Engaging Seniors through Automatically-Generated Photo Digests from their Families' Social Media

Yichen Dang
University of Toronto, TAGlab,
Department of Computer Science,
Toronto, ON, Canada
yichen@taglab.ca

Cosmin Munteanu
University of Toronto, TAGlab and
University of Toronto Mississauga, ICCIT
Toronto, ON, Canada
cosmin.munteanu@utoronto.ca

Carrie Demmans Epp
EdTeKLA Research Group,
University of Alberta,
Edmonton, AB, Canada
demmanse@ualberta.ca

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Abstract
Seniors are increasingly using the Internet. However, their adoption of available services such as social media is often restricted by their limited experience with new technologies. At the same time, there is significant interest in designing communication applications, especially mobile, that improve seniors' social connectedness. These are mostly implemented as dedicated social networking tools for seniors and their families. A barrier to the full adoption of such tools is the requirement for younger family members to actively manage a platform parallel to the social media tools they already use (e.g., Facebook). We propose PhotoDigest – a user-centred application that allows seniors to passively engage in their families' social media activities. PhotoDigest automatically harvests families' Facebook photo posts and delivers them to seniors as weekly digests. We conducted a preliminary deployment study and show that PhotoDigest is easily adopted by seniors, does not interfere with younger generations' life routines, and enhances the entire family's social connectedness.

ACM Classification Keywords
H.5.2 [User interfaces]

Introduction and Background
Older adults (65+) are often considered to be less technologically savvy than others, particularly with respect to using online applications [7]. At the same time, many seniors feel socially isolated [20]. This suggests that older adults do

Figure 1: Screenshot of the slideshow displaying photos from a family member's Facebook stream.

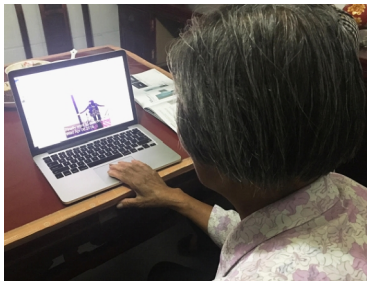
Figure 2: A participant (Mrs. B) interacting with the web app. During this preliminary study, older participants used devices that were most readily available to them (e.g. laptop). Seniors had to "friend" family members on the social media feed. Often this was set up by their younger family members. Privacy-wise this is not different than what more tech-savvy seniors encounters and thus not different than family members connecting on current platforms such as Facebook. The onus continues to be on the younger family members to control the sharing, as they normally do – in fact, this is a serendipitous benefit of our proposed solution: not requiring separate privacy controls from users' own Facebook accounts.

not fully benefit from the increased social connectedness afforded by social media or social networking services (SNS) such as Facebook. Indeed, some reports indicate that only 20% to 30% of seniors use such services [25]. While older adults are becoming digitally more literate, increasingly connected, and adopters of social media, we are still very far from universality. In fact, statistics from national censuses [1], indicate that out of the 15% of the population who are 65+, about 70% of them have Internet access, yet only a third use social media of any kind (and as low as 10% for active users). This means that for a country such as Canada, close to 4 million older adults do not fully benefit from the family connectivity afforded by social media.

Being aware of family members' activities and status is important for closeness and connectedness [18,24]. Communication applications can support this, either through synchronous (multimedia) exchange capabilities such as the Family Portals application [11], or through asynchronous, intergenerational messaging like that provided by the What'Up social platform [5] and the InTouch tablet app [19]. These tools can maintain grandparents' ability to stay connected with geographically remote grandchildren. It also gives them a sense of continuity and purpose, which is a major motivation for older adults to use technology [13], in particular being able to see their grandchildren's pictures.

Social media abounds with photos, and methods for improving access to large collections of photos are being studied. For example, [12] demonstrates how practical knowledge about the world can be extracted by mining community-contributed collections of photographs hosted on Flickr, and [21] how to semi-automatically create printed story books from Facebook. Projects such as VideoProbe [4] have explored ways to enable older adults' access to photo streams through manual curation by their family members.

A common myth of seniors-centred tech is that new "cohorts" of older adults will be digitally savvy – this is partly true, yet it does not account for the current large numbers of seniors who do not properly access such services. It also does not account for the decline in tech savviness that is associated with increased age and with retirement [8]. As such, we are facing a wider continuum of needs and abilities for this user base. While systems, such as Tlatoque [3], have been designed to make fully-featured social media more accessible for seniors, not all these address the lower end of the tech-savvy continuum – older adults who feel completely left out of their younger family members' digital universe.

