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Multi-stakeholder perspectives on information communication technology training for older adults: Implications for teaching and learning

Sajay Arthanat, PhD., OTR/L., ATP. [Associate Professor],

Department of Occupational Therapy, College of Health and Human Services, University of New Hampshire

Kerryellen G Vroman, PhD., OTR/L. [Associate Professor],

Department of Occupational Therapy, College of Health and Human Services, University of New Hampshire

Catherine Lysack, PhD., OT (C) [Deputy Director of the Institute of Gerontology, Professor],

and

Department of Health Care Sciences, Wayne State University

Joseph Grizzetti [Graduate Occupational Therapy Student]

Department of Occupational Therapy, College of Health and Human Services, University of New Hampshire

Abstract

Objectives: The objective of this research was to identify and conceptualize barriers and strategies for effective implementation of information communication technology (ICT) training for older adults.

Methods: A grounded theory approach was used to collect and analyze qualitative data from 61 participants in three stakeholder groups: older-adult ICT trainees, care providers and ICT trainers.

Results: Care providers expressed older adults' *reluctance, lack of affinity, fears* and *socio-contextual attributes* as barriers to overcome with ICT training. ICT trainers highlighted *motivation, trainer-trainee relationship, patience, self-reliance, and mutual value* as strategic themes. ICT trainees elucidated *occupational accomplishment, challenges, and a sense of competence* as themes from their experience with training.

Discussion: While digital literacy and skill building have traditionally been the key focus of aging-centered ICT training, a deeper approach to address *internal (personal)* and *external (socio-contextual)* barriers, as conceptualized in the study finding, is vital in yielding successful outcomes.

Keywords

Information communication technology; Social Networking; Aging; Aging in place; Grounded theory

Introduction

Innovations and advancements in Information Communication Technology (ICT) that include devices such as tablets and smart phones have greatly facilitated access to the Internet and social media for older adults. Aging advocates regularly point out the potential of ICT in community-based “active aging” [1,2]. From an occupational standpoint, the purported benefits include strengthening social participation, management of routines, promotion of leisure and independent living skills, and implementation of tele-rehabilitation [3, 4, 5]. As a telehealth modality, the potential of ICT to minimize health care costs, self-monitor health, prevent falls and optimize provision of interventions for the elderly is well enumerated in literature [6]. At the same time, experts point to the “generational lag” in technology use [7]. Conceivably, ICT is not perceived as an “organic medium” that older adults adopt and use seamlessly [8], and there exists a major disconnect or digital divide between the perceived potential and value of ICT for older adults, and actual rates of adoption, use, and accessibility. As evidence, the National Telecommunications and Information Administration [9] reported that far fewer older adults in the United States owned computers (56%), used the Internet (52%), and had access to broadband Internet (49%) compared to their younger counterparts aged 16 to 44 (82%, 79% and 77% respectively).

Major demographic barriers to ICT adoption are highlighted in the literature. Although data shows an overall increase in technology adoption among seniors in general, the adoption rates of Internet, Smartphones and broadband services plummet as the age group advances, 70–74; 75–79; and 80 and above [10]. Survey research concluded that most active users of ICT in older populations are the most affluent, the highly educated, and those who transitioned into old age from the internet-digital era, 65 to 70 years old [11]. Without sufficient economic resources to purchase ICT technologies and related services, reports indicate that seniors with low-income, those in minority ethnicities, and those in rural regions as far less likely to gain from the benefits of ICT [12]. From a demographic standpoint, older adults continue to “remain isolated” and “relatively divorced from digital life” [10, 12].

Another factor limiting technology adoption in older adults is baseline levels of digital literacy and skills [13]. National surveys confirm a shortfall in the availability of skills training programs to assist older users, particularly in rural areas [12, 14]. Another problem that undermines literacy pertains to design. Many devices and software do not consider the practical realities of older users such as reduced vision, manual dexterity, and hearing [7, 14]. Some researchers have also suggested slowing cognitive skills and mental processing speed as barriers to digital literacy [15]. Apart from resources and skills, the foremost barrier to overcome is attitudinal that stems from limited to lack of exposure to ICT. The consequent lack of domain knowledge paves the way to inherent negative predispositions to technology.

Although some older adults recognize the overall personal benefit of the technology, these benefits are tempered by fears; a reluctance to learn new technology and the perceived risks to personal safety [4]. Older adults who do not use the Internet “often do not feel any need to

try it, are wary of the technology, and unhappy about what they hear about the online world” [16 p.6]. The vast majority of older adults today, with the exception of emerging baby boomers, spent the bulk of their upbringing and adult years in the pre-digital era with limited to no reliance on computers, the Internet or mobile phones. As a result, older adults are simply less familiar and adept with technology, exhibit lower levels of adjustment and use, and lack the reinforcement of a peer online network [17]. Similarly, there is the view point that embracing technology too quickly can be a problem given the preponderance of internet fraud and scams that disproportionately target the elderly [18]. Vigilance for novice technology use is warranted, but technology education and skills are equally important.

