1. INTRODUCTION

Recently the Wall Street Journal reported on some research I had done as part of a fellowship for the Center of Innovation (CFI) at the Mayo Clinic in Rochester, Minnesota. What was interesting about the article, Do it Yourself Designs for Daily Living: how older Americans are reimagining household objects from soap to straws to make their lives easier, is not what it reported on but what it left out. As part of my research on how seniors were adapting their environments, I was asked to give my list of top ten adaptations I had found. When the article went to print, it only presented nine of the top ten that I had suggested (figure 1). It had left out my top pick which was an adaptations related to how seniors were managing their medications.

These visual aids (figure 2), to manage and keep track of their medications, were one of the few examples that were completely senior developed and being done by more than one person. I am not sure as to the reasons it was left out of the article, but it was the one adaptation that did not fit into an easy categorization, visualization and narrative we associate with our senior population. Where the other examples, many of them quirky, fit into the articles storyline of “older people themselves can be resourceful in finding ways to adapt their surroundings to their diminished vision, muscles and dexterity”, the medication management adaptation was not about adjusting to diminished capabilities but more about increased control over a complicated system. As one of the subjects I interviewed said; “it the visual aid that I find the most useful to allow me to efficiently move the pills from the bulk container into the proper location for the dispensing container because when you are handling two patients each with – I have four prescriptions and three over the counters and my spouse has six prescriptions and at least three or four over the counter. That’s a handful and as you get older handling a handful becomes more difficult”.

Unfortunately, there is a tendency to blame the seniors for not taking their medication properly – non-compliance issues (Mitchell & Selmes, 2007). A Harvard medical study estimated the extent of noncompliance in the elderly varies, ranging from 40% to a high of 75% (Salzman C, 1995). But the example of their development of visual aids, suggests that the system is not designed for easy compliance. These adaptations are a testament to the resourcefulness of seniors in adapting their environments to their needs.
to their resourcefulness in managing their medications (the above subject was managing 17 prescriptions) in a healthcare system that provided them limited healthcare guidance on how to manage this increased medication 'workload'. As designers, this resourcefulness is of interest because we can gain valuable insight into the real problems people face and learn from them through these examples on how to design products, systems, or services to better meet their needs. As one of the subjects said “each time I go for an appointment for either my spouse or myself, I take this (his visual aid) and the attending nurse or doctor says ‘oh I sure like your system’.”

The objective of this paper is to show how and what designers can learn from these senior centered adaptations. Using examples from a visual database of over 300 of these adaptations or ‘hacks’, a framework will be presented in order to understand the context of senior centered in terms of types of adaptations, where in the home environment are they occurring, what activities are associated with these adaptations, and what is the level of these adaptations. A case study of adaptations at a retirement complex will be presented and their ‘hacks’ analyzed and some compared to similar industry led products. A specific focus will be on senior led home medication management adaptations and also a design class project, where students were partnered with seniors in an exploration of these medication systems. The class methodology will be presented and some design outcomes discussed.

2. ADAPTATIONS

In biology an adaptation is evolutionary process where an organism becomes better able to live in its habitat. In design an adaptation also involves a process where a product or space is changed or evolved to better meet a specific users needs. In other professions, such as in healthcare, it is called workarounds, which are usually temporary fixes to a problem (Tucker, 2012). The act of doing any workaround or adaptation highlights the need for a real solution to the problem. For example, cut tennis balls put on the bottom of walker legs indicate the need for walkers to slide. What is interesting about user-centered adaptations are that they are frequently simple solutions to everyday problems. For example, the soap in the stocking (Figure 1, image #1) is an ingenious way to address the universal problem of picking up soap in the shower after it has slipped out of your hand. Putting soap in a stocking solves a number of issues. One is that the stockings stretch for easy and flexible use in a shower environment. Two, is that the stocking allows water to run through it and it feels good scrubbing you skin (exfoliate). Three is that the soap is nicely contained and usable in the stocking as it shrinks with usage (the stockings equivalent of ‘soap on a rope’ breaks at a certain use point). Four, the stocking is washable, easily replaceable and inexpensive.

