and trialed a communication device used to build connections within a group of older adults who did not know each other. The design prioritized methods of communication that were familiar to older users, such as the telephone. Participants were given the opportunity to listen to audio content that was broadcast simultaneously on all participants' devices. They were then able to join group telephone conversations to discuss the broadcasts. The device included a facility to create and send text messages and, according to a post-trial survey, this was the most popular feature. However, users were frustrated by the space allowed for their messages (160 characters) and were limited by privacy restrictions. Feedback suggested participants would have welcomed the opportunity to share personal information and to meet each other in person to build rapport with others.

Another example is the *Photostroller* for use by residents in an aged care home [7]. The Photostroller is a movable device, configured to display photographs streamed from the *Flickr* website in response to pre-programmed keywords. Although used in a nursing home environment where participants were co-located, one of the underlying aims of the device was to build social connections between strangers. An ethnographic study of the nursing home setting revealed that residents had vastly different personal histories and limited shared interests, rarely engaging with each other during their daily activities. A trial of the Photostroller revealed that it was successful in building connections: nursing home residents often viewed the content together, responding to the photographs with stories about their own life histories.

These are good examples of technologies that help older adults build new social connections. However they tend to prioritize consumption, rather than production of content. Even the Building Bridges project, which did provide the opportunity for users to create and send messages, aimed primarily to build connections through the shared experience of listening to audio broadcasts and talking on the telephone. The text messaging feature was popular, but was primarily used to arrange telephone conversations. The participants expressed a desire to share personal information in order to build connections with the others. This finding suggests a need for further work to examine the role of content creation and sharing in helping older adults to build new social connections.

A growing body of research suggests that producing and sharing digital content can provide older adults with important opportunities to express themselves and communicate with others in creative and meaningful ways. We discuss this body of work below.

OLDER ADULTS AS CONTENT PRODUCERS

While older adults are not usually perceived as creators of digital content, they are becoming increasingly active online [3]. There are numerous online discussion groups that cater for older people. Content analyses of these communities have revealed they provide an intellectual and creative outlet for many users [20]. A qualitative study by Burmeister [2] also found that online communities provide an important forum for older adults to share information about common life experiences (e.g., retirement, bereavement, health difficulties), helping to create a mutually supportive community. The older people interviewed in Burmeister's study valued the feeling of belonging that they got from contributing to the online community. They viewed this as similar in nature to a neighborhood community.

Karahasanovic and colleagues [12] focused on an existing neighborhood community in an ethnographic study that aimed to explore how older adults could potentially engage in the co-creation of online content. The authors found that digital content production could provide important opportunities for this group of participants, who participated in "collective memory" storytelling about their neighborhood and demonstrated a desire to express themselves through user-generated content.

A case study of a video blogger by a man in his 80s clearly demonstrates the opportunities for sharing and reflecting on life experiences that can arise when older adults produce and share content [11]. Harley and Fitzpatrick analyzed eight YouTube clips posted by Peter Oakley (*Geriatric 1927*). Peter's video blogs described his experiences in World War II, his family life, career, and lifelong interest in motorbikes. Producing and sharing content appeared to enhance Peter's social connectedness, providing an opportunity for him to engage with a global intergenerational audience. The viewers, who ranged in age from 14 to 56 years, were supportive, sometimes asking questions of Peter or encouraging him to tell more about particular aspects of his life.

While Harley and Fitzpatrick's research provided an interesting profile of an older adult who successfully

produced and published content openly on the Web, it is unlikely that Peter is typical of other older technology users. Studies have shown that older adults tend to view social media as youth-oriented spaces, used for frivolous and self-promoting activities [e.g., 1, 13, 32]. Bloch and Bruce observed an apparent disconnect from online participation among older adults. Their interviewees, aged 62 to 84, described using the Internet for consuming information (e.g., reading newspapers, accessing health information), but not for producing content. They argued that limited online participation puts older adults at risk of disengagement from "democratic life", suggesting a need for research "to understand better what is involved in making online activity [for older users] go from passive consumption to active participation" [1, p. 6].