There is growing evidence that education and skills-based training programs can overcome some of the outlined barriers [19, 20]. Educational interventions promoting ICT have been tested with older adults and there is evidence to show that training programs can build not only the technical skills, but also much needed confidence in older learners [21]. Arthanat and colleagues [8] developed and tested an educational intervention that used college students to teach older adults new ICT skills and their study demonstrated measureable gains in knowledge and skills over a 6-month period. Another recent study with 135 residents of a senior living center showed that a much shorter training interval, a 6-week intervention, boosted iPad use from 16% of residents to 90%, and pre-post surveys showed the training program increased knowledge, strengthened family ties, and gave the older residents a greater sense of overall connection to society [4].

These are promising findings but it is important for us to deeply explore the factors that make ICT training programs successful. The outcomes literature is in its early days and there is still much to learn, including better knowledge about patterns of ICT use and associated predisposing psychosocial factors, and the optimal design and delivery of ICT in various settings [22]. Comprehensive profiles that characterize successful older ICT adopters and non-adopters are still forthcoming. Studies that include diverse adults with a full range of skills and abilities as well as patterns of use are needed to inform the development of relevant, older adult tailored ICT training. While some examples of ICT training programs have shown promise for older people, critical problems remain with limited empirical research and no documented guidelines and best practices for effective delivery of training programs.

In a step toward addressing this lack of knowledge and to elucidate the factors that shape the need, use, and successful implementation of an ICT training program, this three-part qualitative study was designed to provide a contextual perspective to training the older ICT consumer, especially the most vulnerable older adults who are seldom included in studies because of their non-use of ICT. This study presents the perspectives of older adult consumers, care providers, and trainers on ICT adoption, which may be used towards effective implementation of training. Qualitative data compiled from multiple sources were used in the study: a) a needs-assessment focus groups of care providers; b) written personal reflections of trainers; and c) feedback of older adult participants from a pilot ICT training program.

Methods

This study was based on the principles of grounded theory to identify the dynamic and multidimensional factors that predisposed or hindered older adults' ICT adoption and to develop a conceptual understanding for accounting those factors in a training program. The University of New Hampshire Institutional Review Board of the Protection of Human Subjects reviewed and approved the study methodology and protocol. All study participants signed a consent form prior to data collection.

Participants

Three study cohorts (stakeholder groups) were involved this study. In all, qualitative data were gathered from a total of 61 participants: 14 community care-providers, 35 graduate occupational therapy students, and 12 older adult participants who completed a pilot individualized home-based ICT training program [8].

The *care providers* were family members and health professionals. The inclusion criteria for family members were a person residing with an older individual in the community or the primary contact person for the individual within the family. The health professionals were nurses, therapists, counselors, social workers or case managers who provided home health services to older adults in the community. The researchers collaborated with multiple community-based agencies for participant recruitment. These included a senior day program, state-funded independent living agency, Aging and Disability Resource Center and a local senior home-based mental health center. The 14 care providers who consented to the study comprised of three home health nurses, three mental health counselors, two residential coordinators, one case manager and five family members.

To incorporate perspectives from *Information Communication Technology Training Recipients*, we conducted a two-year follow-up interview of participants who had completed a home-based one-on-one ICT training program. Their training was delivered by graduate occupational therapy students. The training involved a group orientation and three home visits by assigned student trainers (personal coaches) in one-month intervals. The orientation was conducted for participants to convey the format and goals of the program, to gather their ICT experience and learning needs and above all to introduce their student trainers. An individualized training package was developed that comprised of short and long-term goals aligned to participants' needs and level of comfort. The training was delivered through an Apple iPad which was loaned to the participant for the duration of the training. A comprehensive description of this study and the specifics of the training program are reported in Arthanat et al [8]. Among the 12 older adult participants, 11 were females and one was male. Their average age was 70 years and 8 months. They resided in small towns in New England region of United States. They owned a home computer for an average of 18.5 years, and were generally novice to tablets and smart phones prior to the training. Five participants had indicated having used a tablet and one owned a smart phone.

To better understand best practices, barriers and challenges, and value of ICT for older adults, we considered *ICT trainers* to be important stakeholders. These were the graduate students who provided one-on-one individualized training to recent cohorts of older adults.

The training was a service learning experience for their core assistive technology course [8]. Qualitative data from 35 students in two class cohorts who conducted the one-on-one ICT training and consented to the study were included in the data.