Unfortunately, this presents family members with a choice: either leave seniors outside their regular SNS, such as Facebook, or find a way to engage with seniors through a separate platform. The former may exacerbate social isolation among seniors. The latter is time-consuming and may lead to younger family members not bothering to actively share pictures with the seniors, since maintaining another social network requires additional dedicated effort.

To address this problem we propose PhotoDigest – a web app that enables family members to use SNS (in particular, Facebook) for sharing life experiences with seniors without having to enrol in a separate service. PhotoDigest collects and organizes family members' photos from Facebook into a weekly photo digest page that is then delivered to the senior members of the family. Our aim is to address the needs of the still large number of seniors for whom even a passive social media consumption represents a challenge, and act as "training wheels" for those easing into social media but who need time to become more comfortable with it. We present here a preliminary evaluation showing that such an application is a feasible approach to bridging the gap between seniors-centred social platforms and more widely used SNSs.

Design and Implementation

The PhotoDigest application enables one-to-many communication to the senior from all their relatives and friends. Instead of trying to fully immerse seniors in SNSs, it

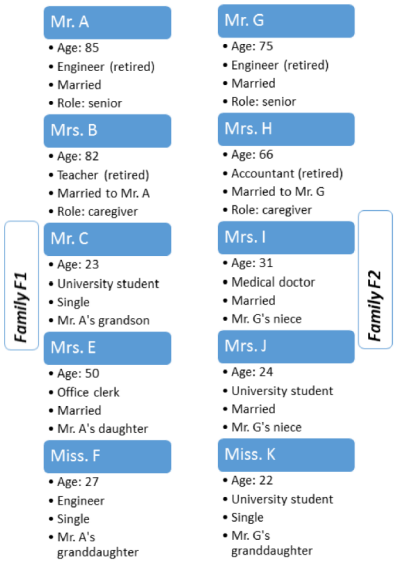

Figure 3: Direct and indirect participants from families F1 and F2. Family F1 is related to one of the authors of this paper, while family F2 is related to one of our lab's members (not author of this paper). We report on the primary app users (Mr. A and Mr. G) separately from their caregivers spouses (Mrs. B and Mrs. H) due to Mr. A and Mr. G being (until our study) non-adopters of social technology, as well as Mr. A and Mr. G requiring care to support many of their daily lives. To that extend, Mr. A and Mr. G self-identified as caregivers (being the persons in the house with most hours dedicate to the primary care of the senior spouse, as per the definition in [26]) – a role they also assumed during the introduction of the new technology. Participants were recruited through purposive sampling from the relatives of our lab's staff.

provides them with access to their families' SNS-based photo stream in the form a regular digest (Figure 1). The digest is generated weekly by automatically collating all photos from their family members' SNS stream into a web-based slideshow. Users open the slideshow by clicking on the link sent in a weekly email or through a browser bookmark. The web app interface has a minimalist design, with high contrast icons, large font, and large images. The application was designed to require minimal setup, and be platform-agnostic (phones, tablets, smart TVs, etc). Seniors or their family members create an app account; during use seniors can configure which family members' (entire family or a subset) photos and for what time span they would like included.

The PhotoDigest web app is run on a dedicated server. For privacy, the server only stores a user's app-specific identifier and their Facebook name. The application does not harvest pictures without proper sharing attributes, it only collates what family members already share (Figure 2). The slide show is populated at runtime using the Facebook Graph API.

Preliminary Evaluation

We conducted a longitudinal deployment study that explored participants' social connectedness changes during the deployment of the application. The study included interviews with the senior and their family members, and a set of measures that were related to our research question, such as social connectedness and well-being scales.

Participants[1]

The deployment study included 14 individuals from two families. Each family included one senior, the caregiver of the senior and four family members (Figure 3). Three of the family members were active participants in addition to the senior-caregiver dyad; however, we include the family members who are indirect participants, as well as the immersed researchers, in our reporting, since these are part of the socio-cultural ecosystem influencing technology adoption [17,19]. Participants were not compensated. Due to language barriers, all interviews and scales were administered by the staff related to each family. The study and recruitment were conducted in compliance with the protocol approved by our university's ethics board.

[1] In this paper we interchangeably use the term "senior" and "older adult", as the terms typically preferred by our participants.

Methods

The mixed-method study was implemented in three phases: pre-deployment, deployment, and post-deployment. The pre-deployment phase consisted of technical setup and instruction on using the PhotoDigest app. The deployment phase lasted one month during which seniors used the app freely (on their own or with their direct caregivers). The photos included in the digests were those posted on Facebook by the non-caregiver participants (younger family members). The post-deployment phase lasted two weeks, during which seniors did not have access to the app. At the end of each phase semi-structured interviews and a set of scales were administered.

