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USING MUSIC WITH INTUITIVE INTERFACE AS A CATALYST TO IMPROVE SOCIAL ENGAGEMENT AMONG ELDERS AT AN ASSISTED LIVING FACILITY

Vishwam Rajagopal
Syracuse University

Abstract

My thesis explores the use of music as a catalyst to improve social engagement among elders at an assisted living facility. In order to increase engagement I am exploring intuitive interface.

The design is an interactive interface which facilitates participation from remote location thereby increasing engagement. The design involves the other residents, part of the art group in Menorah Park to participate in creating the interface, thereby widening the social networks of the elders and creating more meaningful engagement.

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by

Vishwam Rajagopal

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1. INTRODUCTION

In the United States, the rise of assisted living facilities started at around 1980s as a result of negative views of traditional nursing home. The first assisted living started with an aim of providing care for older adults while maintaining the dignity and respect for them (The History of Assisted Living). Assisted living facilities (ALF) are defined as "a model of group housing with additional services, such as at least one meal a day, basic health care, 24-hour security, and some personal assistance. They target older adults who need help with personal care and some ADLs, but who are not so severely impaired that they require 24-hour skilled medical care. ALFs are not necessarily a specific building type but a philosophy of care." (Hooyman et al, 322). The ADLs or activities of daily living are an individual's ability to perform basic personal tasks on their own like eating, bathing, and dressing, getting to and from the bathroom, getting in and out of bed, and walking (Glossary). Different ALFs provide different level of services and are unique in their own way. This is also evident from visiting the various ALF around us. Each of these facilities are termed ALF, the level of services offered varies drastically from the amount of technology present to the activities offered by the facility.

The focus of my thesis was motivated by an inspiration gained from an older adult at an ALF. This individual (let's call him Ted) had an IPad that he used only for online shopping from Amazon. While interviewing Ted, he told me about how he used to be a drummer and how as an ALF resident he couldn't bring a drum into his room. Therefore, I installed a free app for playing drums in his IPad. From the moment I did this, I saw him transform and go into his own world. He forgot that he was being interviewed and started playing the drums with pure focus and enjoyment. I witnessed the power of music and technology and this experience shifted my focus and led me to question "Why don't the majority of the elders venture outside of their rooms more often?" This was observed at various ALF visited during the initial field research.

Social theories of aging help us to understand the changes in an older adult's lives in terms of systems and relationships. According to Aging Matters: An Introduction to Social Gerontology, "all social gerontological theories tackle the question of what is the optimal way for people to age and are relevant to active aging. If we look at the timeline of the social theories, the book mentions about how the earlier theories focused on an individual's ability to adapt to age-related changes in roles. Later theories recognized the diverse and dynamic nature of the aging experience and how social structures affect the aging experience. The most recent social theoretical perspectives are less quantitative and place greater emphasis on the meaning of people's lived experiences" (Hooyman et al, 139). This is a big shift in thinking, to move away from quantitative approaches.

Aging is predominantly tied up to the notion of chronological age. This leads to stereotyping of what an elder person can do or can't do. Therefore, chronological age is a poor predictor of aging. "Aging is primarily seen as a process of decline and withdrawal from society. This often occurs because we are surrounded by depictions of old age, particularly in the media, as something to be avoided, a disease to be dealt with by medical interventions or a problem to be addressed by cutting age-based policies. Having internalized such images, older adults may even shun the label old, reserving it for those with obvious physical or mental decline" (Hooyman et al, 139).

2. RESEARCH METHODOLOGY

The research was primarily based on design research techniques for primary research and secondary research. The research process involved interviews with older adults, industry experts and building and testing two research probes to get feedback from the users to improvise the design. The thesis explores various ways to improve social engagement by using music as a

catalyst. So it is important to define these terms and to answer why social engagement and music.

2.1 Music

Music is universal, it connects people and it makes a mind body connection. Music has various health benefits such as:

1. It alleviates pain
2. Improves the mood of a person
3. Reduces stress
4. Helps with recollection and long-term memory

Music expresses the forms of feelings that the individual is not able to express otherwise, experiences that are not lingual and non-discursive, such as bodily rhythms and other experiences anchored to the early childhood of the individual as well as to unconscious and traumatic experiences (D. Degmecic et al., 288).

The book Musicophilia is a collection of real life stories showing how music helps with health. It talks about how music is emotional, as well as intellectual. One such story is about my father's uncle. My father's uncle is 88 years old; presently living in Mumbai, India had a paralytic attack when he was 59 years old and subsequently lost his mobility. When he tries to recall any number like Date of Birth of a close relative, he always has to count from a nearest number. For example, if DOB is the 26th, he would count from 20 sequentially to 26 and say 26! 26! 26, But when he recalls a song he used to sing from his childhood, he would sing instantly. There will be no lead in and he instantly enjoys singing the song! That is the power of music. The conversation on "why music" and the effects of music has been continuous throughout my thesis research. I remember my classmate Jodi mentioning that "Her mother used to listen to

Jimmy Hendrix song when she was pregnant with her and even now when she (Jodi) is feeling down; listening to Jimmy Hendrix makes her feel calm" (interview, Jodi). Another interesting pattern which emerged from my conversations was Music therapy.

Music therapy is the structured use of music to assist people of all ages in times of need. Music in music therapy is not used mechanically, as some kind of medicine; it is more a medium for contact, communication and experience (D. Degmecic et al. 292). Stige mentions that music therapy as a professional practice is "situated health musicing in a planned process of collaboration between client and therapist." (Stige, 198-200). Stige further states that it has a specific focus upon promotion of sociocultural and communal change through a participatory approach where music as ecology of performed relationships is used in non-clinical and inclusive settings (Stige, 254).

Music therapy intervention provides opportunities to:

1. explore personal feelings and therapeutic issues such as self-esteem or personal insight;
2. make positive changes in mood and emotional states;
3. have a sense of control over life through successful experiences;
4. enhance awareness of the self and the environment;
5. express one-self both verbally and non-verbally;
6. develop coping and relaxation skills;
7. support healthy feelings and thoughts;
8. improve reality testing and problem-solving skills;
9. interact socially with others;
10. develop independence and decision-making skills;

11. improve concentration and attention span;
12. adopt positive forms of behavior;
13. Resolve conflicts leading to stronger family and peer relationships (D. Degmecic et al. 297)

Refer to Fig 1, showing music therapy activity in action

Fig1. A music therapist (Centre) leading a drum circle composed of Alzheimer patients living at a care center in Sykesville, Md., U.S. *Alzheimer Disease; Music Therapy*. Digital image. N.p., n.d. Web.

Music therapy practices are predominantly scheduled as activities in ALF for people with Alzheimer and Dementia. Another area where music therapy is predominantly used is for patients in hospitals. The field of music therapy is expanding rapidly into new areas, practices

and interdisciplinary fields, as well as redefining its goals and values. I reached out to a music therapist to know more about music therapy and how it works.

The interview (interview, Shelley):

Q: How does one become a music therapist and what does a music therapist do?

A: I am certified by a board, I do a full assessment of what a person needs.

Q: How does music therapy work?

A: I use technology and music. A music therapist has a fixed end goal to work towards to.