Data Collection

In-person interviews were conducted with the older adults who received the home-based individualized training. The interviews were held two-years after the ICT training was completed and focused on their experiences with the training and changes in their use of and attitudes towards ICT since then. These interviews were conducted by a cohort of graduate occupational therapy students who were not assigned to the ICT training. The semi-structured and conversational styled interviews (lasting one hour on average) centered on their learning, specific goals, interactions with the trainers, and the ICT adoption process including (but not limited to) motivations, perceived value, challenges and strategies. All interviews were audio-recorded and transcribed by the student interviewers.

The study researchers who had previous experience in leading focus groups, conducted two in-person focus groups with the 14 care providers (eight members in the first and six in the second session) that lasted about 90 minutes. The questions addressed: 1) ICT interests, activities patterns, and attitudes to ICT of older adult care recipient; 2) barriers to ICT adoption and use by the older adult clients or family member; and 3) participants views on the approaches and strategies useful in engaging in ICT use and teaching skills to care for recipient population. Both sessions were audio recorded and the conversation was transcribed by a graduate research assistant. The data was tagged with identification codes for the participants.

For analysis of the trainer perspectives, the student ICT trainers at the end of their course submitted a two-page personal reflection elucidating their service learning experience in delivering the ICT training. This was not a graded assignment and there was no set outline or expectation given to the students as they were instructed to write a personal account of their experience outside of the training goals and content. Students signed written consent for their reflections to be used as data for this research.

Data Analysis

The transcribed data were sorted by stakeholder groups and analysis was consistent with the grounded theory in that data was collected across three stakeholder groups for comparative analysis [23]. As described by [24], we employed open coding by breaking each data set into discrete parts and closely examining each part for similarities and differences. Distinct codes reflecting events, objects, actions and interactions were grouped into conceptually similar categories. Two principal investigators and a graduate research assistant coded the data independently. Overall, our work followed a “constant-comparison” method of analysis [25]. Data was compared and contrasted with each new section of data, coded, and re-coded as patterns and tentative interpretations emerged. Triangulation was achieved by analyzing and comparing each data set against the larger set of data for consistency and continuity [26]. This method of triangulation is ideal for identifying unanticipated themes [27]. Each investigator compiled codes and assigned them into categories on a respective spreadsheet.

Meetings were held periodically to verify consistency in the categories. When newer categories emerged, the corresponding transcripts and quotes were closely examined for clarification and agreement.

Major categories of codes were noted and formed the basis for early discussions about the significant themes revealed in response to our line of inquiry. With agreement and discussions on a set of categories, themes were identified with a descriptive label for each as recommended by Creswell [28]. The themes representative of each stakeholder data set and the entire data set were identified and conceptually linked to create our model on ICT teaching and learning. Having multiple coders was instrumental in moving from categorizing data to thinking abstractly about similarities and differences in experiences across our sample of ICT stakeholders. The findings are presented by stakeholder subgroups, and later summarized in discussion.

Results

Focus group - Care Provider Perspectives

Care providers, the focus group participants (FGP), talked positively about the potential benefits of ICT. These were perceived benefits rather than those they had personally observed. They readily highlighted the possibilities of increased family and social connectivity, better access to information, remaining cognitively active, and engaging in leisure activities as well as being able to manage health and day-to-day errands despite limited community mobility. All these benefits, as mentioned earlier have been well documented. Although the care providers recognized the value of ICT for the older adult, the core themes to emerge in their focus groups were the *barriers and challenges* to ICT use by older adults and possible *strategies for adoption and use*. Barriers and challenges can be classified conceptually as internal and external.

Internal barriers related to inherent characteristics of older adults that affected their ICT use and mirrored those previously reported in the literature [29, 30]. The care providers felt that older adults have an overall *reluctance to innovation* with respect to devices, software, and social media platforms- *My elders, generally across the board, have been resistant [to ICT], there may be a laptop in the house, but they don't use it [FGP #8] Many of my clients have smartphones, but only use them to call and nothing else [FGP #5]. I really can't think of maybe a couple of people that I work with that have iPhones. Other than that, maybe one person had a computer and was familiar with the internet [FGP#3]*. The care providers stated, in their experience, the older adults they worked with were often content to use technology that would be seemingly considered outdated and unacceptable to the younger generation (e.g. older mobile phones and computers). When older clients had access to smartphones, tablets and laptops, it was observed that they seldom used them. If they did use them, it was only basic functions and in most situations product novelty or additional features had little to no appeal. The consensus of the group was that there was minimal interest and drive to learn to use ICT and/or follow use trends and software. As one participant summed up- *We have three IT people assigned at our residential facility just to help the residents and employees and they also have classes there for iPad and laptops, almost weekly, and they're very poorly attended. They're free but poorly attended. [FGP#6]*