If we look at the ‘soap in a stocking’ design through Donald Norman principles of good user-centered design outlined in his book the Design of Everyday Things, in which he identifies good design as simplifying the structure of tasks, making things visible, getting the mapping right, exploiting the powers of constraint, and designing for error, then soap in the stocking meets all of those criteria of good design. And when we look at what is available on the market for seniors to address bathing issue and the need to keep a hold of soap, we find either the problematic ‘soap on a rope’ solution or equally hard to use pump lotions. Many of the adaptations I found, although not necessarily aesthetically pleasing, met much of the criteria of Norman's good user-centered design.
A more current view of these senior led adaptations is to position them in the language of the DIY community and the activity of product hacking. Hacking often refers to the act of modifying or customizing everyday products to improve their functionality. As defined by Wikipedia, a hacker is a person who enjoys exploring the limits of what is possible, in a spirit of playful cleverness and the act of hacking is to “either to make it better or faster or to give it added features or to make it do something it was never intended to do”. Because much of our human made world has not been designed for an aged population then the seniors and their caregivers become the ultimate hackers because they have to creatively adapt or 'hack' those products and spaces to more effectively meet their aged needs.

3. RESEARCH
The impetus of this research into identifying senior-centered product hacks came out of the work of Jane Fulton Suri of IDEO and her book Thoughtless Acts? Observations on Intuitive Design. Her book presented a collection of creative ways that people interact with their environment. Like her, I believe that people are creative and resourceful and that we as designers can tap into that creativity. From that perspective, I proposed and did research at the Healthy Aging Initiative Lab (HAIL) as part of a fellowship in Healthcare Innovation at the Center for Innovation (CFI) at the Mayo Clinic in 2012. The project called Adaptations: the assistive environment involved an investigation into the issue of how seniors and their caregivers were adapting everyday products and environments to better meet their needs. These adaptations include everything from the tennis balls on bottom of walkers, to putting stickers on screened doors so you don’t walk into them, or having notes beside switches reminding people to turn them off. These are all types of adaptations people make to better accommodate their various physical and cognitive abilities.

The outcome of this exploratory investigation was the development of photo collection of examples of senior centered adaptations. In all 345 photos of adaptations were collected from a combination of online sites, visits to senior homes and examples gathered from caregiver workshops. The majority of the examples were collected online and put up on a Pinterest site called Product Hacks for Seniors. A wide range of photos examples were collected around any adaptation that potentially concerned an aged population. For example, adaptations around disabilities and wheelchairs were included. Also, because it was a visual collection, adaptations had to have photo evidence. Therefore many adaptations that were identified verbally in the caregiver workshops I ran could not be used because there was no photo evidence.

3.1 Framework and findings
A framework was developed to help categorize and understand the various aspects of the adaptations. I was not looking for adaptations in the form of commercial products. I was looking for adaptations that had to be Do-It-Yourself (DIY). The taxonomies identified in the work of Jane Fulton Suri’s Thoughtless Acts and in the Richard Wentworth’s photo series Making Do and Getting By were used to provide a framework for identifying the types of adaptations. Jane Fulton Suri identified seven ways we adapt our environment. She listed them as reacting, responding, co-opting, exploiting, adapting, conforming and signaling. Richard Wentworth identified adaptations as warnings, repairs, reminders, and adjustments. Kevin Henry in his article, Parallel Universes: Making Do and Getting By + Thoughtless Acts compares their approaches and goes on to say that Wentworth’s “images depicts desperate acts of repair”, while
Fulton Suri’s images focus on “humans intuitively extending their bodies or the objects around them to service their needs”.