Measures and Instruments

The following set of scales were used: Satisfaction with Life Scale [6]; Friendship Scale [9] for measuring social isolation; Connectedness Scale for Older Adults [22]; and Three-Item Loneliness Scale [23]. Through guided interviews administered at the same time, participants provided details about their connections to family members, awareness of their activities and status, awareness of pictures shared, and subjective impression of how close and involved they felt with their families' lives. These scales were chosen because of the high degree of objectivity, as well as because these were validated through numerous studies showing their robustness to personal impressions (and hence, suitable for our study where researchers and participants were familiar with each other). Additionally, the post-deployment interviews focused on questions related to withdrawing from the use of PhotoDigest – asking about participants' feelings and experiences. At this stage, caregivers were also interviewed to gain a complementary perspective of seniors' PhotoDigest

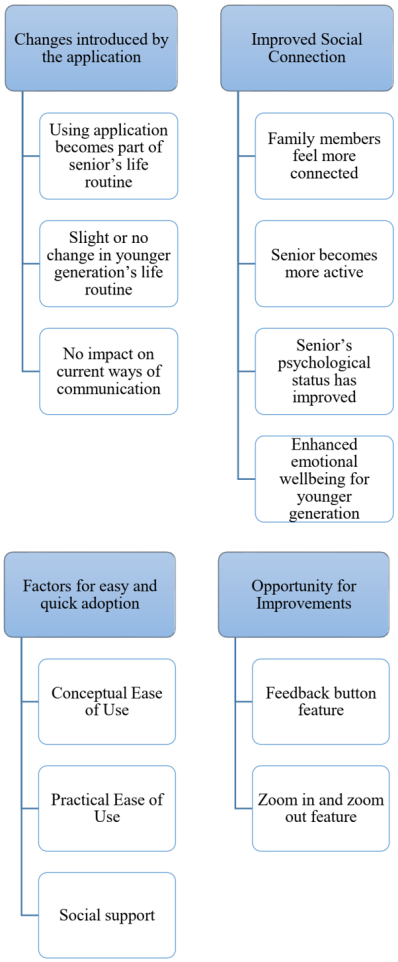

Figure 4: The four themes (and codes) based on the thematic analysis conducted by the main researcher (paper author) over the interviews with both families. The codes were verified by a second researcher.

usage. These sources were used to triangulate the data and better understand participant experiences.

Analysis and Findings

The interviews were transcribed and translated into English by the interviewer. The principal researcher checked these transcriptions before analyzing them using inductive thematic analysis [2], resulting in the codes and the four high-level themes presented in Figure 4. We present here participant quotes and reported actions that led to these themes.

Changes introduced by the application

Participants reported that PhotoDigest became part of their life routine. Mr. A used the application twice per day, while Mr. G used it once per day. Additionally, Mr. A reported using it any time he felt lonely. Such changes in their routine were also positively reflected on their caregivers. Mrs. B reported on Mr. A: "he used to nap after breakfast, but now he likes to chat with me a bit about what's going on in the family". Mr. G mentioned: "It has become one of those things I check once a day since it shows only family stuff". Moreover, both Mr. A and Mr. G stated that PhotoDigest did not affect their face-to-face or phone communications with family members.

While seniors' daily routines changed, most family members (4 of 6) mentioned that there was no change in their own habits nor did they feel obligated to use Facebook. Mr. C said: "I like to post photos on Facebook. I just do exactly the same thing." Similarly, Miss K said "No. No. I like updating them [pictures]" when asked about whether having her grandfather using the app made her feel obligated to use Facebook.

Improved social connection

PhotoDigest made the senior participants feel more connected with their distant family members. Mrs. B described Mr. A's concerns: "Sometimes he feels his children or grandchildren are very busy. He is worried that he may interrupt their work or life and become a burden for them. [PhotoDigest] gives him a great way to know what's going on in the family without any effort from the senior's children. It makes the senior feel occupied and don't feel lonely." Similarly, Mr. G perceived the app as a news feed helping him to "not miss any family updates". This increased access to information resulted in Mr. A feeling that he had "become closer to [his family members] by looking at their photos."

These feelings of increased awareness and connectedness were confirmed by their families. Mrs. E said: "I feel my dad now is closer to everyone in the family. He knows exactly what they are doing, and there are many interesting topics going on when we talk". This improved social connection leads to increased emotional well-being. Mr. A stated: "I am very very happy – I am in the loop. It keeps refreshing my memory". Mr. G's daughter, Mrs. I, said "I feel he is way happier now. You know he really loves learning new stuff especially when it comes to technology". This reflects back on the seniors' family members: "I also feel happier than before by knowing my father is happier." (Mrs. E). Similarly, Mrs. B commented on how Mr. A seemed happier and that "he feels that he is an active member of the family and knows everything going on in the family".