Q: How does music benefit elders and what is your process?

A: Music makes people drop their guards, music of frank Sinatra take them to their times. Because they are from the same time, people share similar experiences, like the World War 2 times. It is a collective experience. I use music as a tool for collective experience. Live music is the best. It is important to play at the moment.

In the paper: Health Musicing - Music Therapy or Music and Health? A model, empirical examples and personal reflections the author explains that "becoming healthy" is an intentional act aimed at balancing physical, psychological and social elements to create or enhance well-being and quality of life. The author further underlines the social aspect of "health as participation" and describes the potential of musicing as, "A provider of vitality; a tool for developing agency and empowerment; a resource or social capital in building social networks; a way of providing meaning and coherence in life" (Lars Ole Bonde, 2). The term and concept "Health music(k)ing" embraces all the aspects of how music experiences provide health affordances, even outside the therapy room. Thus, health musicing is not limited to a

professional therapeutic context. It can be observed in any social or individual practice where people use music experiences to create an outcome such as regulate emotional or relational stress or to promote well-being, be it professionally assisted or self-made. The theoretical model described in the paper shows the vast area of the health musicing. See fig 2 showing the model.

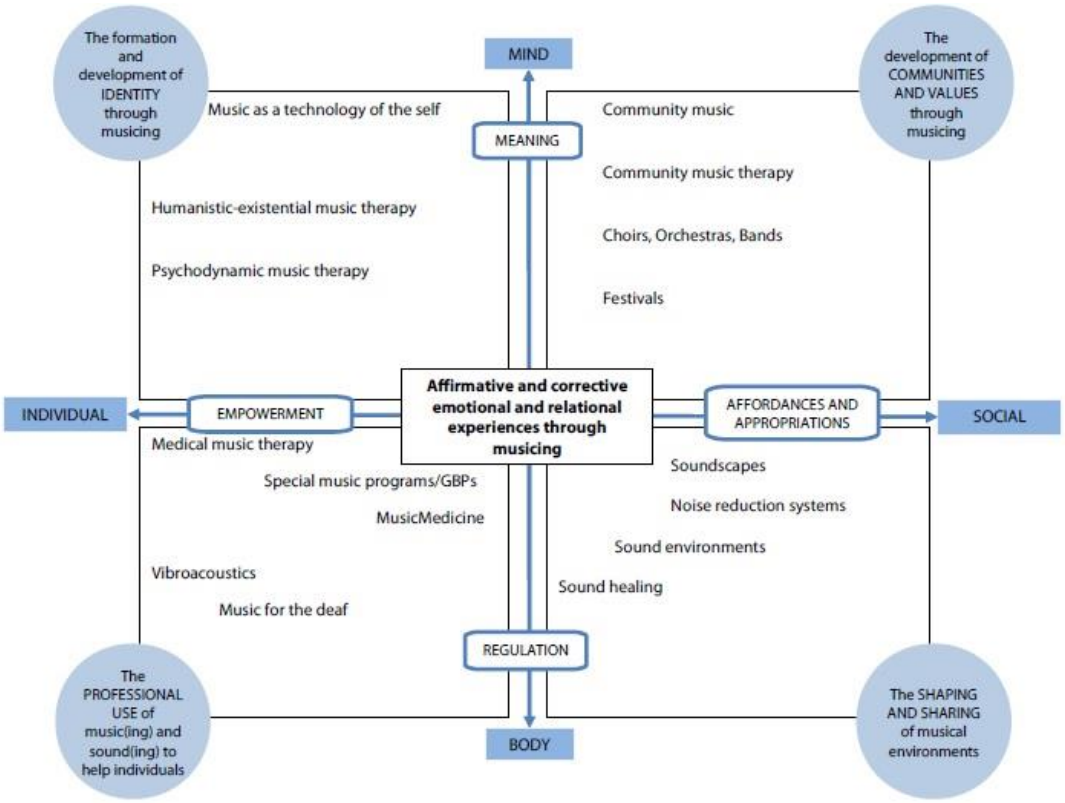

Fig2: Health musicing, Theoretical model. Lars Ole Bonde, 6

My thesis focuses on the social quadrants. However on the contrary to the activities described in the quadrants in fig2, my thesis explores how the individual reacts and responds in the social context and how engagement happens. It is important to understand why engagement is important for elders in ALF.

2.2 Social engagement

The World Health Organization (WHO) as part of the Active Aging Initiative states that "the goal of providing housing in communities that encourages daily social interaction and interdependence among young and old (48)". In the words of the WHO Active ageing is the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age. It applies to both individuals and population groups. Active ageing allows people to realize their potential for physical, social, and mental well-being throughout the life course and to participate in society, while providing them with adequate protection, security and care when they need. The word "active" refers to continuing participation in social, economic, cultural, spiritual and civic affairs, not just the ability to be physically active or to participate in the labor force (Ageing and life-course).

Secondary research suggests that appropriate amounts of social interaction positively impact health, well-being and life satisfaction (Nichole Campbell, 647). In the journal salience of social relationships for resident well-being in assisted living, the authors suggest that relationships with friends within the retirement community are very important. This study also showed that positive internal social relationships were associated with significantly higher life satisfaction in ALF (Street et al, S129–S134). Numerous studies have shown that social engagement, through interpersonal relationships and participation in social activities promotes physical and emotional well-being and lowers mortality rates in later life. In the paper The Role of Social Engagement in Life Satisfaction: Its Significance Among Older Individuals With Disease and Disability, the authors talk about how social engagement not only provides physiologic (e.g., immune system function, cardiovascular reactivity, cardiopulmonary fitness) and psychological (e.g., sense of belonging, self-esteem, purpose of life) benefits but also promotes healthful behaviors (e.g.,

smoking cessation, proper diet, exercise, help-seeking behavior), which, in turn, enhances physical and emotional well-being (Jang et al., 267). A similar research by Harlow and Cantor showed that social life participation was more important for retirees than for those who were still connected to social life through work activities (1235-1249). Nichole M. Campbell discusses about factors that indicate social space success. It is important to understand this because in ALF, activities take place in a defined space. These factors play an important factor in the choice an individual makes to attend an activity. These factors are proximity to the social space, sense of privacy within a space and opportunities to actively engage with other residents. These were important in determining a likeability of a space in a facility (Factors predicting retirement community social space success, 1).