An interrelated subtheme that might explain in part the reluctance to innovate was the care providers' perception that there was a *lack of affinity* between ICT and the older adults. *I think it [ICT] just doesn't factor into their lives for whatever reason (this statement followed by unanimous group nonverbal and verbal agreement) [FGP#4].* The care-providers felt the older adults did not see the functionality and value with ICT that others saw for them. There was an agreement among the participants that older adults perceived technological innovation to not sync with or cater to their lifestyle or needs. As a result, there is a lack of collective peer culture to reinforce and support ongoing use of ICT. *I have probably seen a hundred older adults in the last five years and maybe three of them are computer comfortable...and 10 of them may have tried a Smartphone [FGP#5]. I really can't think of maybe a couple of people that I work with that have iPhones [FGP#8].* This lack of affinity was vividly illustrated by a care coordinator at a senior residential community facility, who with humor and resignation stated *"I've seen laptops used to prop open bedroom doors (laughter) so it's not a matter of them not having the technology or the ability to have it, or the funds, they just don't want it. [FGP#6]*

Fears about competency, capacity to learn and personal vulnerability are commonly reported factors that influence adoption and use of ICT in this population [31]. Underscoring the reluctance to innovate and lack of affinity was an emotionally laden barrier, we labeled *fears of the unknown* in which ageist attitudes are internalized, including that in later years of life, there is a decreased ability to learn new information and master new skills. *To turn on something without knowing the general workings of it and how to use it is scary for them [FGP#1]. They are afraid of feeling stupid, and afraid to try it and get lost or something [FGP#6].* The care providers felt older consumers' reluctance and hesitancy in adopting ICT could be attributed to worry that a lack of "know how", concerns about damaging the technology, or altering its settings and not being able to problem solve to "fix" the issue. Consistent with existing literature, the fear of being scammed, concerns about privacy, and ICT abuses were cited as genuine anxieties for the older adult. The care providers also were concerned for the older adults and themselves. As one family caregiver stated *I am also concerned about viruses from opening emails. How many protective programs do you need? [FGP#9].* While another one [FGP#12] said *It's amazing, I bought my granddaughter a baby seat and now I get emails about baby seats! Privacy is gone.*

The external barriers were evident in the *demographic and socio-contextual attributes* of older adult ICT consumers. Health care providers discerned and profiled older ICT consumers based on their background and demographic attributes. Older adults with familiarity to ICT were described as having had exposure to technology through a job and career pre-retirement, to be more educated and of a higher socioeconomic status. *I'm thinking of a few clients I saw who did have computers or iPads and trying to think what maybe distinguishes them, I don't know if it was exposure when they were younger, a job or career they had where they had to use it so it was a little more normalized for them [FGP#4].* At the same time, non-use of ICT was ascribed to lower socio-economic status of older adults. *The majority of them [older adult clients] don't have the means to purchase and iPad or computer or anything of that nature, so that is obviously a huge hurdle for them [FGP#7].*

In terms of family dynamics, care providers observed that even when younger family members were keeping pace with ICT innovation, they felt the younger generation, were oblivious and/or unsupportive to the slow adoption of their parents and grandparents. *My grandson told me they don't use Facebook© anymore. Now they use something bigger, but when I asked him he would not tell me [FGP#14]*. Another family member added, *my son was talking to me about how at a certain point my type of windows will no longer be operational with my computer and that there would be no more technical support available [FGP#12]*. Such an unsupportive outlook from family members perpetuates the persistent relative lag in technology innovation and adoption by older adults as described by Charness & Boot [7]. Unlike the younger generation, in the older adult community, adoption of ICT through positive peer influence and active engagement is less prevalent. In fact, negative peer pressure and stigma were noticeable in close-knit group residential settings- *When you hear two of the residents talking about Facebook, you'll hear the other residents almost mocking them behind their backs, like who do they think they are? [FGP#6]*. In dismissing interest in ICT, those closest (family and professional care-givers) perpetuate myths that older adults are not interested in ICT or worse, reinforce that older adults lack the capacity to be effective ICT consumers. The implication can contribute to the failure to proactively support ICT use, limit access in the older population, dismiss attempts to use ICT, as well as can undermine the confidence of older adults who may pursue ICT.

Despite observing many barriers to ICT use, the care providers shared useful insights about facilitating ICT adoption, which we labeled as *strategies for adoption and use*. This theme encompassed fostering an inner drive for ICT and strategies for age-appropriate training tailored to the unique learning style and needs of the older adult. *Motivation through meaningful experiences* with ICT as a key precursor to ongoing and consistent use was considered critical among the strategies for adoption and use. There was consensus among the care providers that ICT needed to be linked with what the older adults inherently valued in their lives, in most cases, maintaining and building family ties a viewed as fundamental need. *Some [older adults] have decided how to work the computer because they want to keep tabs with their grandchildren [P#8]. They [older adults] love to Skype to stay in touch, some have Facetime on their iPhones (sounds of collective agreement accompanied this comment). [FGP#6]*

Unlike the younger generation for whom novelty is instinctively desirable and can stimulate interest, the older adults were said to be intentional and purposeful in their exploration of technology. Motivation for use is linked to whether the technology aids a pre-existing activity or fulfills a need that is meaningful and desired [32]. Examples supporting this premise from the focus groups included watching old movies, listening to classical music, a virtual tour of a World War II memorial and reading biographies. *I totally agree with ... people are isolated and when we hand them something[iPad] that's going to open all these doors to so much in the world, you have a question, you go to Google, trivia or world affairs or anything else I think that's exciting [FGP#8]*.

