

Assistive and Interactive Technology Needs Assessment for Older Adults and Caregivers to Enhance Quality of Life and Independence

Application for 2019-2020 Graduate Research and Creative Activity (GRACA) Grant

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College of Information Science and Technology

PROJECT DESCRIPTION

Maintaining quality of life (QOL) and independence is a goal for many older adults. Advances in technology have allowed older adults to achieve this goal by promoting retention of functional ability and improving physical and psychological well-being. Recent developments of assistive and interactive technologies (AITs) are particularly useful for older adults in their pursuit of improved QOL and independence. **The aims of this project are to investigate the AIT needs/preferences of older adults and their caregivers, examine what individual characteristics impact these needs/preferences, and compare the relationship between the needs/preferences of older adults and caregivers.** This project will help support survey data collection and analysis efforts for a larger research project that has been funded by the NU Collaborative Initiative through one of the Planning and Proposal Generation Grants (\$20,000).

As the global population becomes older on average, the needs of older adults and caregivers, along with the development of AITs that address these needs, are of growing global interest. The population of older adults, particularly those age 65 and older, is increasing and is projected to continue to increase. The global population of people age 65+ is expected to increase from 8.5% in 2015 to 16.7% in 2050 (He, Goodkind, & Kowal, 2016). In tandem with advances in healthcare and medicine, people are living longer, and fewer people are dying in infancy. For example, in the US, the average life expectancy at birth in the U.S. soared from 68.2 years in 1950 to 78.6 years in 2017 (Kochanek, Murphy, Xu, & Arias, 2019). In the same period, infant mortality rates per 1000 births in the U.S. dropped from 29.21 in 1950 to 5.79 in 2017 (Kochanek, Murphy, Xu, & Arias, 2019). With these trends projected to continue moving as they have historically, the development of more effective AITs can help to support longer lifespans and benefit this growing portion of the population.

As this population continues to increase, the ratio of older adults to caregivers will also increase. Consequently, there likely will be a shortage of caregivers in the future. A caregiver is someone that assists a person in some way with day-to-day activities. Caregivers can range from close friends or family to licensed medical professionals, and they may be paid or unpaid. Caregivers face physical, psychological, and temporal challenges. The challenges caregivers face may overwhelm them to the point of burnout. Burnout occurs when one is overwhelmed physically, mentally, and/or emotionally, and it can cause changes in mood or function. In the case of caregivers, burnout rates can be up to 50% in geriatric wards (Cocco, Gatti, Lima, & Camus, 2002). Development of effective AITs is one way to reduce caregiver burnout.

AITs are items, equipment, or product systems that are specifically focused on assisting people with disabilities with some activity of daily living (ADL). Common types of AITs in use presently include wearables, robotic assistants and companions, virtual assistants, and mechanical assists. Wearable technologies, such as Fitbit devices, can be used to monitor vital signs, which can be viewed directly by the individual or remotely by the caregiver. Robotic assistants and companions can provide both physical and emotional support by aiding in various physical activities, such as home care and lifting of heavy objects, as well as gain understanding of the individual via social interaction. Virtual assistants, such as Alexa, can communicate with individuals, provide pre-programmed reminders, and be paired with smart home technology to allow for control of various areas of the home. More mechanical AITs, such as a seat lift assist, can provide physical support and help minimize harmful bodily movements. The broad range of AITs available allow difficulties with various ADLs to be addressed.

Given the broad range of AITs available to address a wide variety of needs, older adults and caregivers may feel overwhelmed or confused by the technical aspects of certain AITs, especially if they seem particularly complicated. This feeling can inhibit technology use, despite the potential for improvements to independence and QOL. Although there are many emerging AITs available to assist individuals in various day-to-day activities, there are still areas where more assistance is needed.

Therefore, given the potential for AITs to positively improve QOL for older adults and caregivers, **this proposed study aims to investigate and benchmark the current and future needs, preferences, and usability issues of AITs for older adults and their caregivers.** This will help inform researchers and practitioners on future strategic directions.

Research Questions and Contributions

This project's purpose is to engage in data collection and analysis for a needs assessment to identify AIT needs and preferences of older adults and caregivers. The main questions of this study are:

- (1) What are the individual needs/preferences of AIT?
- (2) What is the relationship between individual characteristics and AIT needs/preferences?
- (3) How do the needs/preferences of older adults compare and complement to their caregivers?