In the previous researches, the terms social engagement and social interaction have been used in context of their research and don't go deeper to uncover what it is. They don't clearly define these terms. They clearly establish how social engagement improves health and well-being of elders. An ALF addresses the social engagement needs of residents by creating various leisure and non-leisure activities which encourage elders to participate as a group. At Menorah Park located at Syracuse, New York, the activities fall under the themes of mind, body and soul. Research suggests that engagement in meaningful and productive activities, often within the context of friendship, kinship, and organizational participation, is a key component in promoting health. An activity when viewed from an individual's perspective has multiple facets such as the activity itself, their liking of it, the other residents participating in the activity and Because social connections are often cultivated in the context of leisure activities, it has not always been possible for investigators to distinguish whether benefits are derived from the social aspect or from the actual content of the activities (Carin Lennartsson and Merril Silverstein, S335-336). In

their research, Carin Lennartsson and Merril Silverstein have considered activities along the dimensions of solitary-social and sedentary-active and have attempted to understand the pathways or mediators by which engagement with life extends longevity in the oldest old population. The questions that were used as a basis for their research are: Are survival benefits associated with activities that involve (a) social integration, (b) physical mobility, or (c) engagement that is neither social nor physical in nature? The authors state that engagement with life is one of the three pillars of successful aging and mention that it comprises of "maintaining close relationships" and "remaining involved in activities that are meaningful and purposeful" (S336). The research also mentions that activity, even if not explicitly social in nature, has positive effects on the survival of very old individuals. This suggests that psychological dimensions of activities—such as motivation, inner direction, and purposefulness—may be key mediating factors in the promotion of health and longevity in late old age (S340).

In the book, Aging and The Life Course: An Introduction to Social Gerontology the author talks about how emphasis on activity is congruent with western values of being productive. The author explains that proponents of active aging use a broader definition of productive aging and not only includes paid, but unpaid activities as well. The author discusses that this is a strength based approach that focuses on an elder's ability and capacity to contribute rather than a problem focused approach. Productive aging provides elders with choice of opportunities for meaningful engagement with others and are inclusive. Successful aging is a term that implies a right or wrong way to age and creates a bias on what is successful as success is something that is specific to an individual. Hence the often preferred term is productive aging.

The author explains that leisure and social engagement is a key component in productive aging. Leisure is defined as any non-work activity characterized by the absence of obligation. These activities have various benefits such as:

1. Building social support systems.
2. Creating new source of personal meaning and being valued and
3. Enhancing a positive identity, self-concept, and life satisfaction. (Hooyman et al, 227-229)

Research suggests that the quality of social interactions in non-work activities seem to be more salient for well-being than the number of interactions (Menec, S74–S82).Social interaction is important in achieving life satisfaction, particularly in later life. “Life satisfaction among the elderly is strongly influenced by three variables: physical health, socioeconomic status, and the quality of social interactions” (Nichole M. Campbell, 5). In discussing social interaction in retirement communities, it is important to note there are two types of interaction: informal and formal interaction. Informal social interaction is casual interaction. Formal social interaction, in contrast, is usually based on planned social activities. Therefore, planned retirement communities offer many planned social activities to encourage elder engagement.

Interviews with elders revealed patterns of music and family from their stories. These interviews were conducted with elders at different environments like elders aging in place, elders at an assisted living facility and independent living facilities (Interview, Sylvia, Ted, Janet). The first set of interviews had generic questions and was mainly aimed at getting the stories from the elders to know more about them. Though music and family was the prevalent theme in their stories, technology was a layer of common themes though it wasn’t talked about. The late show with Jimmy Fallon reveals how music based games are fun, interesting and involves engagement

with others. Technology is a key component to deliver this fun and engaging experience. To understand more about music and technology, I interviewed Professor John Coggiola from the Setnor School of music. The professor echoed music benefits for depression and stress and also about how music therapy is used for elders with dementia and Alzheimer. It was in this interview that I first learnt about adaptive instruments. There are two types of adaptive instruments, one where the physical instrument is adapted for a user and the other where technology intervention happens. The most common among the technology intervention are the use of IPad apps as adaptive instruments. After meeting John, I observed a performance by the Setnor school band playing music with adaptive instruments. Reflecting back to my interview with Ted, I elected to change my thesis question to "How can music and technology empower elders?" Through further conversations, I learned about various technologies that are used with music or used to make music to enhance the user experience, IPad being the most common of this kind. Interview with activity coordinator at Menorah Park, Syracuse revealed how IPad has been used for activities and sometimes just to play music on the background. A concept tied with health musicing. Though the idea of using IPad as a layer to facilitate music and engagement was convincing, I wanted to step away from the idea to explore more technologies that exist in this domain. Researching further in this area, I learned about newer technologies in this domain, they are:

1. *Skoog*

   Skoog is a tactile cube that provides a unique way for the users to create and learn music. It offers a fun and tactile way of engaging their users. This is an interface that can be paired with an IPad or computer to explore the full potential of the interface. It is an accessible interface wherein people with disability can use it with much ease as

well. Skoog is an inclusive product that breaks barriers in music learning and playing primarily for people with disabilities. These are sometimes used in music therapy as well. Skoog's interactive surface is a soft toy like surface which when interacted on, triggers electronic signals to play music. The sensitivity of the surface can be controlled using software provided by the company and this makes it adaptable for specific used needs. Refer to Fig3 showing Skoog.

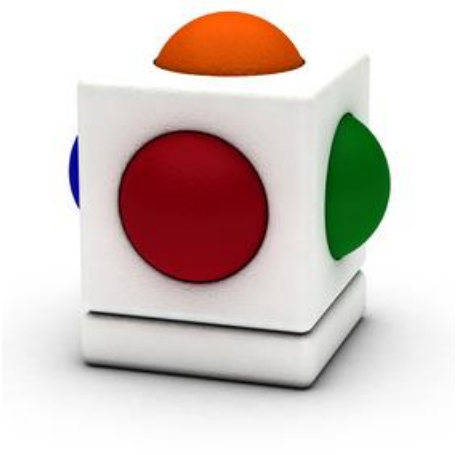

Fig3: Skoog music instrument. *Skulina, David, and Benjaman Schögler. Skoogmusic.* Digital image. N.p., n.d. Web.

2. *Beamz*

Beamz is a laser based interface technology that plays music upon interacting with the laser. There are two components to the Beamz, one available in the IPad for digital playing of music and there is the physical laser based interface. Beamz, similar to Skoog is being used in music therapy sessions with elders. This provides a fun way

to play music. There is a process of discovery to it that opens up potential benefits of developing self-expression. Refer to Fig4 showing Beamz

Fig4: Beamz. *Gleiter, Dan. Beamz used by an elder*. Digital image. Music Therapy Helps Nursing Home Residents. N.p., 08 Apr. 2012. Web.

3. *Makey-Makey*

Makey-Makey is a kit that transforms everyday objects into touchpads (What is Makey Makey?). It enables people to make custom interfaces, it is compatible with all software, and it does not require the user to program or to assemble electronics. It is designed for a wide range of audiences, supporting ideation for experts and access for beginners (Jay Silver, Eric Rosenbaum and David Shaw, 1). In the paper Never Too Old: Engaging Retired People Inventing the Future with MaKey MaKey, the author's study show how the older adults enjoyed the kit and how well they collaborated and played music with it (Rogers et al., 8). Their study shows how it helped in breaking barriers and inhibitions that the elders had initially. Refer to Fig5 showing Makey-Makey.

Fig5: Makey-Makey in action. *Makey Makey*. Digital image. N.p., n.d. Web

These newer technologies pertain to the internet of things (IOT). Zero UI is the design component of all these technologies. The term Zero UI coined by Andy Goodman is about moving away from screen based interfaces to a more natural interface. Taking inspiration from the concept of Zero UI, I adopted to design two research probes using Makey-Makey as a medium to design intuitive interfaces for the research probes. Makey-Makey as a choice was natural because of its flexibility and simplicity. It embodies a natural support for changing interfaces. Considering the process of ageing, there is a significant change in mobility and flexibility as well. Therefore, using makey-makey would make it easier to adapt an interface according to a particular user. Another reason to explore IOT technologies apart from IPad is that

IOTs are the next technology boom. The graph between expectations and time of technology innovations show that IoT will boom in the next 5 years (refer fig6).