While having trainers skilled in technology had merit, when exploring what is important from a training standpoint, care providers emphasized the need for trainers to establish a rapport with the older adult trainee to build confidence and create a mutually comfortable

learning situation. It was expressed that rapport and trust were critical to overcoming the older learner's fear and anxieties about technology. *And when you can start it in a safe way, with having a young person who is kind, gentle, patient, also eager, I can't see any downside to opening that door [ICT use] [FGP#11].*

The focus group members felt the intergenerational approach to training to be effective in increasing receptivity of older adults towards technology. They expressed that they thought the older learner would be more comfortable and confident in interacting and learning from the *tech-savvy millennial* students- *I think bridging the gap between the generations is great and that it would be important to have a portfolio on the client so that they know their likes and dislikes from the beginning before training commences [FGP#13].*

Continuing the focus on the trainers, there was a consensus that younger trainers needed to be cognizant, especially in the beginning, not to be prescriptive of the fast-paced social media and applications (apps) that may seemingly appeal to them but not necessarily to the older adult. Avoiding or simplifying ICT terminologies or jargon during training interactions was stated to be important. *...and it's going to take a long time just to initially get over the fear of just using a computer or an iPad. And repetition, time and repetition [FGP#10].* In addition, keeping the training low key at the beginning and advice about *time and patience* were expressed by the focus group members. The mantra *keeping it simple* was unanimously conveyed by the care providers. They advocated breaking down instructions and mutual demonstrations of steps in learning a new ICT task- *...just figure out what that individual needs and narrow it down and keep it simple and focused on one[activity]: this is how you get onto the internet, this is how you check the email, don't worry about PowerPoint or Excel [FGP #6].* Commonly voiced was the advice to slow down and allow older adult trainees to initiate and problem solve tasks on their own to reinforce learning. For example, a home health care provider shared her strategy of providing short and easy to use cheat sheets as an effective tool to strengthen ICT skills. The take home message was, individualize and proceed at the learner's pace with meaningful activities.

Graduate Student (GS) ICT Trainer Perspectives

Trainers' perspectives garnered from summative self-reflections focused on interactions and rapport with the older trainees, their attitudes and predispositions that influenced the training, strategies they learned, challenges, and above all the value of the experience. Four standout themes, *motivation, trainer-trainee relationship, patience to promote self-directed learning, and self-reliance and sustainability* were derived from the frequency and richness of the identified codes in the written reflections.

Motivation encompassed the older adults' inherent interest (or lack thereof) and personality attributes associated with engaging in the training. Individual student experiences were dictated by receptivity of their trainees to the technology and desired ICT activities. When the older adults approached the training with a sense of chronic dissatisfaction with and/or suspicion of the technology, expressions of frustration in trying to overcome these internalized barriers were evident in the student trainers' reflections. *I felt that MM was less in need of skills, but needed more motivation to use the iPad [GS#3].* When the student was unable to shift the negative attitude towards ICT, a mutual frustration was noticeable- *It did*

not help that many of the original things she wanted to accomplish, she decided after starting working on that tasks that she no longer saw a need for them in her life. [GS#5] On the other hand, the majority of student trainers expressed appreciation for the openness, curiosity, and excitement of the trainees to exploring and adopting ICT. *LP was very eager to be involved in this project so that made this assignment go smoothly. [GS#1]* *BF was extremely receptive and appreciative of this project. For a 75-year-old woman, she was always vibrant, excited and ready to learn. [GS#7]*

The second theme to emerge in reflections pertained to the *trainer–trainee relationship*. It focused on the students' descriptions of rapport and connection with the trainee older adult. These relationships were influenced by a synchrony in their background and personalities with the older adult. *JT was a relaxed mellow and quiet type of person, so it was easy for me to work with her. [GS#4]* Another student wrote- *I felt comfortable training CK right away and found we had a lot of shared interests mostly with our family values. [GS#12]* These quotes represent the mostly positive working relationship among student trainers and trainees. However, a mismatch in trainer and trainee learning – teaching styles, values, or when the trainer had difficulties establishing a therapeutic teaching environment, goal achievement and acquisition of skills was hindered. The essence of the trainer-trainee relationship was mutual respect or trust. It emerged throughout the reflections. It was stated as precursor to engaging in the relationship and for the older adult to admit a need for skills and knowledge. Respect and trust were fundamental to overcoming barriers to ICT learning and the risk taking involved in problem-solving. The student trainers learned to respect and recognize the older adults' capacity for learning ICT and the older adults learned that admitting their vulnerabilities did not diminish them as individuals. Shared success built satisfaction and enjoyment for both members of the relationship. *She (the trainee) never stopped expressing her appreciation for us and this project, and that made everything so worthwhile. [GS#23]*. Through the relationship, student trainers gain important insights – namely the importance of teaching is about enabling the learner to acquire the skills instead of merely imparting knowledge.

