

Design Thinking as a Process for Innovative Older Adult Applications

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Abstract—Design Thinking is a critical methodology used by designers to work through and solve complex problems, and to develop solutions aimed at creating a preferred future. Designing for aging requires focused expertise, considerations, and principles for bringing about effective solutions for this target population. While there is vast knowledge within each of these areas of knowledge and practice, little has been discussed and presented at the intersection of the two – design thinking and aging. This paper introduces a system for design thinking addressing the needs of older adults. The system is comprised of a seven-phase “P” methodology: Position, Purpose, Prosthetics, Place, Participation, Potential and Presentation. This paper discusses a case study of the application of this methodology in a project titled “Aging and Health(care) 3.0: Place of Aging,” a collaboration across Industrial Design and Architecture. The significance of this paper is to introduce approaches that better identify critical opportunities when designing for older adults. This paper discusses approaches that are contextual and personal in the realm of designing for *one* in the context of *many*, with the aim of redefining care for healthy aging.

Keywords—Design Thinking; Critical Making; Design for Aging; Methodologies

I. INTRODUCTION

Design practices have become more complex, yet essential, for addressing challenging societal problems. While design once was considered a more linear iterative activity for problem-solving, user requirements have expanded the design process making it more inclusive and comprehensive. The incorporation of the social sciences in design has resulted in switching practices from a designer-centered design to a user-centered design approach [1][2]. User-centered design approaches have been dominating the design disciplines in order to design products that better serve users [3]. IDEO, a global design company, was one of the pioneers in harnessing the power of specific methods to develop a more critical, nuanced and responsive design process. Since then, a plethora of alternative methods have emerged in response to better understanding user needs [4]–[7]. While design methods are still suitable for better identifying user requirements, usability and adoption, they limit their impact on contemporary design practice and rhetoric. Even though participatory design aims at involving the targeted user in the design process for meeting the needs of the stakeholders [6][8], the method can challenge critical insights. The emergence of design thinking is responsible to

address complex issues within complex social issues that focus on understanding user experiences in our built environment [9]. Design thinking supports the belief that designers should be more involved in the big picture of socially innovative design; that design is a collaborative effort; and that ideas have to be explored in a hands-on way with stakeholders [10].

Building on the strengths of design thinking, this paper discusses the curricular process of a class exercising empathy towards users, cooperative activities, design prototyping and contextualization. A set of design activities was envisioned as a system to address the problem area of abandonment of older adults in our society. The rationale was to customize a methodology that can go beyond participatory design by collectively setting principles for designing for impact in the population—in this case, behavioral change and well-being of older adults by reformulating health by focusing on *care*. The goal was to set forward the need for design thinking for improving the perception and integration of older adults in the community.

The paper is structured as follows. In Section II, we introduce principles for design and well-being, as well as objectives for designing solutions for the aging population. In Section III, we describe a seven-phase “P” methodology: Position, Purpose, Prosthetics, Place, Participation, Potential and Presentation. The subsections describe in detail each phase and its application. Lastly, section IV discusses concluding thoughts about the “P” methodology reflecting on its application in a project titled “Aging and Health(care) 3.0: Place of Aging,” a collaboration across Industrial Design and Architecture.

II. DESIGNING FOR OLDER ADULTS

Designing for older adults requires focused expertise, considerations and principles for bringing about effective solutions for the population. There are a number of sources aimed at giving easily accessible information as a primer for designing for older adults [11]. Fisk et al offer a practical introduction to human factors and older adults by illustrating practical translations of scientific data into design applications. Similarly, Universal Design principles provide guidance for designing products and environments involving the consideration of the human factors across populations of varied abilities [12]. Universal Design holds the promise to design products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.

A. Principles of Well-Being in Aging

The International Plan of Action on Ageing in 1991/1992 held as its main objective “to add life to the years that have been added to life” [13]. Building on this objective and considering Universal Design principles, the following guiding principles were proposed in parallel with design activities:

- AGENCY: Independence in decision-making and actions.
- DIGNITY: Ability to maintain one’s image of oneself and one’s values.
- IDENTITY: Recognized as an individual person by others.
- RELEVANCY: One has purpose in one’s own and others’ eyes.
- CONNECTIVITY: Integrated into the rest of society
- CURIOSITY: One keeps discovering and learning (progressive)
- ECCENTRICITY: Ability to behave outside of expected or normative actions.
- LOVABILITY: How others care about you and respect you regardless of your quirks.

B. Design objectives for the Aging Population

Clarifying design objectives is a central component for the success of any project. A design process cannot exist in isolation. Design objectives guide the creativity and critical thinking. Without objectives, the design process can arrive at solutions that may not meet the requirements of the end user. Design objectives are not a list of requirements from the user, neither scoping the project but advancing a comprehensive approach to delineate a guide on how to advance human beings by design. When designing for the aging population, the design objectives should reflect integration, implementation, inspiration and progression.