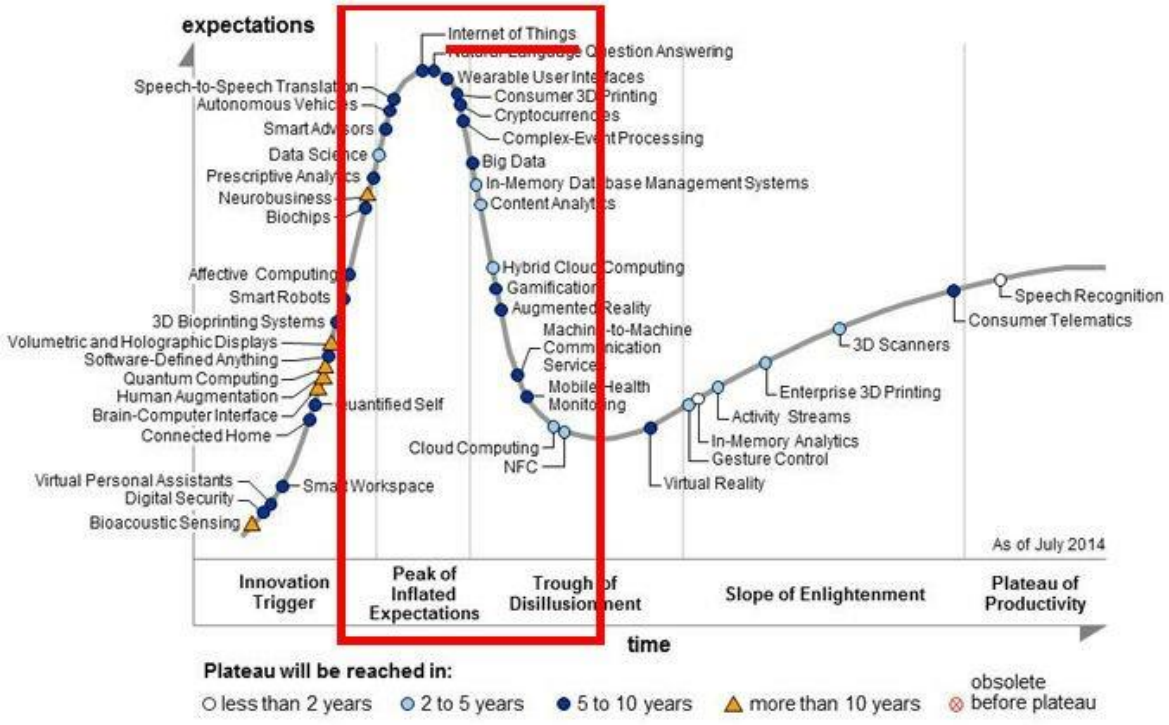

Fig6: IOT boom highlighted. *Hype Cycle of Emerging Technologies*, 2014. Digital image. Gartner Hype Cycle, n.d. Web.

During research, it was evident that there was a visible technology gap in the ALF. Different ALF have different level of technology adaptations. Some ALF provide advanced services using technology while some lack even basic Wi-Fi. The biggest challenge with the IPad is to design an app that's interface would be accessible and easy to navigate. The other technology gap identified was that elder's found it hard to navigate interfaces in the app and had to learn more about functionality of an IPad to use it effectively. One of the elder stated "IPad is really useful, it has great potential, but I find it extremely hard to use it, I don't know how to use it". Though there are elders who are familiar with IPad as well. Considering this technology gap

in an ALF and among elder, the idea was to introduce an intuitive interface based music experience early on (IOT) to the elders so as to avoid the occurrence of this technology gap in the future.

Probe 1:

The first research probe was a cardboard interface with tin foil arranged similar to piano keys. The Makey-Makey was connected to the computer where piano software was running. Upon touching the tin foil keys, it would play piano notes. This interface was tested with users so as to get feedback from them (Refer to Fig7 for research probe1 interface).

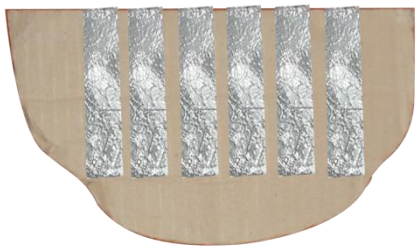

Fig7: Probe1 with cardboard and tinfoil interface

POEMS framework analysis of probe1:

#	People	Object	Environment	Message	Services

Probe 1	Cohort of elders	Makey-Makey	ALF	Music connects people	ALF
	Target elders	Intuitive interface	Virtual Reality	Music is a motivator	What elders can learn?
	Next generation of elders	Familiar objects		Who is the focus Cohort?	
		Radio		How this can be adapted to their needs?	
		IPad		Familiar interfaces can help	
				Interesting device	
				Fun to use device	
				music + color, music + lights	

Analysis of the feedback revealed insights and new questions as shown in the POEMS framework above. Further research was done to explore unknown areas which emerged from the testing of probe 1. A follow up interview was set up with the music therapist to understand the process of working.

Q: How do you measure social engagement?

A: Regarding social engagement, I set up social goals and train towards that. It is complicated to measure social engagement. We can't be around all the time to know what they talk about. For example, say during dinner, they meet someone who was in the same music therapy session; there is a good chance that they talk about it.

Q: What is the difference between a music therapist and an activity coordinator?

A: An activity coordinator uses music in an activity or set up music based activities like singalong, wheel of fortune. These activities go on forever. However music therapy is goal oriented, so there is a start and an end.

As part of the research I went for an observation activity at Menorah Park to observe a sing-a-long session. Observations: The sing-a-long was conducted in a common space where people gathered. There were people in distant rooms watching TV while the session was ongoing. Many of the elders were chair users or were with walkers. The elders had gathered beforehand for the activity, even before the person conducting the activity had arrived. After waiting for some time, a couple of elders walked away from the pending activity. The other elders were getting restless. One elder asked "Where is the music?" to which a caregiver (staff of Menorah Park) replied that "If they don't come in 5 minutes, I will take you outside". There was another interesting conversation between the caregiver and the elder. The elder says "Maybe I won't like the music and I can sneak out", to which the caregiver said "You can't because I have to take you out".

The activity conductor (Dick Ford) came and handed out song sheets with lyrics for the elders to sing along with him. Dick started playing songs; the elders were enjoying the music. I saw people singing songs, tapping feet and dancing their bodies. In sharp contrast there were elders sleeping at the event. There were some elders who needed help following the songs with the lyric sheet. An elder walking past the space, stopped by for a song. Even when Dick stopped singing, a couple of elders were singing. People were singing even after the session. At least 20 to 25 elders were part of the activity. Dick mentioned that his work provided a good break for the caregivers and help to relieve their stress. His session also gives them time to do their other work. He also mentioned that the caregivers are often overlooked. During the observations at Menorah Park, I was observing for objects familiar with the elders. Some of them were: Tables, Chairs, Books, Decorations, Cushions, Piano, Walkers, and Wheelchairs.