Researchers have also demonstrated that older adults may be reluctant to share content publicly online [8, 32]. For instance, Gibson and colleagues presented various social networking sites to groups of older people and conducted focus group discussions to gauge participants' perceptions of the sites. They found their participants were resistant to using online social networking; they were concerned about exposure and preferred to maintain privacy [8].

If older adults are to become digital content producers as well as consumers, then, it is necessary to provide tools enabling them to easily create and share content in nonthreatening and supportive environments. One such environment is within the family. There has been much research and development in recent years examining the use of technologies by older adults to share information with younger family members [23, 25, 29]. For example, the *Wayve* device was trialed in the homes of an older couple, their adult children, and their grandchildren [15]. The device was used to display and send photographs, text messages, handwritten notes and drawings. The findings demonstrated that the grandfather, in particular, embraced the opportunity to produce content to share with his family. Many of the messages he sent to his grandchildren were creative and playful, a finding that aligns well with earlier research demonstrating how technology can mediate playful interactions between grandparents and grandchildren [29].

One of the key features of Wayve was that the sent messages and photographs were displayed prominently on the device, promoting serendipitous engagement with the content as users walked past the display. The display also appeared to fuel participants' creative efforts. That is, knowing their contributions would be viewed by significant others inspired a creative approach to content production. Other researchers have also noted the importance of prominent displays for encouraging and shaping content production [17, 22].

The studies reviewed here demonstrate that social engagement is possible when older adults produce and share content in two contexts. Firstly, older adults have used technologies to produce content for familiar audiences (in the context of family communications). Secondly, there are studies of older adults who produce content for a wider audience (mostly strangers) via publicly available forums. However, as noted above, research has shown that some older adults may be reluctant to share information publicly online. Existing research has yet to examine the role of user-generated digital content for enabling older adults to create new relationships. In this paper we examine how new social connections can be forged when older adults create images and text messages to share with each other, using a specially designed touch tablet application.

ENMESH: ENGAGEMENT THROUGH MEDIA SHARING

Our prototype iPad application, Enmesh (ENgagement through MEdia SHaring), was designed for use by older adults to create and share photographs and messages. The choice of the iPad was based, in part, on the fact that older adults tend to find touch-screen interfaces more accessible than other input devices such as a mouse or keyboard [18]. The iPad provides Internet connectivity and has an inbuilt camera and keyboard, making it ideal as a vehicle for both capturing and exchanging photographs and messages.

Enmesh features a unique interactive display (Figure 1). The photographs and messages float down the iPad screen in a cascading motion. The appearance of items is controlled by a semi-random algorithm that displays recent items more frequently and older items less often.