In delineating the objectives, integration refers to proposing products and/or systems to build intergenerational, supported and connected communities. The goal is to develop bottom-up approaches across generations that can help older adults have access to a community of care. Implementation is about proposing products and/or systems to have a successful effect and long-lasting impact within the aging population. The goal is to develop solutions that are feasible for implementation in the near future and more importantly, sustainable from the point of view of self-maintaining. Inspiration is about proposing products and/or systems that are forward thinking and enablers. The goal is to celebrate the aging population with creative, attractive and pervasive solutions that avoid physical, visual or experiential segregation. Lastly, progression is about proposing products and/or systems that allow positive growth. The goal is to develop solutions that grow with the aging population and inspire them to do more and be more.

III. “P” PROCESS

Exercising the aforementioned design objectives and principles, the goal was to create a curriculum that would focus on understanding and questioning current conventions

around aging, and portray how design - from the products, systems, platforms, programs, services, experiences, digital and non-digital perspective - can impact health and well-being in dwellings for a meaningful aging of future generations.

The design thinking approach for addressing the needs of older adults starts with people and ends with people. Through interactions among research, interventions, and implementation (see Figure 1), the system provides the basis to contextualize problem setting and problem-solving grounded in needs. The design methodology described here is comprised of a seven-phase “P” structure: Position, Purpose, Prosthetics, Place, Participation, Potential and Presentation. The following sections describe in detail these phases applied to a project "Aging and Health(care) 3.0: Place of Aging", a collaboration across Industrial Design and Architecture. The sections are structured with the curricular approach used in the course (see Table 1).

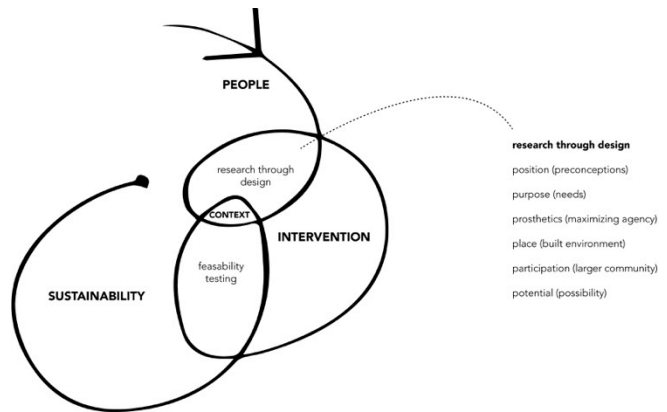


Figure 1. Design Thinking as a Process

TABLE I. RESEARCH THROUGH DESIGN METHODOLOGY

Step	“P” Process		
	User Centered Approach	Research	Design
1	Position	Recognize	Scoping
2	Purpose	Understand	Defining
3	Prosthetics	Identify	Exploring
4	Place	Locate	Applying
5	Participation	Engage	Co-creating
6	Potential	Propose	Generating
7	Presentation	Report	Validating

a. Curricular approach for Aging and Health(Care) course

A. Position

The goal of this step is to move beyond preconceptions and build a deeper understanding of users through direct evidence. It requires an attentive observation of the population with the aim of discovering experience perceptions of older adults. While an abundance of

observations exists within the literature, the aim is to learn about the population firsthand with sensitive and critical eyes, and to go "out" and record observations of encounters. The goal is to have the designer obtain an open-ended and exploratory *personal* view. This step requires exercising observational and interviewing skills that can be materialized through a video outcome summarizing the insights. One interesting aspect of the outcome is that it should be a conceptual representation of data collections excluding voice. *Voiceless* representations force reflection, and help avoid potentially erroneous preconceptions. The end result is an evidence-based storytelling around being an older adult in America (see Figure 2).



Figure 2. Example of preconceptions observations—stillness in age.

B. Purpose

The goal of this step is to understand the personas/types of users going beyond preconceptions and building them with evidence. For this step, types should be constructed as prototypes. Prototypes serve as material typologies for applying design thinking and critical making in the understanding of users. The construction of persona prototypes involves the translation of observations, building from the previous step, to reflective insights (see Figure 3).

Questions to guide the development of this step include: How individuals physically carry themselves in public? How individuals engage with others (actively approaching others, cheerful, withdrawn)? How individuals react to change or stress? Are there family members present in their lives (and what are the age groups)? Are they experiencing physical limitations? Can they move around on their own or are they dependent on others? Do they and how do they engage in activities? Answering these questions provides insights for categorization. The aim is to develop a *situated* classification criterion. Each category should be based on multiple variables and carefully considered, while setting the range of each category (and its variables) before determining that there now is a different category. This part of the process involves identifying the critical factor/s (the 'tipping point') separating one category/type and another.

While there is a need to create personalized typological categories, it is worth knowing how, over time, psychologists have attempted to classify personality types. The most widely used classification systems that sort humans by how they understand and respond to the world around them include the Myers-Briggs Type Indicator (MBTI) based on Carl Jung's theory that we experience the world in four basic ways: sensation, intuition, feeling, and thinking [14]; the Five Factor Model (FFM) openness to experience, conscientiousness, extraversion, agreeableness, neuroticism; and the Keirsey Temperament Sorter uses Plato's

temperament categories of the Artisans, Guardians, Idealists and Rationals [15]. This model is broken into two categories each, where each of these has two role variants, and then filters the 16 categories through "rings" of: abstract vs. concrete; cooperative (complying) vs. pragmatic (adapting); directive (proactive) vs. informative (reactive); expressive vs. attentive. Overall, for this step, it is worth considering typological studies in other fields. The ones below are not all about appearance. Rather, appearance is a factor of how something is structured, how it performs, when and how it was made, available materials and technologies, alterations and stresses upon it over time, the circumstances and the histories of those who created it.