Factors for easy and quick adoption

Our deployment confirmed previous findings that ease of use is key for seniors' adoption of communication technologies [19]. The passive aspects of PhotoDigest were perceived as being easy to learn and use: "In the past, when I want to look at photos, especially for past photos, it is very complicated. But the logic [of this app] is easy." (Mr. A). Mr. G further explains the app's ease of use by commenting on how the app is "much simpler than social media we see nowadays." Mr. G additionally commented on how the site effectively filters the content that it aggregates: "I love the slides show and how it family centered. It is like you are filtering the important family updates out of my news feed." Finally, support from family helped seniors adopt the app easily, as all family members were active in helping their seniors use the app.

The Satisfaction with Life Scale exhibited a change in score from 30 (satisfied) to 32 (extremely satisfied) for Mr. A and from 31 to 32 for Mr. G. These changes represent a gain of 0.4 for Mr. A and 0.25 for Mr. G, where 1.0 means that the participants' Satisfaction with Life Scale improved as much as possible. Before using the application, Mr. A's Social Connectedness score was 58 and Mr. G's was 63 out of a maximum possible score of 68, indicating both seniors were strongly connected with family members. Their scores increased slightly post-deployment to 59 and 66 respectively, representing a gain of 0.1 for Mr. A and 0.6 for Mr. G (again, with 1.0 representing the maximum improvement possible).

Figure 5: Insights from the Satisfaction with Life and the Social Connectedness Scales. The results of assessments are often reported as gains relative to a maximum possible improvement, which helps quantify the benefits of the intervention relative to the participants' prior assessment.

Opportunities for improvement

Further design changes could increase the social connectivity aspects of the app. For example, a like function similar to that on Facebook was desired "so that I can feedback their photos" (Mr. A). Mr. A expanded on this desire: "I wish to have something to let them know that I saw their photos." Mr. G suggested a zoom feature to look at the photos in more detail. He also requested the ability to view photos offline.

Analysis of scales

Two of the scales we administered showed changes from pre-deployment to post-deployment (Figure 5). While Satisfaction with Life exhibited improvements, it is Social Connectedness showing surprising changes, especially for Mr. G, as these scales typically reveal less dramatic changes through short-term technology interventions [16]. On the other hand, there were no visible changes in the scores for the Loneliness Scale or for the Friendship Scale (Figure 6) – likely since the facilitated photo exchanges focused on family members, with little evidence of connections to outside of the family circle.

Discussions, Limitations, and Future Work

While there are numerous advantages to having researchers fully immersed in the environment they study, this has the potential to create confounds due to familiarity between researchers and participants [17]. Our preliminary study presented here reflects the same trade-off, with richer in-depth analysis made possible only by the existing familiarity. However, future extensions of this work will aim to counterbalance these confounds with the involvement of additional researchers not related to participants.

In this work we have opted for the use of quantitative scales to reflect some of the findings. While the sample size did not allow extensive use of such scales, we have opted to present the descriptive statistics as a complement to the qualitative data gathered, and as a suggestion of quality of life indicators that may see a positive change from the use of such a social media tool. Future longitudinal studies will seek to formally assess changes in these indicators using these scales.

We plan to refine the design of the app and deploy it with other families, in order to extract more generalizable findings and overcome some of this study's current limitations (such as positive attitudes caused by a prior personal relationship with researchers). Our future work will also investigate the app's real-life integration in other platforms more accessible to seniors (tablets, smart TVs), with consideration for senior-centred design recommendations [10,15,19].

Our study suggests that PhotoDigest may have also acted as "training wheels". Particularly, by helping participants become more engaged in the (digital) social life of their families, it prompted them to (timidly) indicate interest in exploring a more active engagement. A longitudinal study is needed to determine if some seniors may find moving from no (digital) social engagement to a passive consumption tool satisfactory, while others may transition toward more active engagement.