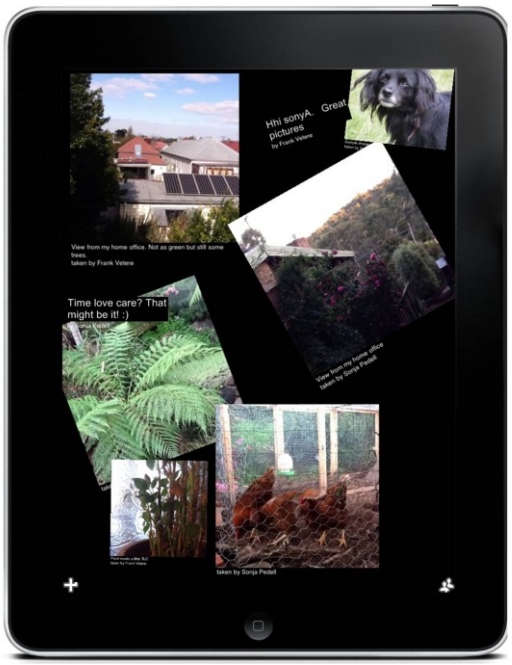

Figure 1. The Enmesh display

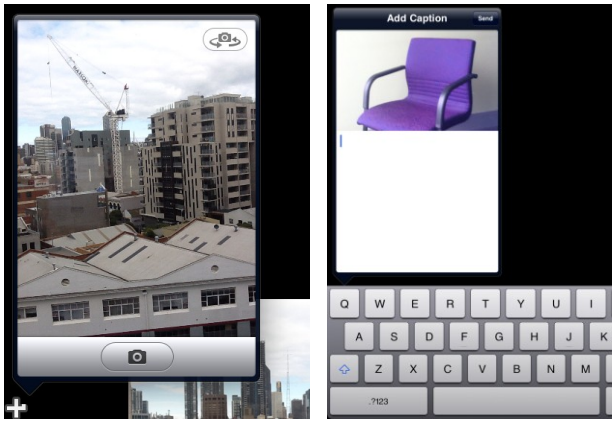

Figure 2. Interfaces for taking photographs and writing messages

All those connected to the Enmesh network can see the same configuration of photographs and messages as they move down their individual iPad screens. People can move objects around the screen, reduce or enlarge them, and temporarily remove them from the display by "flicking" them to the side with a swiping motion. Importantly, these movements are visible to all other users viewing the display. When a person touches a photograph or message, a label appears on its border saying "touched by [user's name]". By making these interactions visible to other users, we hoped to build a sense of social presence within the user community. The display is controlled by a central server. If two users try to move a photograph at the same time, the server will use the most recent information. As a result, only one user can effectively manipulate an object on the display at a time.

Users can create and send photographs and messages by tapping on a "+" symbol at the bottom of the screen. A dialogue box then provides the option of taking a photograph, writing a message, or both (Figure 2). When a photograph or message has been recorded, users can press "send" to upload the content to the shared display.

FIELD STUDY

Enmesh was trialed with a group of seven older adults, aged between 71 and 92, who lived in their own homes. They were all clients of a local aged care provider and received regular visits from a care manager. None of the participants knew each other prior to the study. They were selected to participate because they had been identified by their care managers as being, or at risk of being, socially isolated. Two care managers also took part in the trial, using Enmesh to view the content their clients had shared, and to share their own photographs and messages.

Participants

Seven older adults participated in our study. Some details about the participants are provided below, with pseudonyms used to identify each participant:

Betty (88) lives alone, with no children or surviving siblings. She has no computer, but admires her friends' use of the Internet.

Charlotte (77) lives with her disabled daughter and has several health problems. She has never used a computer.

Donald (85) lives alone. His daughter and grandchildren live overseas. His daughter bought him a new computer primarily for Skype, but he finds it hard to use.

Emma (89) lives with her 95-year old husband. They have some family living nearby. Emma has a computer but rarely uses it.

John (92) is a widower who lives alone. His family visits occasionally. He uses an old computer for email.

Lynne (71) lives alone and regularly visits her 94-year old husband in residential care. She has a computer and uses it for emails and information access via the Internet.

Sophie (92) lives alone and has no children. She regularly visits her sister and spends time with nieces and nephews. Sophie has never used a computer or keyboard before.

Procedure

The trial took place over three months. Each participant was provided with an iPad. At the start of the trial, a researcher visited participants to show them how to use Enmesh. For the first two weeks, participants used Enmesh to share photographs and messages with their care managers only.

After two weeks participants had the opportunity to meet each other at a social event. From this point, all participants were connected to each other, with the display showing everyone's messages and photographs. A second social event was held after six weeks and a third at the end of the trial. These gatherings gave participants the opportunity to build rapport through face-to-face contact, and also helped to build participants' confidence and engage them in the research and evaluation process [31].

Data Collection and Analysis

Interviews

The participants (older adults) were interviewed three times: at the start, middle, and end of the trial. One participant withdrew due to health problems and was only interviewed once. Care managers were interviewed at the end of the study, although their responses are not reported here. In this paper we are interested in the motivations and outcomes of user-generated digital content for older adults. We therefore focus on comments made by older adults during the final interviews.

The interviews followed a semi-structured format, asking participants to reflect on their experiences of taking part in the study and using the Enmesh application. Key themes were identified through a thematic analysis. Here we focus on comments that reveal participants' reflections on their experiences of creating and sharing content.

Enmesh content

The research data also consisted of photographs and messages that participants sent to the shared display. These were recorded on a server and reviewed and examined for key themes. Since the focus of this paper is on older adults creating and sharing digital content to build peer connections, digital content created by care managers was excluded from the analysis. The analysis focused on identifying common themes that emerged in the content that participants shared. These themes were: 1) domestic spaces, 2) objects and artwork, 3) interests and hobbies, and 4) daily activities. Each of these is examined below, followed by a discussion of the social interactions that occurred during the study.