Understanding the individual differences in AIT needs/preferences may help identify technologies that would best support independently functioning older adults. From our study, we may also identify certain individuals that are more open to intervention/assistance from AITs. Finally, we hope to discover where there are gaps in the needs and identify where AITs need to be further developed.

The findings from this research will be presented at the UNO Student Research and Creative Activity Fair in poster form. Goals of this research include assisting with manuscript development for submission to a journal for publication. Potential journals include, but are not limited to, *Communications of the AIS*, *Journal America Medical Informatics Association*, and *Health Systems*. Additionally, results from this research will contribute to poster submissions for *Americas Conference on Information Systems* and *AMIA*.

Research Methodology

The research method for this project is an online or in-person questionnaire. Approximately 100 total subjects (50 older adults and 50 caregivers) will be recruited. Older adult participants will be aged 60+, live independently in the community, and native English speakers. Caregivers will be aged 19+, native English speakers, and will be providing assistance with one activity of daily living (ADL) or instrumental activity of daily living (IADL) for an adult aged 60+. The project will explore ADL/IADL ability, technological needs/preferences, QOL, and caregiver burden of both aging individuals and caregivers. The questionnaire development, IRB, recruitment of the participants, and compensation will be managed by the PIs of the NU Collaborative Initiative planning grant, Dr. Ann Fruhling and Dr. Julie Blaskewicz-Boron.

Participants will complete an online or in-person questionnaire via Qualtrics or paper with specific items related to (1) demographics; (2) ADL/IADL ability; (3) knowledge of and experience with using AITs, use of AITs, and overall attitudes toward AITs; (4) QOL; and (5) caregiving (if applicable). Participants will be subsequently administered a separate, follow-up survey to collect contact information to be utilized for compensation and study follow-up.

The questionnaire combines a variety of surveys and survey questions, and is specifically designed to explore areas of interest. (The questionnaire has been constructed by the researchers on the

larger planning grant and is in process of obtaining IRB approval.) ADL/IADL ability and technology use and comfort questions will be based on methodology presented in Miller et al. (2018). Questions will include current and future ability to perform various ADL/IADL tasks and participants' familiarity and use of various AITs. QOL will be assessed using the 19-item Control, Autonomy, Self-Realization, and Pleasure (CASP-19) scale (Hyde et al., 2003). This scale is validated with older adults and is widely used to assess satisfaction and QOL (Hyde, 2015). Caregiving will be assessed utilizing questions from the caregiver module (module 21) of the 2019 Behavioral Risk Factor Surveillance System (BRFSS) Survey (Centers for Disease Control (CDC), 2019). Demographic questions will assess (1) older adult versus caregiver identity, (2) age, (3) gender identity, (4) ethnicity, (5) education, (6) household income, (7) marital status, and (8) employment status. Additional original questions will be included by the researchers to assess (1) personal health insurance coverage, (2) number of caregiving recipients, (3) ADL/IADL care for caregiving recipients, and (4) services most needed by caregivers.

The data collected from the online questionnaire will be dominantly quantitative survey data. In order to address the questions of interest, the data will first be analyzed descriptively. A series of frequency distributions, percentages, means, and standard deviations will be calculated for all variables. A regression analysis will then be performed to assess associations between variables. Regression weights will tell the direction and extent to which demography, functional ability, QOL, and caregiving may influence AIT need, adoption, and interest. Similarly, regression weights will tell the direction and extent to which AIT need, adoption and interest influence QOL and functional ability.

Project Timeline

Week	Project Phase	Research Activities
Weeks 1-2	Literature Review	Finalize a literature review of technology and aging to contribute to development of project deliverables and scope
Weeks 3-8	Data Collection	Recruit survey participants; collect survey responses
Weeks 9-11	Data Digitization	Clean/digitize surveys as necessary; download surveys from Qualtrics
Weeks 12-17	Data Analysis	Complete analysis of project data
Fall Semester	Deliverables	Prepare presentation for UNO Research and Creative Activity Fair

Student/Faculty Mentor Roles

Masters Student: As the researcher for this project, I will be responsible for 1) reviewing the literature used to develop the questionnaire, including the theoretical frameworks and needs assessment research design, 2) completing CITI training and supporting IRB approval as necessary, 3) collecting online and in-person surveys, 4) monitoring and digitizing survey data, and 5) analyzing all survey data. Subsequently, in the 2020 fall semester, I will prepare to present at the UNO Research and Creative Activity Fair in March 2021.