Conclusion

We reported a preliminary study investigating a photo digest application that harvests family members' social media streams. Our analysis of qualitative data collected from a longitudinal deployment with two seniors and their families provides evidence that such an application can improve older adults' social connection to their families and facilitate a deeper sense of awareness of their activities. This was achieved with minimal disruption on the part of their family members. While access to family photos has been shown to improve social connectedness and reduce loneliness, a lack of family support introduces a barrier to seniors' adoption of the technologies that facilitate these improvements [19]. The measures we collected, even limited by the duration and sample size, are encouraging in suggesting that a one-way social media feed may be able to address the unmet needs of older adults who are excluded from social media. The measures we collected, even limited by the duration and

There were no visible changes in the scores for the Loneliness Scale as neither senior was lonely before or during deployment – Mr. A maintained a score of 3 while Mr. G had a score of 5. A score of 3 is the lowest in terms of indicating loneliness (that is, not lonely at all), with the highest score (indicating extremely lonely) being 9. Similarly, there were no changes in the scores for the Friendship Scale – Mr. A had a score of 19 (high acuity) while Mr. G had a score of 17 (moderate acuity), on a scale of 0 to 24.

Figure 6: Insights from administering the Loneliness Scale and the Friendship Scale.

sample size, are encouraging in suggesting that a one-way social media feed may be able to address the unmet needs of older adults who are excluded from social media, and that a passive photo digest application may improve social connectedness and overcome some of the adoption barriers.

References

1. M. Allen. 2013. Consumption of culture by older Canadians on the Internet. *Insights on Canadian Society*. Statistics Canada Catalogue no. 75-006-X.
2. V. Braun and V. Clarke. 2006. Using thematic analysis in psychology. *Qualitative research in psychology* 3, 2.
3. R. Cornejo, et al. 2013. Enriching in-person encounters through social media: A study on family connectedness for the elderly. *Int. J. of Human-Computer Studies, 71(9).*
4. S. Conversy, et al. 2003. VideoProbe: Sharing pictures of everyday life. In *Proc. IHM 2003*.
5. M. Dianti et al. 2012. What's Up: Fostering Intergenerational Social Interactions. *Designing for Inter/ Generational Communities* 2012: 21.
6. E. D. Diener, et al. 1985. The satisfaction with life scale. *Journal of personality assessment*, 49(1).
7. G. A. Grimes. 2010. Older Adults' Knowledge of Internet Hazards. In *J. of Educational Gerontology*. 36: 3.
8. V.L. Hanson. 2009. Age and web access: the next generation. *Proc. W4A*.
9. G. Hawthorne. 2006. Measuring social isolation in older adults: development and initial validation of the friendship scale. *Social Indicators Research*, 77(3).
10. C. Jian, et al. 2013. Modality Preference in Multimodal Interaction for Elderly Persons. In *Conf. on Biomedical Engineering Systems and Technologies*.
11. T. K. Judge et al. 2011. Family portals: connecting families through a multifamily media space. *Proc. CHI.*
12. L. Kennedy, et al. 2007. How flickr helps us make sense of the world: Context and content in community-contributed media collections. In *Proc ACM Multimedia*.
13. E. Lahtinen, et al. 2005. Strategies for promoting the mental health of populations. *Promoting Mental Health*.
14. S. E. Lindley, R. Harper, and A. Sellen. 2009. Desiring to be in touch in a changing communications landscape: attitudes of older adults. *Proc CHI.*
15. M. R. McGee-Lennon, et al. 2011. User-centred multimodal reminders for assistive living. In *Proc CHI.*
16. M.E. Morris, et al. 2014. Smart technologies to enhance social connectedness in older people who live at home. *Australasian journal on ageing*, 33(3).
17. C. Munteanu, et al. 2012. Tale of two studies: challenges in field research with low-literacy adult learners in a developed country. In *Proc CHI*.
18. C. Neustaedter, et al. Interpersonal awareness in the domestic realm. *Proc. OzCHI*.
19. B. Neves et al. 2015. My hand doesn't listen to me!: adoption and evaluation of a communication technology for the 'oldest old'. In *Proc CHI.*
20. N. R. Nicholson. 2012. A review of social isolation: An important but under-assessed condition in older adults. *The Journal of Primary Prevention*, 33
21. M. Rabbath, and S. Boll. 2014. Personal Media Reunion: Re-collecting Media Content Scattered over Smart Devices and Social Networks. In *Proc MMM.*
22. M. E. Register and J. Herman. 2010. Quality of life revisited: the concept of connectedness in older adults. *Advances in Nursing Science*, 33(1).
23. D. Russel, et al. 1980. The revised UCLA Loneliness Scale: Concurrent and discriminant validity evidence. *J. of personality and social psychology*, 39(3).
24. K. Tee, A. J. Brush, and K. Inkpen. 2009. Exploring communication and sharing between extended families. *Int. J. Human-Computer Studies*, 67 (2).
25. Telenor Group. 2013. Can Facebook help reduce loneliness among the elderly? .
26. Wolff, J. L., et al. 2017. Family caregivers of older adults. The Gerontologist 58.6 (2017).