FINDINGS

Here we present the findings in two sections. First, we describe the content that participants produced, beginning with an overview of the number of objects sent, followed by a discussion of the key themes. We then describe the social interactions that occurred during the study, as revealed by the messages exchanged and the comments participants made during interviews.

Content Produced

Participants produced 231 photographs and messages over ten weeks. Table 1 shows the number of items sent by each participant. Most photographs were complemented by a caption. John adopted a "leader" role [24], sending nearly as many items as all the other participants combined. Thus many items discussed in the findings are from John. Nevertheless other participants remained engaged and provided a critical role as audience.

Domestic spaces

Many of the photographs showed details of participants' domestic spaces, such as exterior views of or from the home, interior rooms and spaces, decorations and objects, and photos of the garden. This is not unexpected, given that participants spent a lot of time at home. What is noteworthy is that many of these photographs described aspects of participants' daily lives and domestic spaces

Participant	Text only	Photographs with text caption	Photographs without text caption	Total sent items
Charlotte	2	9	0	11
Donald	1	8	4	13
Betty	8	3	5	16
Lynne*	9	5	2	16
Sophie	4	4	11	19
Emma	15	28	4	47
John	52	56	1	109
Total	91	113	27	231

Table 1. Number of photos & messages sent by participants (* Lynne participated for four weeks only)

Figure 3. John's photographs of his (a) "NASA rocket control centre" and (b) "household elevator"

that were important to them. For example, Donald shared a photograph of his refrigerator with the caption, *"My own birthday present"*. John shared numerous photographs illustrating his domestic surroundings, and these were often accompanied by captions that reflected on the limitations of old age. A photograph of the exterior of his home was captioned, *"my prison for most of the time,"* while he described his motorized scooter as *"freedom machine when on parole"*. A poignant example was the photograph of his empty garage (*"Had a car once but don't drive any longer – too old"* [John]).

These brief messages reveal a combination of lighthearted and somber reflections on ageing. John also frequently used humor to describe his domestic surroundings. He shared an image showing a radio in his kitchen set up for emergency calls: *"My kitchen is starting to look like a NASA rocket control centre, wires everywhere."* A photograph of a stepladder in his home was labeled *"The household elevator. Forbidden territory for me according to my carers, but what do I do when I need to get to a high shelf? Hire a forklift?"* (Figure 3).

Objects and artwork

Participants also shared photographs of household objects and artworks. These objects were often associated with personal memories and familial histories. Donald, for instance, shared photographs of ornaments, with the caption *"The Holland collection,"* and a photograph of a framed painting hanging on his wall that depicted a Dutch windmill. During the interview, Donald explained these were important to him because he had grown up in Holland. The windmill and ornaments represented *"the place where we used to live,"* reminding him of his childhood and his brothers who had all passed away.

Similarly Betty shared images of a framed Parisian print, with the caption *"gay Paris"*. During the interview it transpired that Betty had been an avid traveler. She had visited Europe many times and the artwork on her wall was a cherished memento from this part of her life.

Figure 4. Sophie's photograph of three sisters

Artwork and objects in the home often had special meaning because they were associated with loved ones. John shared a photograph of a tapestry on his wall: *"My late wife's handiwork – about 22000 stitches"*. Many photographs showed framed portraits of family members, on display in the home. Sophie shared an image of two adjacent portraits of herself with her two sisters, both as young girls and as older women (Figure 4). This photograph, although not captioned, was very popular with the other participants. In the interviews, participants noted that they enjoyed trying to match the people in the two pictures.

Photographs of sentimental objects and artwork enabled participants to create and share aspects of their history in a simple and visual way. Other photographs showed objects relevant to current activities. For example, John shared a photograph of a head-mounted light, explaining:

"Something that is very necessary for me when reading fine print or doing close work. Must have it because my vision is much impaired with macular degeneration. Just another old age disability that I have to put up with, but I seem to manage adequately though in spite of it." [John]

This example illustrates the personal meaning attached to the objects that participants chose to photograph and share. John associated this object with old age, but also with maintaining his ability to undertake productive work.