Probe 2:

Based on the analysis and insights gathered from additional research post the first research probe, for the second research probe I designed a book like interface with interactive pages. See fig8 for probe 2.

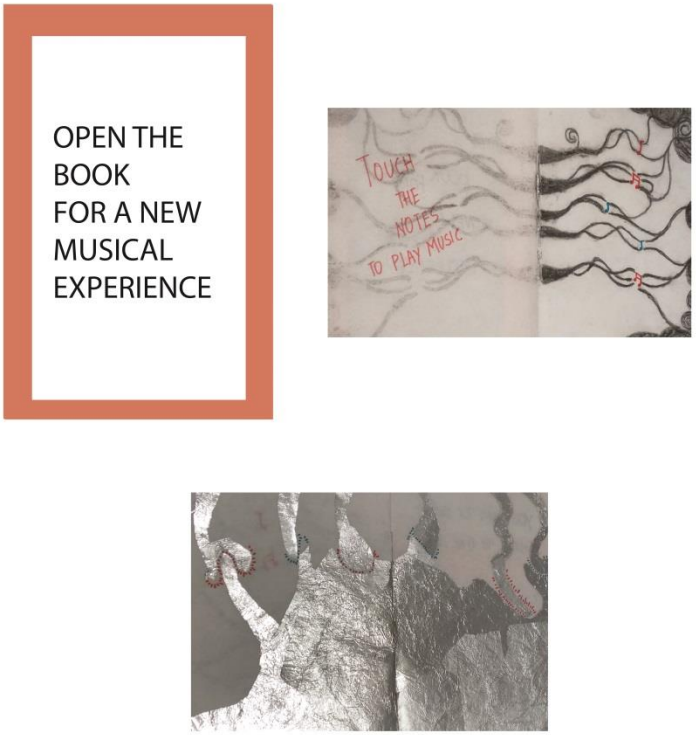

Fig8: Probe2, A book with two different types of interactive pages

The cover of the prototype read “Open the book for a new musical experience”. The book had two pages to test different aspects of the prototype. The makey-makey was connected to both the pages and the computer. The computer was running software that emulates different musical instruments. The first page was descriptive and directed. It had graphics that directed the user to touch the notes indicated with different color to play music. The interactive surface on the first page was a sketch made with graphite in order to create an electrical switch. Touching the

colored notes would activate this switch, which the computer recognizes and plays the corresponding music. The second page was more abstract with no direction on what to do. In the second page the interactive surface was made with tin foil. Research post research probe 1 revealed the environment around elders at an ALF. Considering that many of the elders were chair users or used walker, the book was set up at an angle on the table so that it would be easier to use from a sitting position. The feedback I received from this research probe testing was very important for me to move forward in the thesis.

After working with the prototype with elders at Menorah Park, the first important observation (testing and interview, Shirley et al.) was that there were human factor issues. It was easy for me to touch and play the book; however this wasn't the case with the elders. When the elders touched to play the music, it didn't work. I wasn't initially sure about why it wasn't working and it had to be fixed so as to proceed with the testing. It turned out that the elders had to press harder for the interface to work. On the contrary, I had to just touch the interface for it to play music. This revealed one of the key design factors for the interface, which is human factor (pressure sensitivity in this case). Clearly there were limitations with the interface that could be easily improved. The way the interface was setup initially was changed by the elders according to their comfort, i.e. they had laid the interface flat on the table rather than at an angle like it was setup initially. This enabled them to pass the book around easily and this consideration led to another important factor of the design, which is portability. The graphite contact which was in the first page started wearing down as the time went and the graphite got in their hands the stopped working altogether. The tinfoil contact set up on the second page was hard for the elders to play on as they had to press harder for it to work. To experiment further with the tinfoil contact, I provided moisturizer for the elders to apply to check if it improved the connectivity,

however it had no impact. The book interface was big enough for one person to be fully engaged and there were times when two people were able to play together. If this were to be set up in a table where more than two are going to sit around and play, the interface doesn't support this configuration. It was also noted that there were people who were actively listening to other elders playing the music and they were cheering them.

There were lots of comments from the elders such as

"How do I play this? This looks beautiful"

"What do I do now? Why is this not working?"

These questions were the fed to the iterative thought about the usability of the design. This was also observed from the second probe's design wherein, the first page was easier to play because directions were provided to the user, whereas with the second page required explanation.

There were also general comments beyond the prototype, such as:

"It would be great to have someone teach us music"

"I don't care about the formal learning of music. I am having fun"

This was an active discussion about playing music as "for fun" vs playing music as a melody/ or a song. There were additional calls for direction when playing a piano when an elder mentioned that "If you can point to a middle C, I can play to a melody", "need to go more according to scale". This didn't happen with the drums and the elders mentioned that "drums can work among the group, it is fun". The pattern of conversations about fun and involvement of other elders eagerly wanting to join in or the cheering the person playing the music led to the third key factor for the design, which is fun and collaborative.

3. ANALYSIS AND SYNTHESIS

The research probe testing, interviews and secondary research experience has iteratively added on to the thesis. This journey has thrown a light at the system to understand its intricacies, challenges and its function. Refer to Fig9 showing the system.

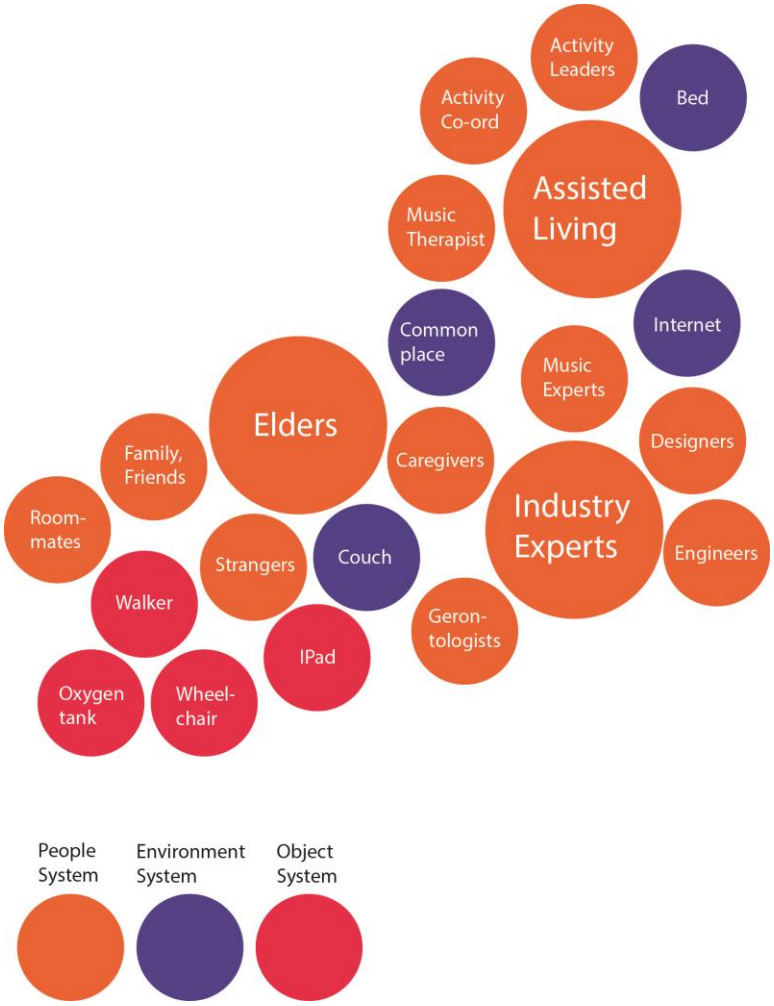

Fig9: Elder audience segment identified post research probe 2 feedback

My research focus started with the cohort of elders at an ALF. However the research probe testing experience allowed me to look at the elders from a more individualistic perspective rather than a cohort. From the sample of elders who were interviewed and those that participated