The third theme that was overwhelmingly expressed in the reflections and the one that may serve as a key training strategy was the need to exhibit *patience* to promote self-directed learning. *I really wanted to be able to just show her everything she could do on every single app, but realized quickly I needed to use more verbal cueing and let her explore herself [GS#34]*. Another student stated “*I found myself wanting to interject and help her often, but I knew I had to refrain so that she could problem solve on her and develop skills [GS#16]*. Enabling and promoting ownership of skill acquisition are important constructs for any individual assuming the role of teaching older adults to access and effectively use ICT. Student trainers continually expressed how important it was to curb their instincts to prescribe or teach everything they knew and advance the training content quickly. They reflected on the need to teach ICT skills by breaking down the steps and having their trainees demonstrate what was learned and problem solve as a critical strategy of effective training. Here the student trainers reiterated the *keep it simple* observation expressed in the care providers' focus group. The student trainers observed, first-hand, the importance of a simple content delivered at a learner learning pace and interest. *I learned how important it is*

to be able to provide step-by-step directions for clients as well as how crucial it is to simply the process at hand [GS#21].

The fourth theme in the reflection papers was that student trainers defined their success based on their respective trainee's feelings of *self-reliance and sustainability* with ICT use. *JT surprised me every meeting with how much she had improved and learned and I never would've expected that progress [GS#19]. By the last meeting, she had less clarifying questions and more specific goals to accomplish [GS#28].* Achievement of the most meaningful goal set with their trainee was naturally a determinant of success. However, success of the training was not solely gauged by this outcome. How a trainee became skilled and was motivated to self-initiate learning and explore ICT going forward a critical determinant of success. *In addition to social participation and health management, SP has expressed his admiration for the endless opportunities the iPad provides by being able to pursue leisure interests such as sports and music...[GS#14] A main take away for LP is being able to take the skills we worked on together and teach them to members in her community center, giving everyone an opportunity to learn. [GS#1]*

Whilst the focus of this analysis is ICT use by older adults, a sub-theme was *mutual value* experienced by the trainers. Student trainers finding gratification and sensing the long-term value with the training implicitly yet mutually strengthened the trainer-trainee experience. Many students viewed their older adult ICT trainees as their first "real clients" and emphasized the confidence they gained from interacting with and teaching someone in a natural context. Some expressed pleasure and gratification in having made a positive difference in someone's life through ICT. *I discovered a passion for working with older adults, which I was not confident prior to this assignment. [GS#32] Though I wasn't performing a traditional occupational therapy role, it felt good knowing that my training helped make a difference for someone [GS#9]* Another value-added reflection was how the student trainers' experience gained them the confidence with key skill sets to effectively practice client-centered occupational therapy. Several statements were identified that expressed that their interviewing and interpersonal skills, goal writing, clinical reasoning, problem solving and hands-on knowledge with technology were strengthened through this experience.

Older Adult (OA) ICT Trainees' Perspectives

There were two major themes (with subthemes) that emerged from the follow up interviews with the older adult trainees. The first and central theme that may have vital implications in getting the *buy-in* from older adults to explore ICT was the sense of *occupational accomplishment*. Within this broad theme, we subdivided accomplishments by major occupations.

In keeping with existing observations about the core benefit of ICT for older adults was *social connectivity (participation)*. The family and social opportunities afforded by ICT were repeatedly expressed in the interviews- *I have been able to connect with some really good friends from school that I haven't seen in ages and now we communicate back and forth and I know what's going on in their lives and vice versa; and I also found with my older grandsons that if I want to communicate with them, the best way is to text them [OA#4].* A

sense of novelty and excitement about intergenerational communication was particularly evident in the interviews. Older adults who learned or expanded their text messaging or video chat with their grandchildren found it was positively reinforced by the communication with the younger family members. In fact, the socio-emotional need to connect with families is noted to be the gateway for many older adults to adopt ICT [11; 31]. Connectivity also meant how ICT supported community engagement and face-to-face social participation. For example, engagement in community volunteering was frequently highlighted- *I'm on a couple of town boards and so there's a lot of communication between members, and of course emails [OA#9]*