Figure 5. (a) Bowling room, and (b) Workshop

Interests and Hobbies

Participants shared photographs and information that expressed their personal interests and hobbies. Emma, for instance, shared a photograph of a dedicated *"bowling room"* in her home, while John shared a photograph of a building in his garden with the caption: *"Workshop – my lifeline for many years."* (Figure 5)

Sophie and Charlotte shared photographs of their garden, sometimes naming the flowers or providing a story about the plant: *"My beautiful tree from a seed from Ambon a prison of war camp"* [Sophie]. Emma shared several photographs and messages that described birdlife. She captured an image of a computer screen showing two birds and described their significance with this caption:

"These two birds we had as pets when our children were young. The galah is pale - grey above and pink below. The corella is a white cockatoo with very small crest. They were great birds." [Emma]

John provided some insight into his life as an engineer and hobbyist, sharing photographs of machinery and objects he had used or built. He shared a photograph of a drafting table which he described in a message to Emma:

"I built it myself some time ago with a view to doing some contract drafting work after I retired but it never came to anything. However it has been a big help with all my hobby work since and I have used it a lot." [John]

John also created a series of photographs showing the different steps of a repair job he was undertaking on a lawn mower. Each photograph was titled "Mr. Fixit" and included a brief caption describing the project.

Daily activities

Participants sometimes shared photographs and messages that described their daily activities, such as meal preparations, visits from grandchildren, and other aspects of domestic life. For instance, Lynne shared a message saying *"Today theme is food in fridge and what's for tea"*. This was followed by a photograph of a plate of prawns. Some weeks later, Betty posted this comment:

"I saw some mention of prawns which reminds me oh horrors I have some in the fridge. And I think they may be a little Weary! Must go and check!" [Betty]

Later she added: *"Soo my poor prawns are now languishing in the rubbish bin! Never to be enjoyed by anyone. Ah well such is the fate of the poor prawn!"*

For some participants, health concerns were central to their daily activities. Lynne, for example, documented one day with a series of photographs and messages that began with the message: *"A diabolical day. Xrays show broken vertebrae. Sorry no pics except bed in turmoil."*

This was followed by a photograph of her unmade bed, with the caption, *"Bed after struggle to climb out."* A later message said she did not feel like eating that night,

Figure 6. Photographs illustrating Lynne's "diabolical day"

but this was soon followed by a photograph of a simple meal of tea and toast, with the caption *"Hunger pangs set in after all!"* (Figure 6). The day ended with a photograph of her preparations for bed, *"Back warmers, pain killer and walking stick ready for bed."*

Social Interactions

Participants did not, at first, actively respond to each others' posts. Over time, however, social activity increased and people referred more often and with longer responses to each other's messages. Participants established conventions to effectively communicate when their messages – which could all be seen by everyone in the group – were directed at particular people. A shared language developed for group communications (*"hello fellow iPadders"*), while participant names were used for messages directed to individuals *("Hi John, greetings from Sophie").*

Sometimes participants asked questions to prompt a response from their audience. For example, Sophie shared a photograph of her garden with the caption: *"Friends – how do you like my tree?"*

Participants found the onscreen keyboard difficult to use and messages often contained mistakes. Interestingly, this led to exchanges between participants, such as John's teasing comment to Emma:

"Interesting messages Emma!! First a letter "A" then "R". Miss out on something? Not to worry though, my typing is way off too. Don't see too well that's why." [John]

In another example, John asked Emma to clarify the meaning of a photograph, which she had mistakenly captioned *"koo"*. A lively exchange developed and after some discussion, Emma was finally able to explain the photograph:

"Have just found the koo which you mentioned it was supposed to read Viking tree made by my granddaughter as a school project. I sure mucked that one up." [Emma]

The interactive shared display also prompted participant interactions. When participants noticed others moving items, they often created a message to initiate contact, e.g., *"John, I can see you are having fun moving the pictures"* [Donald] and *"Hello Emma I see you moving pics around. How are you tonight?"* [John].