in the research probe testing, I developed an audience segmentation framework where the elders fit in. Fig10 shows Sample elder persona characteristics and the audience segmentation framework.

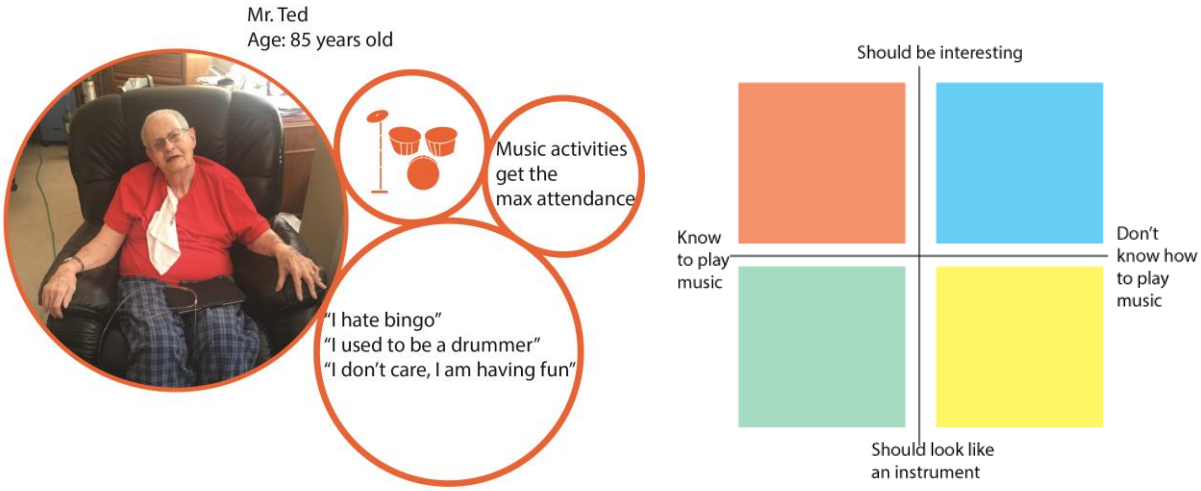

Fig10: Elder audience segment identified post research probe 2 feedback

Challenges of the system are:

Activity:

As mentioned in section 2, ALFs strategy with activities is to provide a multitude of activities, i.e. increasing the quantity of activities to increase engagement among elders. This leads to a packed activity schedule for elders from which they can choose. Often it is very easy to miss activities from the schedule because of the complex and clustered list of activities. This leads to elders missing activities. Another drawback with this approach is that this means that the elders have to be present at a particular place and a particular time to be a part of this activity. I was able to witness this when I was testing my second research probe, wherein my prototype testing had to be scheduled as an activity. An elder who came post the scheduled time wasn't able to be part of the testing.

Social engagement:

Engagement is a very broad term. Consider a singalong activity, there are people tapping the feet, actively listening to the songs and sing along with it, some sleep during the activity. These are all different types of engagement with the activity. In music therapy, there are two types of engagement with a therapy session, active and passive engagement. When a music therapist involves elders in an activity where they contribute actively by making music is called active engagement, while when the therapist plays music for the elders wherein the elders just listen to it, it is called passive engagement. Both these types of engagement are beneficial for the elders and the therapist determines which type of therapeutic activity should be set up for an elder. Social engagement is a part of all the activities mentioned above. Social engagement is integral and often co-exists with a lot of activities. In the current age, interacting through social media is also termed as social interaction and social engagement is a broad umbrella of various actions related to interaction and engagement. As a result it is hard to measure social engagement. During the interview with the music therapist, the therapist mentioned that it is highly subjective and she measures it depending on the individual goal set to an elder. For instance, if the goal for one elder is to be socially engaged for 2 minutes, she works till the elder can be socially engaged for 2 minutes and the goals keep changing progressively.

Music:

In Menorah Park, music based activities get maximum attendance specially when there is a good activity conductor playing live music. I was able to observe this during the singalong at Menorah. The activity coordinator also stated the same. She also mentioned that other activities have an average of 4 to 5 people attending it. Though music based activities get higher attendance, there is potential for meaningful engagement for elders through music. To explore

the solution space, it is first required to understand the existing barriers around music. Through observation at Menorah, I saw pianos in the corridors. But no elder play it, even those who know how to play. There are attitudinal barriers surrounding music, i.e. to play music. Elders hesitate to play in front of other residents, often seen as strangers. They don't want to play music in front of strangers! Many a times, finger dexterity and other health problems because of aging also affect elders' ability to play instruments that inhibit them from playing music. In this case the music itself becomes a barrier.

4. FINAL DESIGN

By understanding the system and the challenges identified during the research phase, to proceed in the direction of the final design additional research helped add on to the existing insights. Interview with Zeke a musician and designer, helped me to realize that there has to be a basic set of instructions that has to be defined. Taking inspiration from his works of custom designed string instruments, he mentioned that the core for the design is to have elements of "vibration and amplification" (interview, Zeke). Considering that I am using makey-makey as a medium to design the interface, the nature of music produced would be in the digital realm. The core of this music interface would be the electrical contact and the software used. From research, it was evident that elders are interested in new technology, provided the interface to the technology is easy to understand and use. Considering the adaptable nature of makey-makey, the interface can be adapted to any elder needs and necessities. Therefore it is possible to design an intuitive interface which is easy to use.

During the second research probe testing, there was a group consensus from the elders in feeling that they wanted to connect with more people in the facility. "It would be great to have

more people involved" was quoted by the elders. One of them mentioned about their local art group which is led by an art therapist stating that the simple interface made with cardboards and tinfoil reminded her of the art club. Collaborating with the art club would provide added value to this design concept. Considering the key factors identified during the research phase, human factor, portability, fun and collaborative nature along with the inspirations, I designed a button system with interchangeable positions which is connected to the makey-makey. These button system lie beneath and art based surface which acts as the interface that elders interact with. Fig11 shows this design.

Fig11: Final design

The buttons are sensitive to the pressure applied by the elders and the interchangeable positions of the system make it flexible and adaptable in nature. The art interface is designed by collaborating with the art group thereby promoting meaningful engagement. The design has a feature to use an iPad along with this system enabling playing music with a group or by

themselves. This also enables participation from remote locations or even engaging with family or friends far away.