The second sub-theme identified in the older adults' interviews was the value of ICT in *instrumental activities* pertaining to personal needs and general household tasks. Participants highlighted the role of ICT in healthcare e.g., *I can email my doctor directly and he usually gets back to me right away. Plus, I can check my [medical] appointments through that [iPad] [OA#7]* Increasingly healthcare is moving to internet based communications and the need for consumers, especially the older adult to access online reports, book and check appointments and health information [33, 6]. Similarly, two years since their training, the older adults reflected on how ICT was incorporated into their daily routines- *I've got newspaper apps, magazine apps, grocery store apps, restaurant apps and travel apps. [OA#2] I set up my monthly budget on my laptop and it's easy for me to track everything. [OA#11]*. One participant described his iPad as his "lifeline" that was always in reach.

The third sub-theme pertained to *leisure*. Many of the older adults in the pilot training program reported self-initiated leisure activities during and after the training [8]. They purchased "apps" that paralleled their traditional leisure interests such as card games, scrabble, and word finding games-- *One thing I forgot to mention is that I play spider solitaire and seven little words, a couple of games [OA#7]*. Similarly, many sought out leisure related information on sites such as Pinterest. This was an unanticipated finding in that although ICT-based leisure would be a benefit, we under-rated its relative value and as a source of motivation to use the ICT. Exploration and engagement in leisure activities were discussed enthusiastically.

The selective use and focused perspective remained unchanged from the beginning of the training, which was aligned with the individualized approach to ICT teaching and learning [8]. Namely highly personalized meaningful ICT activities reflected our initial conceptual model that among the older adult there is a threshold of relevancy and value that needs to be attained for adoption of ICT [11]. In accordance to the dual technology adoption construct [34], only when an ICT activity is meaningfully valued and the task is perceived as "doable," only then is the technology embraced by the older consumer. Conceptually the relevancy and value must be strongly aligned with the existing value system of the individual, as older adults are less reactive and influenced by technological innovation.

The second major theme in the interviews we identified was *challenges in sustaining use*. Despite the positive attitudes to ICT following supported adoption and training, it was also important to recognize ongoing challenges that are inherent in meeting the needs of the older adult. The challenges were evident across the interviews. In the case of some, living alone

meant that they did not have a family member or relatives close by who encouraged ICT usage- *I wish I had a few more lessons before the girl (trainer) left. She was very good but because it was new to me and I really did not have back up support because I live alone. [OA#5]* Others also expressed financial constraints that prevented them from investing further in technology such as a broadband internet subscription. Interestingly, in other cases participants talked about how family had stepped up and provided financial support or further technology.

Despite the challenges there were descriptions of ICT use that reflected an increasing *sense of competence and pride* in their respective ICT abilities. The competence was again perceptible in how the older adults had diversified the use of their iPads from the original training period- *I've advanced beyond the original iPad from training, I now have an iPad Air 2 [OA#4]*. At the same time, there were trainees who were self-limiting their ICT use and only did those activities they found meaningful or had mastered- *It's more a lack of interest trying to get deeper into an application and trying to figure out everything. I don't need it all. [OA#3]* The findings underscore the critical factors in ICT training that not only strengthen adopters or proactive users to grow and sustain their use of ICT, but also drive minimal or reluctant users to meaningfully use ICT to age in place.

Discussion

The scope and use of ICT to support aging-in-place continues to expand with advances in tablet devices, smart phone, social media applications, home safety and health monitoring and automation devices and software. However, at some point the wealth of articles on the “grey digital divide,” digital literacy, and programs to promote ICT among older adults all reflect on the gaps in our understanding of the complex dynamics of ICT and its interface with the older consumer [22]. The uncovered themes from this study have already been well elucidated in aging and ICT literature. However, the unique contribution offered here is to identify the similarities and differences in the themes as they pertain to distinct stakeholders, and to conceptualize their inter-relationships in implementation of ICT training programs.

While several benefits of ICT to support aging-in-place were revealed, individualized and context-based one-on-one education may be needed as a positive mediating factor in facilitating an interest among older adults to explore and adopt ICT. It can counteract inherent reluctance, fear about ICT, and prevailing ageist stereotypes. Distinct as well as convergent themes evolved within and across our stakeholder groups. In comparing the themes across stakeholders, we found agreement on core themes: the importance of meaningful occupational engagement as a reason for initiating and sustaining ICT use; and the need to promote client-centered and context-driven ICT training. While the care providers stressed the scope and barriers posed for older adults with adoption of ICT, we gained insights on best practices and strategies from the ICT trainers. The older adult trainees helped us establish an understanding of the value of ICT and what constituted “success” of a training program.