Many of the messages to the group contained comments or questions about the technology (e.g., *"How do you move the cursor"* [Lynne]). These questions and their responses served two purposes: they contributed to an evaluation of the technology, enabling the researchers to identify difficulties participants were experiencing, and they fostered the development of a shared sense of purpose within the group.

This shared purpose helped to create a sense of community. The development of community became evident at a social event held for all clients of the aged care provider. Managers from the organization were interviewed at the end of the study and they noted the social cohesion between the study participants:

"It created friendships - I don't know if you heard about our Christmas party last week. They got together that little group – that little group knew each other. They supported each other. One in particular took the others under the wing and looked after them for a couple of hours." [Aged care manager]

In addition, the three social events held as part of the study were particularly important for building rapport. After meeting each other face-to-face, participants felt as though they were sharing information with friends, rather than strangers. As Sophie said, *"they became a person where otherwise it was only a face"*.

Nevertheless, sharing information with a group of people who were effectively strangers at the start of the study did present some challenges. Both John and Emma – the most prolific content producers – commented on these challenges during the interviews.

For John, the content shared by others sometimes had insufficient information to capture his interest:

"I noticed that a lot of the messages were not directed to anyone ... It was 'this is a house across the road' and nobody would react to it and I found this was a bit of a miss, because I thought if someone puts something on it should be a bit described." [John]

Conversely, he was disappointed that his own efforts to engage interest from others were sometimes unsuccessful:

"I took a photo of my back fence and said 'you can see the TAFE [building] in the background' and I thought people would [comment on] it… If I put on something that is of interest to me I would hope someone else would comment or it would strike someone with a similar interest, but it has not happened." [John]

Emma, too, tried to imagine what people would be interested in, and this influenced her choices about content to share. Concern about the interests of the audience sometimes limited her content creation:

"I started sending messages without a photo, because I ran out of things around the home. You look to find something that is interesting – to some people at least not to you anyway." [Emma]

This concern also limited Betty's contributions, who said she *"didn't write many messages"* because she *"couldn't think of anything original to say."* [Betty]

Like John, Emma found there were times when her efforts to engage interest fell short, although she also acknowledged that people may have enjoyed her photos but not responded to them:

"I tried to put on things that people might be interested in. Of course I am a bowler so I put on a photo of the bowling room, nobody responded to that so obviously there was no bowler [in the group]. Lots of people were interested in the birds. Lots of people might be interested but might not write a response back." [Emma]

This observation is supported by interview comments made by other participants, suggesting they enjoyed viewing the shared content and felt a sense of connection within the community. Donald, for instance, called the iPad his *"friend"* and described the Enmesh display as *"an illustrated book by many authors."* Although he did not contribute as actively as others, he saw himself as a co-author of the display and felt part of the community.

DISCUSSION: CONTENT PRODUCTION FOR SELF-EXPRESSION AND SOCIAL ENGAGEMENT

The examples presented above demonstrate opportunities for self-expression and social engagement that emerge when older adults create and share photographs and messages. Some of our participants were clearly more active content producers than others and for them the benefits appeared more pronounced. Aged 92, John was one of our oldest participants as well as the most prolific. He shared photographs with captions that richly described his life, reflecting on both his past experiences and his current activities and lifestyle. The content John created suggests there may be important opportunities for digital technologies to enable those in the "oldest old" age group to express themselves in new creative ways. This age group is frequently overlooked in studies that aim to design technologies for older users [12]. Studies that do focus on the oldest old tend to emphasize consumption, rather than production, of content [e.g., 7].

The analysis of content sent to the Enmesh display reveals a wide range of topics. Participants did not shy away from sharing some of their bad days, but they mostly tried to find positive aspects in their daily life, often using humor to describe their experiences. By sharing information about their daily activities and surroundings, participants provided others with a "window" into their world. This enabled them to build rapport and find common interests. Similar findings have been found in Computer-Supported Cooperative Work (CSCW) literature, suggesting that sharing photographs and information about personal events can help to build rapport among distributed workers [e.g., 27]. Studies of photo-sharing in other contexts have also found that photographs are valuable for building connections between strangers [e.g., 17, 19].