By using the commonalities between Wentworth’s and Suri’s taxonomies of adaptations in combination with the information from my collection of over 300 visual examples, I identified four major areas of adaptations and product hacks related to seniors:

1. Adjustment and modifications – changing something to better meet ones needs
2. Repurposing – converting something to another use
3. Inventions – a new way to better meet ones needs
4. Signals (warnings and reminders) – prompting ourselves and others

In addition to identifying the types of adaptations, I incorporated into my investigative framework a categorization of where in the home environment these adaptations were occurring (kitchen / dining, living / office, bedroom, bathroom), what was the reason for these adaptations (ease of use, safety, physical comfort/esthetics), who was doing these adaptations (seniors, caregivers, non-caregivers) and what was the level of the adaptation (no expertise required, some expertise required, significant expertise required). Also, activities were associated with the adaptations were investigated and the healthcare nomenclature associated with Activities of Daily Living (ADL) was used. The term ADL is used in healthcare and refers to the daily self-care activities in person’s place of residence. ADL’s are a measurement of the functional status of a person in their ability or inability to perform these daily tasks. Fundamental activities of daily living are essential for living independently where as instrumental activities although not essential are important to maintaining independent living.

The following is my list of the ADL’s I used in developing a framework:

1. Fundamental Activities of Daily Living
   - Mealtime – preparing food, cooking & eating
   - Functional transfers/reach/support – sit to stand issues
   - Household maintenance and access – opening doors, cleaning, pet care, mail.
   - Personal Care – hygiene, grooming, dressing
   - Medication and health management – taking

2. Instrumental Activities of Daily Living
   - Physical – walking, exercise
   - Communication – use of communication devices
   - Creative – hobbies, art, music, entertainment
   - Sedentary (non tech) – active reading, writing
   - Sedentary (tech) – passive watching

The following is a snapshot of some of the initial findings from the preliminary exploration and analysis of the over 300 photo adaptation examples.

- 80% of adaptations involved adjustment and modifications to products
- 65% of adaptations were being done in the kitchen or bathroom
- 40% of fundamental activities of daily living were associated with preparing food, cooking and eating.
- 45% of instrumental activities of daily living were associated with physical mobility issues such as walking and exercise
- 86% of adaptations were associated with ease of use issues.
- 28% of adaptations required no expertise (the other levels of expertise were difficult to determine due examples just being visual records and required further investigation).
• 17% of the people associated with implementing adaptations were seniors. These adaptations were all from my in-home research done in a continuing care retirement community. These preliminary findings warrant further investigation and analysis. Even though the information gathered was limited due to the incomplete data associated with extrapolating information based on photos, some interesting things were revealed. For example, the most interesting and informative adaptations were those that were senior developed. These senior led ‘hack’ examples mostly came from research I did in apartments of seniors in a continuing care retirement complex. The following case studies from the in-home research briefly illustrate some interesting adaptations and their relevance to designers.

4. ADAPTATION CASE STUDIES
I documented adaptations and interviewed residents of five apartments in a senior retirement complex over two visits. This documentation involved both photo and video documentation of adaptations that they had identified and those that I identified once in their apartments.

4.1 Gerry – adapting to limited mobility
Gerry, single male in his 80’s, initially identified two adaptations. But during the visit I was able to identify fourteen other adaptations. These adaptations were mainly adjustments and modifications around functional transfers and sit to stand issues. An interesting adaptation was the repurposing of his chair to facilitate the activity of dressing. He would use the chair cross piece as a leg lift for him to help him put on his socks and shoes. As a designer we tend to focus on designing independent products to help them dress such as aids for putting on socks (I do an exercise with my students and have them use these commercial ‘sock aid’ products - even they find it extremely difficult to use). In Gerry’s case the chair was a key assistive aid to facilitate his dressing. This highlighted the need for designers to first identify the environment and objects associated with activities like dressing and the role of chairs, and then design around enhancing these environments and objects.