Taking inspiration from the music therapy model of measuring outcome contrary to the nature of activities in an ALF, it is possible to measure engagement among elders. This acts as a feedback thereby providing an opportunity to improve the design in the future. The music therapy model which is reactive in nature i.e. outcome based compared to the proactive nature of activities in ALF where the activities are offered to elders from the moment they are part of the ALF. The reactive nature acts as a feedback mechanism thereby providing opportunity to improve the design in the future. Adapting the model of measuring engagement from the research by Learning for action, 2013, four steps have to be followed.

1. Setting individual goals
2. Understanding the individual elder
3. Measuring engagement
4. Feedback from the measurement to improve interface

Figure 12 demonstrates the flow of engagement during the second research probe session.

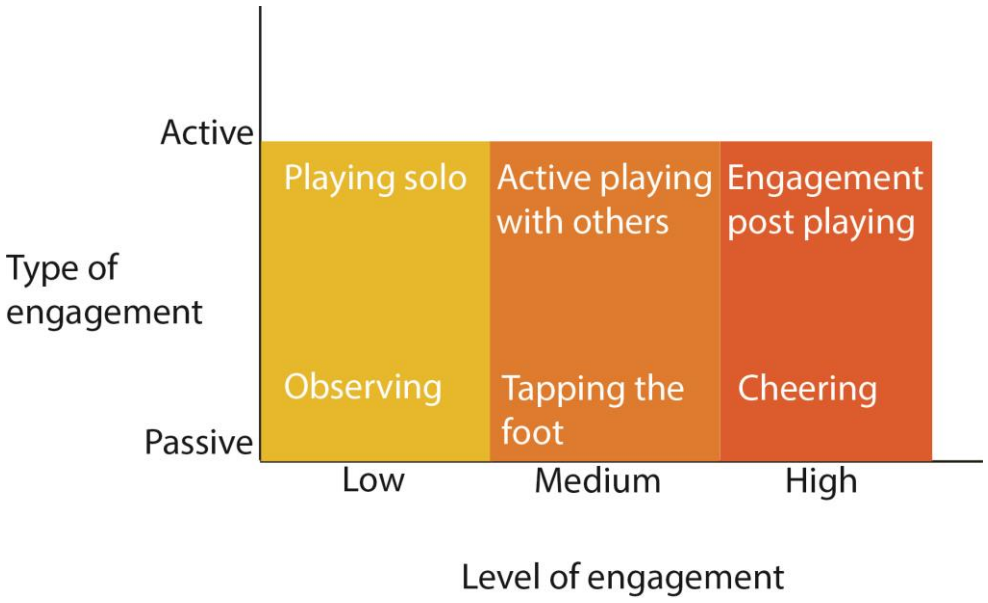

Fig12: The dynamics of social engagement during the testing of research probe2

Testing the final design:

The final design was set up at University House Wallingford, an ALF in Seattle. Four participants tested the final design, three of them were elders at the ALF and the other participant was the activity coordinator.

Key insights from design testing session:

1. Complex looking structure drives curiosity among the elders.
2. Complexity in the use also introduces confusion.
3. Technology is always an obstacle and
4. Design has to consider the process of aging.

Initially I set up the prototype with the activity coordinator to get her feedback on the design. The prototype was set up with additional questions to prompt when user gets stuck somewhere. The feedback was documented and then patterns were observed in the participant's behavior and

answers. Interacting with the elders and talking to the activity coordinator, it becomes clear that the prototype was complex and intriguing overall. The complexity derives from unfamiliar nature of the design and also the interchangeable button matrix. This complexity intrigues them wherein they voiced that it makes them think what this is and what will this do? This complexity drives curiosity. Though the art based interface isn't complex, the curiosity drives from the patterns and colors on the interface presented. Everybody mentioned right away that they would hit the black dots to play the music, however the curiosity was about what would the other areas do?

This complexity is also the cause of confusion. The confusion arises from the functioning of the prototype. One of the key things that they want to know is if they can master the device. So they were curious about the working of the device. The interchangeable pattern of the button was complex for them in different levels. Firstly, it seemed difficult for them to understand what button does what anymore wherein it loses that memorable pattern that they remember from how they used it before. Considering the process of aging, when memory gets affected, this might play a crucial factor.

Technology is always an obstacle wherein the complexity increases multifold and they experience other challenges outside the prototype. Because the idea encloses this concept of playing from their own room and such, it introduces challenges of handling an iPad, wherein touchscreen interfaces becomes harder to use and also there are challenges with the UX of the remote calling applications built for the iPad, rightly because elders aren't the primary users of these applications and these applications aren't intuitive for elders to use. The existing mode of connecting the prototype to a computer makes it even more complex for elders to use.

The other challenge that was vocalized was about the buttons. For aging hands, when it loses grip and can't apply more pressure, buttons gets harder and harder. This view was shared by activity coordinator as well.

The other takeaways from this testing session were that everybody voiced that the idea is fun and game like. One elder quoted "It is kind of fun, I can imagine people sitting in their chairs playing this together." Tactile interface is a big plus and they liked the idea of playing from remote locations.

5. CONCLUSION

This journey has thrown up surprises in terms of challenges at times. These surprise challenges are important to discuss as they reveal barriers in ALF that can be changed down the road to the future. All my research probes had to be scheduled as activities so that I am able to test the prototypes. One of the biggest challenges that were revealed during the research phase was that because the activities are scheduled, elders have to be present at a particular place and a particular time which creates more opportunity for an elder to miss an activity. It was contradicting the nature of the design which is meant to break this barrier of scheduled activity. A more open mindset can be adopted to try and test ways to conduct activities in ALF so as to evolve them. Another surprise was thrown when I found out during the second probe testing that the Menorah Park had just got Wi-Fi access enabled throughout the facility. An internet connection was a key necessity for my design and at this age and day; it was surprising that Wi-Fi was just recently enabled throughout the facility. If there was no Wi-Fi, I wouldn't have been able to do my testing. With growing baby boomer population, who are familiar with technology start coming into ALF, Wi-Fi would be a basic service that is offered to all. Services offered to an elder have to be expanded beyond advanced health services offered by ALF. Other services

offered in terms of activities have to be considered as well. The places where technological advances in health monitoring and health services are up to date in ALF, these advances somehow fail to make it that big in the activities department. There is lack of extensive research in terms of technology, activity and having fun.

This design provides an opportunity to create meaningful engagement and fun environment which benefits elders, this has the potential to break attitudinal barriers with playing music by making it fun and at the same time it provides ways to involve roommates and caregivers. In the book Aging Matters: An Introduction to Social Gerontology, the author talks about how caregiver stress is often overlooked (Hooyman et al., 194-198).