Faculty Member: Dr. Fruhling is one of the Principal Investigators for the larger planning grant study. Dr. Fruhling will provide advice and guidance in the aforementioned master's student responsibilities. Dr. Fruhling will also assist in the literature review, identifying research participants, will monitor/moderate data collection and analysis, and provide feedback on deliverables.

Previous Internal Funding

I have not received any previous funding for this research project.

BUDGET JUSTIFICATION

The total amount requested for this grant is \$5000. The proposed budget reflects the time allotment at a standard graduate student pay rate of ~\$15per hour.

Project Phase	Details and Justification	Time Allotment	Budget
Domain Knowledge (February-March 2020)	Literature Review	40 hours	\$600
Data Collection (March-May 2020)	Recruiting survey participants; collecting survey responses	110 hours	\$1650
Data Digitization (June 2020)	Surveys will be cleaned and digitized as necessary; surveys downloaded from Qualtrics	50 hours	\$750
Data Analysis (June-August 2020)	Complete analysis of all project data	130 hours	\$2000
Total			\$5000

Associated Sources of Income

This GRACA grant will allow me to devote time to develop the project, implement it, and analyze the outcomes. The outcomes of this project will benefit the larger project being conducted by Dr. Fruhling and her co-PIs and be to my academic benefit.

Additional Expenses

Access to journals is available through the UNO's Criss Library at no additional cost. Additionally, the College of Information Science and Technology has a variety of statistical software programs available for data analysis. R Linux, a free statistical software, is also available for data analysis. Transportation, travel, and additional mileage expenses will be paid from NU Collaborative Initiative planning grant.

References

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6. Cocco, E., Gatti, M., Lima, C. A. D. M., & Camus, V. (2002). A comparative study of stress and burnout among staff caregivers in nursing homes and acute geriatric wards. *International Journal of Geriatric Psychiatry*, 18(1), 78–85. doi: 10.1002/gps.800
7. Kochanek, K. D., Murphy, S. L., Xu, J., & Arias, E. (2019). Deaths: Final Data for 2017. *National Vital Statistics Reports*, 68(9). Retrieved from <https://www.cdc.gov/nchs/nvss/deaths.htm>

January 30, 2020

Dear GRACA Reviewers,

This letter is to document my strong support for Joshua Idachaba's GRACA research project entitled "Assistive and Interactive Technology Needs Assessment for Older Adults and Caregivers to Enhance Quality of Life and Independence". Joshua is a Biomedical Informatics graduate student. He has BS in Biochemistry from the University of Missouri-Columbia. One of the areas of the Biomedical Informatics is Health Informatics. This project aligns directly with this area of focus; therefore, it will provide Joshua a tremendous learning experience.

Likewise, Joshua is poised to contribute significantly to the needs assessment. The needs assessment is part of a larger research planning project that has been partially funded through a Nebraska Collaborative Initiative planning grant. Joshua's contribution will be assisting with data collection, validation and analysis, (specifically the quantitative data). He will work another graduate student who is conducting the qualitative portion of the study. He recently had an internship at UNMC which gave him a foundation on understanding academic research. He is also taking two courses (research methods and statistics) that will provide him baseline knowledge for this project. Although, I have not known Joshua very long, I have been very impressed on how fast he has come up to speed on the goals of this project, his writing skills, and how prompt he has been on completing this application. This project will provide him a strong foundation in Biomedical Informatics and prepare him for future thesis research.

The proposal's emphasis is on understanding the current Assistive and Interactive Technologies (AITs) needs of older adults and caregivers that are key to improving the quality of life and independence of these folks. The results will inform researchers on older adults and caregivers' perceptions and answer questions such as: Are older adults and caregivers aware of the available AITs? Will they use an AIT if it is available? How usable are different AITs that exist today? What are the perceptions on the value and ability to improve quality of life? The questionnaire's data also serves as a benchmark baseline on where people are today and will help us assess future impacts. Through this project's efforts, a significant impact will be integrating the results into a strategic research direction for an NIH/NSF proposal to improve the usability (ease of use and usefulness) of AITs.

I will be available as needed during the summer to support and guide Joshua's research study. I plan to be in contact with him weekly to monitor his progress. The study's end goal will be for him to present at the UNO Student Research Fair and co-author and submit a manuscript to a conference and/or journal. This letter also serves as verification of the student's proposed budget needs and costs. If you need additional information or have questions, please contact me at afruhling@unomaha.edu or 402-554-4968.

Respectfully submitted,
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