4.2 Margaret – adapting to a medical condition
Margaret and Brian is a couple in their late 70’s. Margaret had an eye condition that required scleral lenses. She experienced extreme difficulty in inserting her lenses using the standard lens industry insertion products. Eventually, she found an item online, the Sea Green Lens Inserter, which was much easier to use. In talking to the developer of this product, John Dalsey a machinist by trade, he described the development as a result of a trial and error process of trying to help a friend insert his scleral lenses. Eventually, he found that insertion was make much easier by using a LED light from his keychain to direct the persons eye. From that keychain developed a very simple and easy solution to helping people insert these lenses developed. For Margaret, inserting these lenses was a vast improvement over the lens industries solution that she was initially given with her lenses. This highlights the issue that simple solutions can come from those who have to use or interact with the system or product on a regular basis.

4.3 Peter – Mr. Fix-it
Peter, living alone and in his 80’s, had a background in the trades and access to the retirement complex’s...
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woodshop. In his apartment he had fourteen adaptations. One interesting adaptation was to an emergency switch by his bed that he could not pull when he was lying in bed. Peter adjusted the chord to be usable in bed (figure 4). This highlights the issue that in designing for seniors mobility and accessibility issues are not well understood. Another interesting invention/adaptation was a mouse curser stabilizer. Ironically the week before, Margaret’s spouse Brian identified that the issue he most needed addressed was controlling the mouse and curser because of hand tremors. There were existing products out there like the Assistive Mouse Adapter (AMA), which costs just over $100. Peter addressed his hand tremor issues by building a little black nesting box where he docks the mouse thus breaking the tracking of the infrared sensor that moves the curser. Peter represents a generational mindset that grew up in a time when you tinkered and fixed things. As a designer, there is an opportunity to both learn from and couple this DIY mindset who grew up on the old technology of Popular Mechanics with a new generational DIY mindset growing up on the new technology of Make magazine.

4.4 Peggy – getting a feel for it.
Peggy bought a pack of 25 orange silicone bumps with adhesive backs for $4 and put them on control pads all over her house (figure 5). This included computer keyboards, cell phones, dishwashers, coffeemakers, etc. These tactile and visual indicators helped her identify key controls on these appliances and provided tactile feedback. As products move to screen based controls and appliances with flat buttons there is a need for the design community to balance that design direction with an aging population that may have less visual, tactile and auditory acuity to effectively operate those controls.

4.6 Cliff - caregiver
Cliff, the primary caregiver for a wife with dementia, has adaptations revolving around caring for his wife. In one example, he took an outdoor motion sensor and used it to track the movements of his wife indoors. Originally he put the sensor by the apartment door but now he uses it by her bedroom. As Cliff says; “She likes to sleep in the morning and what I have been doing is putting that sensor in the back bedroom so that I can be out here. When she wakes up to go to the bathroom that (sensor) chimes and I will go in and say good morning and it has done away with some head butting that was not any fun”. Cliff has also repurposed alligator clips he gets at the local casino into napkin holder clips for his wife when she eats (figure 1, image #3). In his view stuffing a napkin in his spouses shirt/dress collar or alternatively the bibs that were available in the complex were undignified. He has made over eight number napkin clip holders and given them to other residents. For designers, this highlighted the issue of not only designing around seniors needs but also around the particular needs of seniors who are primary caregivers.

4.7 Seniors – managing medications
As Cliff says; “the trick is to find something where it is possible to identify more than one way whether pills have been taken, if they have been taken, which ones have been taken. So everyone is looking for a way
to do that”. Like the other residents I documented, Cliff had also adapted a number of things related to how he manages his medication and how he takes his pills. Here are some commonalities associated with how seniors were managing their medications/pills. Everyone uses various containers (i.e. shoe boxes, plastic boxes) to store and carry their medicine/pills. Everyone stored their medication not in traditional bathroom medicine cabinets but in various locations in drawers and cupboards and surfaces around the apartment. Everyone carried their pill containers to a separate area where their weekly pill organizers were located and used a kitchen or table surface to help organize and dispense pills. Everyone had developed their own visual aid in the form of a paper based plan sheet to manage their pills. Everyone complained that that they have to manage too many pills.