Interestingly, our participants were not overly concerned about privacy, which contrasts with other research on older adults and social networking [8, 32]. Enmesh was designed specifically for use by older adults within a closed social network where participants got to know each other through face-to-face meetings. This may have contributed to trust in the system and a belief that participants' privacy was being respected. The shared display also helped to create a sense of community. Participants could observe each other interacting with the display, sometimes commenting on those interactions with messages directed to that person. These greetings provided a form of lightweight communication. They were used to announce to the other person "I can see you," much as a wave to a neighbor would communicate in a face-to-face context. In this way, our study supports earlier research that has shown how presence and awareness can be forged through computer-mediated communication within distributed groups [5, 9].

Our findings suggest two important considerations for enhancing older adults' experience of producing content. Firstly, technologies for content creation should provide *opportunities for self-expression and creativity*. The core function of Enmesh was to enable participants to create and share photographs and messages. This combination of imagery and text communication enabled participants to describe and share personal objects and spaces that communicated details of their histories and everyday lives. Through this medium, participants were able to express themselves in creative and meaningful ways.

Additionally, photographs and text communication provide powerful tools for supporting storytelling and reminiscence. In some cases narratives emerged from the combination of messages and photographs sent to the display, such as Lynne's description of her "diabolical day" and John's "Mr. Fixit" photographs. This was an interesting use of Enmesh that we had not anticipated. Enmesh was appropriated by some participants for supporting digital storytelling, which demonstrating a desire by older adults to engage in creative content production.

A second important consideration is *how* the content will be *displayed and shared* with others. For content production to be a rewarding and engaging activity, it needs to reach an interested and responsive audience. The

audience plays an important role in defining any content production activity, as illustrated by Harley and Fitzpatrick's case study of "Geriatric 1927" [11]. We found that considerations of audience were important in shaping the content participants chose to create and share.

Considerations of audience were mediated by the shared display. As noted above, the shared display fostered a sense of presence among users. The display of content influences users' understandings of, and interactions with, their audience [15, 17, 22]. In our field study, the users were both the creators and the audience of the content produced and this affected the way they approached the content creation activity. Participants tried to imagine what others would be interested in seeing and this was guided, in part, by considerations of their own preferences for the content they viewed on the display.

Successful participant interactions occurred during the study, particularly in the messages participants exchanged in response to each other's photographs. Some participants also noted, however, that engaging with a relatively unfamiliar audience involved some "hits" and "misses." It was challenging to share content with peers who were initially strangers. This was moderated to some extent by the three social gatherings held during the study. While these events have not been discussed in depth here, we acknowledge that they were a crucial part of building social connections between participants. This can be contrasted with findings from the Building Bridges project [6], which did not provide opportunities for participants to meet in person. One of the key findings from that study is that participants felt it would have been easier to build rapport if they had met face-to-face.

Our study involved trialing a socio-technical system, encompassing the technology, the social events and the care organization. This research contributes to broader work that aims to support older adults who choose to "age in place" or live at home for longer. Aged care providers that offer community-based care help to make this possible. Given the central role the care organization played in our participants' lives, involving care managers in the study helped ensure participants felt comfortable contributing to the project and using Enmesh [31]. Future work is needed to explore how similar technologies could be used when face-to-face contact is not possible, or when care providers are unable to actively contribute.

CONCLUSION

In this paper we have presented findings from a field study in which a small group of older adults created photographs and messages for a shared display. Our field study was unique in a number of ways. Firstly, the Enmesh application provided opportunities for older adults to *create and share* digital content. Secondly, most of our participants were aged over 85 and are therefore considered to be in the "oldest old" age group. It is rare for people in this age group to be thought of as producers, as well as consumers, of digital content. Thirdly, participants did not know each other prior to the study. Research into the design of social technologies for older adults has typically focused on strengthening *existing* social and family connections. Our findings demonstrate that creating and sharing content provides opportunities for older adults to build *new social connections* within a small peer community. We found that participants were willing to share personal information in this forum, building a sense of community within the group. Participants demonstrated a capacity to create meaningful content for the Enmesh display. Some participants in particular appeared to thrive on the opportunity to express themselves creatively using this communication tool. In this way, our study demonstrates that digital content production can provide important opportunities for older adults for social engagement and self-expression.

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