Care providers pointed out how older adults could maintain socio-emotional connection with family as well as activate connections with friends both near and far. As a sign of perceived

competence and adoption, older adult participants enthusiastically shared creative ways by which they were managing some of their instrumental activities of daily living. These included a wide range of activities from scheduling their day, remaining in contact with their health provider, managing finances and monthly budget as well as online shopping. While the benefits of ICT were obvious, the barriers to its adoption were deep rooted and could be conceptualized through an interaction of the individual's personal and socio-contextual factors. The personal factors, we term as internal forces, were found to be disinterest, fear, misbeliefs and reluctance in the elderly towards ICT. These seem to have been perpetuated by the socio-contextual factors, the external forces, of ageism prevalent among family and peers, and vice versa. In other words, when family members and friends did not perceive the need for or benefits associated with ICT, the attitude seemed to compound the negativity and lack of confidence of the older adults to ICT. At the same time, the realization of that negativity by family and friends hindered them from encouraging ICT to older adults. As an example, a few care providers discounted the need for their older family members or clients to have a smart phone with the assumption that they would only use it to make calls. At the same time, some older adults in our training program expressed a preconceived disinterest in using a smart phone and applications for social networking attributing their appeal to the younger generation.

In overcoming this interplay, the need to promote ICT training in an individualized and meaningful context was validated in the study findings. A strong rapport with the trainer at the outset facilitated confidence building and trust in exploring recommended ICT applications and solutions. Understanding the older individual's background, experiences and values in turn helps the trainer make the ICT recommendations meaningful. The trainer needs to be highly perceptive and adaptable to the pace of learning on the part of the older adult and should consider multiple ways of breaking down the information and content. Pacing the training was a viewpoint expressed by all stakeholders in this study. Student trainers also realized the need to create simplified training content and realistic goals at the beginning. Knowledge of the technological predispositions and patterns of adoption among older consumers is developing. Nevertheless, there is a need to conceptualize ICT adoption and training strategies for the older adult in order to provide efficacious training to this population.

In drawing from three stakeholder groups, we used the findings of this research study to modify and inform an early model of adoption of ICT we proposed [11]. We now overlay the stakeholders' perspectives in a revised model (Figure 1). In the earlier model, we focused on a hierarchical profile of seniors who adopted ICT. In the present model, we begin by conceptualizing the personal factors including background, experiences and demographic attributes that are intrinsic to the older adult as he or she considers ICT. The facilitators and barriers that older adults cycle through as they progressively adopt ICT are also displayed. Note here that the facilitators and barriers are not linear in nature. As the older ICT consumers strive to progress through the hierarchy, the barriers may be encountered as they explore and venture into each ICT activity. The fundamental facilitators to capitalize on during training are the meaningfulness and motivation inherent in each activity, to build a rapport between the trainer and trainee to establish confidence and trust, and to permit time and simplicity with the training. It must be expected that the training outcome will vastly

vary on the individual's personal factors and exposure to the facilitators and barriers. Therefore, the success of the training may not simply be gauged by the frequency and expanse of ICT activities performed, but through sustainable use, self-exploration, sense of autonomy, and competence within the confines of each hierarchical level of ICT adoption.

Limitations

This study compiled three data sets from different stakeholders. The data was collected at different time points with respective purposes. The timeframes and the format (focus groups and written reflections) did not permit verification of data saturation. The stakeholder groups were unique by age and technological dispositions. As a result, the content and structure of each data set varied considerably.

Clinical Implications

Aging-in-place is an emerging niche in rehabilitation and health care. Home-based intervention programs to support wellness and address chronic conditions are being planned, delivered and monitored remotely by means of "e-health" or tele-rehabilitation. However, the effectiveness of such programs for the client or caregiver relies heavily on access and acceptance of the technology [7; 35; 36]. While health professions are urged to stay current and embrace ICT [37], intervention delivery may only be effective through a deeper understanding of the client's technological dispositions and support.

Conclusion

There is a plethora of research exploring ICT use among older adults, specifically the facilitators and barriers to its adoption. This study was unique and comprehensive in compiling qualitative data from a large sample of individuals organized in three stakeholder cohorts, and in proposing a conceptual model that encompasses dynamic and multi-dimensional attributes to consider in ICT training. Our findings confirm that digital literacy and skill acquisition solely cannot be the focus of aging-centered ICT training. A deeper understanding of the interplay between the individual's internal (i.e. personal factors) and external (i.e. socio-contextual factors) forces complemented by contextually meaningful activities and individualized strategies are crucial in generating successful outcomes. In accordance, we have developed an ongoing training program, Individualized Community and Home-based Technology Training (i-CHATT), and a longitudinal randomized controlled study is underway to test its effectiveness on older individuals' ICT adoption, social participation, independence and health-related quality of life.

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Model for Promotion of ICT for Older Adults based on Facilitators and Barriers to its Adoption

Figure 1:
Model for Promotion of ICT for Older Adults