5. STUDENT/SENIOR PROJECT

In the fall of 2012, I explored this medication management issue in a design class called Collaborative Design. The following is a brief outline of the project and outcomes. The project was called Health narratives – design a better narrative and involved a group of interdisciplinary design students at NSCAD University. The project involved three phases. The first phase involved an investigation into medication use among seniors; the next phase involved documenting seniors’ medication management activities. The last phase involved understanding the issues and needs of their seniors and designing various solutions.

The first phase involved understanding the context of medications and seniors. The design outcome of this was visual graphic synthesizing information from two documents (Medication use among senior Canadians & Drug Use Among Seniors on Public Drug Programs in Canada). The information graphics were put online (Pinterest site) where both the authors of one of the documents and health design professionals (Mayo Clinic) commented on the content and composition of the student’s work. As well, these information graphics were displayed at a national conference (Our Future is Aging: Current Research on Knowledge), where the students had the opportunity to talk about the medication issues with health professionals. In the second phase, students were paired up with seniors from a local senior drop in center and documented the seniors’ medication management activity in their homes. The outcome of this phase was a task analysis in the form of an illustrative storyboard.

In the third phase, the students used evidence of issues identified through their senior visits to design a new and health narrative for their seniors. Issues that came up involved problems with accessing pill bottles both visually and physically, problems with transporting more than one bottle, and problems with storage and convenience. Areas where seniors had made adaptations became areas for exploration. For example one senior used a candy container to put her pills in when she had to take them during the day. She liked the look (no stigma) and it fit better in her purse when she had to take them outside of the home. Students looked at this and created a system where seniors could personalize these containers for their pills in a safe way. In another example, a senior would move his medication/pills from a storage cabinet to the top of his laundry machine where he would dispensing them into his weekly container. He liked size and clean surface of the washing machine and its proximity to where he stores his medicine. A student combined the need for a dispensing surface and a container to hold all of his pills into portable medication container/cabinet.
The benefit of the student project was not necessarily that it ended up in creating the optimum design for the problem but it did provide the students a better context from which to start looking for preferred solutions to the problem. As opposed to designing from a place of assuming what they need, students were designing from a place of seeing what seniors are already doing to meet their needs.

6. CONCLUSIONS

I have written extensively on ageism in design and among designers and because of this I think there is a tendency to devalue the opinions and design (adaptations) of a senior population. Based on my investigation and collection of over 300 adaptations, I found that the adaptations that were clearly senior led were much more appropriate and creative to meeting a need and solving a problem. As our population ages and healthcare costs rise, jurisdictions all over are implementing aging in place strategies to keep people in their home longer. Unfortunately most of that built environment is not designed for them in mind. Fortunately for designers, the DIY adaptations are already being done and there is an opportunity to take our design lead from these adaptations and in the process celebrate and reframe this senior centered activity as creative product hacking.

The omission of the medication management adaptation from the Wall Street Journal Article highlighted the need to open up wider the narrative of the value of the seniors role in identifying the issues and offering solutions to not just products and environments but services and systems like the healthcare system in which they are actively involved with. At the conclusion of my fellowship at the Mayo Clinic one of the recommendations I made was based on a suggestion by one of the seniors I had interviewed. He thought there was an opportunity for senior led medication management seminars and workshops where physicians, pharmacists, healthcare providers and designers come together and learn and work with the seniors to develop senior centered solutions.

REFERENCES

Canadian Institute for Health Information (2010), Drug Use Among Seniors on Public Drug Programs in Canada, 2002 to 2008, Ottawa, Ont.: CIHI. SBN 978-1-55465-711-7 (PDF)

Henry, Kevin, Parallel Universes: Making Do and Getting By + Thoughtless Acts (Mapping the quotidian from two perspectives) Core 77 website accessed 02/06/13 at http://www.core77.com/reactor/03.07_parallel.asp