Moving forward:

There is a big leap from the probe2 to the final design wherein there is an exploration from familiar objects to unfamiliar objects in the design of the prototype and also introduces other layers in the concept that have to function to get the most out of the final design, like the art therapy group working to create the interfaces. This adds another layer of complexity to the design. There is a need here to step back a bit and focus on one hero for the concept, which would be music. Less is more was the central theme of feedback from the final design testing. Features can be built around this central concept of music which would enhance the user experience of the design. These features can have benefits like improving the hand eye coordination and what not, but these features should complement and add value to the existing design. This can be achieved by either button placements or design of a more sensitive button system, Also colors would play a crucial role in this. The complexity can further be reduced by having embedded technology with the design and not using makey-makey connected with a

computer which then would also use an iPad for remote use of the design. There are inherent challenges with the makey-makey as well. Firstly, this is a wired piece of technology which has to be connected to a computer and internet at all times. Collaborating with engineers to develop this as a stand-alone module would tremendously improve the portability of the design which would then greatly reduce the complexity with the existing design.

The remote use of this design would work best if an application is designed in the iPad specifically with elders as the primary users so that it is more intuitive for them to use and more accessible. Improving the user experience is a big step towards making technology more accessible for elders at an ALF.

Works Cited:

Brownlee, John. "What Is Zero UI? (And Why Is It Crucial To The Future Of Design?)." Co.Design. N.p., n.d. Web. 03 May 2016. http://www.fastcodesign.com/3048139/what-is-zero-ui-and-why-is-it-crucial-to-the-future-of-design

Campbell, Nichole M. "Factors Predicting Retirement Community Social Space Success, Housing and Society", 2014, 41:1, 1-29, Web 03 May 2016

Campbell, Nichole. "Designing for social needs to support aging in place within continuing care retirement communities". Journal of Housing and the Built Environment November 2015, Volume 30, Issue 4, pp 645-665

Degmečić, Dunja. Požgain, Ivan. Filaković, Pavo. "Music as Therapy". International Review of the Aesthetics and Sociology of Music 2005, Vol. 36, No. 2, pp. 287-300. Web 03 May 2016

Evans, Shelley, Phone Interview, 29 Feb 2016

Evans, Shelley, Skype Interview, 29 Mar 2016

Ford, Dick, Personal Interview, 9 Feb 2016

Harlow, R. E., & Cantor, N. "Still participating after all these years: A study of life task participation in later life." Journal of Personality and Social Psychology, 1996, 71, 1235-1249. Web 03 May 2016

Hooyman, Nancy R., Kevin Kawamoto, and H. Asuman Kiyak. Aging Matters: An Introduction to Social Gerontology. Pearson, 2015 Kindle Edition

Janet, J[1] Personal Interview, 13 Feb 2015

[1] Name Changed to protect the identity of the interviewed user

Jang, Yuri., Mortimer, James A. Haley, William E., Borenstein Graves, Amy R. “The Role of Social Engagement in Life Satisfaction: Its Significance Among Older Individuals With Disease and Disability”. The Journal of Applied Gerontology, Vol. 23 No. 3, September 2004, 266-27, Web 03 May 2016

Jill Quadagno, “Aging and The Life Course : An Introduction to Social Gerontology, 2/e” . N.p., n.d. Web. 03 May 2016 <http://highered.mheducation.com/sites/0072405538/student_view0/glossary.html>

Learning for Action, "Deepening Engagement for Lasting Impact: A Framework for Measuring Media Performance & Result". 2013. N.p., n.d. Web.

Leonard, Zeke, Personal Interview, 28 Mar 2016

Lennartsson, Carin and Silverstein, Merril. “Does Engagement With Life Enhance Survival of Elderly People in Sweden? The Role of Social and Leisure Activities”, Journal of Gerontology: SOCIAL SCIENCES Copyright 2001 by the Gerontological Society of America, 2001, Vol. 56B, No. 6, S335–S34, Web 03 May 2016

"Makey Makey | Buy Direct (Official Site)." Makey Makey | Buy Direct (Official Site). N.p., n.d. Web. 03 May 2016. <http://www.makeymakey.com/>

Menec, V. “The relation between everyday activities and successful aging: A 6-year longitudinal study.” Journal of Gerontology: Social Sciences, 2003, 58B, S74–S82. Web 03 May 2016

Ole Bonde, Lars. “Health Musicing - Music Therapy or Music and Health? A model, empirical examples and personal reflections”. Music and Arts in Action/Lars Ole Bonde 2011 | ISSN: 1754-7105 | Page 120. Web 03 May 2016

Tara, K[2] Personal Interview, 07 Apr 2017

Ted, T[3], Personal Interview, 13 Feb 2015

Rogers,Yvonne. Paay, Jeni.Brereton3, Margot.Vaisutis, Kate.Marsden, Gary.Vetere, Frank. "Never Too Old: Engaging Retired People Inventing the Future with MaKey MaKey". 2014. N.p., n.d. Web 03 May 2016

Sacks, Oliver. *Musicophillia,Tales of music and the brain,* Alfred A. Knopf, 2007, Web

Shirley[4], et. al, Personal Interview, 21 Mar 2016

Silver, Jay. Rosenbaum, Eric. Shaw, David. "Makey Makey: Improvising Tangible and Nature-Based User Interfaces". TEI 2012, N.p., n.d. Web. 03 May 2016

"Skoogmusic: Assistive Music Technology." Skoogmusic. N.p., n.d. Web. 03 May 2016.< http://www.skoogmusic.com/>

Stige, B. "Culture-centered Music Therapy". 2002. Gilsum, NH, Barcelona. - 198-200

Stige, B. " Elaborations Toward a Notion of Community Music Therapy". 2003. Oslo: Unipub.

Street, D., Burge, S., Quadagno, J., & Barrett, A. "The salience of social relationships for resident well-being in assisted living". The Journals of Gerontology Series B Psychological Sciences and Social Sciences, 2007, 62B(2), S129–S134, Web 03 May 2016

[2] Name Changed to protect the identity of the interviewed user
[3] Name Changed to protect the identity of the interviewed user
[4] Name Changed to protect the identity of the interviewed user

"The History of Assisted Living (AL) - The Who, What, Where, When & Why of Assisted Living." The History of Assisted Living (AL) - The Who, What, Where, When & Why of Assisted Living. N.p., n.d. Web. 03 May 2016. <http://www.assistedlivinghistory.com/>

"What Is "active Ageing"?" World Health Organization. N.p., n.d. Web. 03 May 2016. <http://apps.who.int/iris/bitstream/10665/67215/1/WHO_NMH_NPH_02.8.pdf>

"What Is "active Ageing"?" World Health Organization. N.p., n.d. Web. 03 May 2016. <http://www.who.int/ageing/active_ageing/en/>

VITA

Vishwam Rajagopal

EDUCATION:

Year	Degree	Major	Institution
2017(Thesis defense completed in 2016)	MFA	Collaborative Design	Syracuse University
2010	BE	Electrical and Electronics Engineering	Anna University

PROFESSIONAL EXPERIENCE:

Date	Position	Organization
07/2016 – 12/2016	UX Research Intern	Redfin Corporation
02/2016 – 07/2016	Design Research Assistant	Syracuse University
08/2015 – 12/2015	Teaching Assistant – Design Research	Syracuse University
01/2015 – 07/2015	Design Research Assistant	KBL Studio
08/2010 – 07/2014	Software Engineer	CGI