Figure 3. Example of a purpose prototyped personas.

C. Prosthetics

With aging, older adults find themselves needing support where they live. Aging in place aims at keeping older adults in their "home" places for as long as they can. Yet, aging at "home" challenge *self-care* even in activities of daily living, the common, everyday tasks people do to become be *self-sufficient* such as bathing, eating and dressing. Some activities require re-learning to remain independent and healthy. With age or when becoming ill, the body and mind lose dexterity, balance, motor skills and the brain's keen awareness of the body's signals. Many of these activities have a strong and direct impact on our health. The question is, what tools, as prosthetics, people use to remain independent in one's environment?

The goal of this step is to understand activities and devices supporting the aging population; and how these activities are contextual. There is a need to consider questioning the role of place and environment: What are the living conditions? How the environment enables or constrains us? What is the landscape of aging in terms of abilities and disabilities? What type of tools do older adults use to support their daily living? Are these tools wearable prosthetics, environmental prosthetics? What are the cultural/social implications of adopting these "prosthetics" for aging?

The key is to identify the interplay between artifact and place as there are associated activities that need to be identified as issues (i.e., bathing has associated issues such as balance). This step involves working with older adults and constructing a photo storyboard representing the critical perspective (analysis) on a single need of older adults aging in place. Storyboarding is a suitable technique for documenting insights (see Figure 4). Photo storyboarding can represent taxonomies of needs helping

visualize problems/opportunities: how older adults do those activities through time? What insights come from observing, photographing and annotating older adults environment and activities? In addition, this step can benefit from creating customer journeys by understanding and visualizing what older adults do on a daily basis? What problems might they have? What has become a "new normal"?



Figure 4. Example of a prosthetics visualizations.

D. Place

The goal of this step is to define what is the *place* for aging. Historically, and today in many parts of the world, one ages in the home of a family member, usually that of a grown child and their family. In this case, aging is done within an intergenerational setting where any assistance needed is readily at hand. Moreover, aging within the family means the older person is a respected member of the group, revered for their wisdom, origin stories, memories shared with the rest of the group, and their lifetime of being the protector and provider for the clan. Yet, in other parts of the world, and certainly in the United States, families are widely scattered having relocated for jobs or other opportunities. Moreover, in a large number of households, there is either only a single parent, or there are two where both have full

professional working lives. In either case, there is seldom someone at home able to take care of an aging parent. In the United States, aging members of our society typically stay in their own home as long as they are able to fend for themselves, and when home is no longer an option, they move on to some type of assisted-living facility where, more often than not, their community consists of other elderly adults who can no longer care for themselves. Some of the most often heard complaints about such facilities – even the very best – are that they are “full of old people;” that the individual feels like an “inmate” (i.e., “imprisoned” with little agency); and that they are a nobody, surrounded by people and a place with which they have no history. So, what do we mean by ‘place’?

We spend a life time finding our particular place in the world and as we age and days become increasingly marked by loss – one’s abilities, one’s memory, one’s friends and family members – one’s place of return, one’s sanctuary, and the physical manifestation of one’s agency and rootedness in this world – one’s home – takes on significantly greater importance. Yet, not all adults can age in place in the sense they can stay in their own home for the duration of their life. The reasons may be economic, they may be physical, or they may have to do with decisions being made by others. Whatever the case, many of the new places aging adults are moved to do little to address the fundamental loss of ‘one’s place in the world’ and ‘home.’ This step looks critically at recent housing solutions for older adults from various parts of the world. The intent is to develop an understanding of what issues are being addressed in the design of these facilities, what aspects are not, and what role might a designer play in developing places and conditions that restore the aging to their ‘place in the world’ (albeit a new one), a more meaningful version of ‘home’ and all that implies about purpose, identity, memory and agency. The outcomes of this phase should be a map (see Figure 5) summarizing the components of place. If necessary, maps of older adults showing their movement and activities in place can help visualize components of place.

This step involves having a critical perspective on *place* and summarizing insights on the ‘place of aging’ by visiting local housing options ranging from nursing homes, a variety of income neighborhoods, assisted living facilities and various retirement communities. There is a need to think across scales from the overall location within the town or city, to relationship to adjacent streets, houses, schools, store, to the grounds of the facility, to the building itself, to the details of the building’s layout and design including corridors, common spaces, private spaces, bedrooms and bathrooms, interfaces between indoor and out – views, access, to mention a few.

E. Participation

The goal of this step is to develop methods and tools for empowering older adults to co-create solutions to their concerns and needs, and to develop solutions that involve the larger community in an essential way. This step requires partnering with someone in the aging community (presumably someone met during the previous steps) to

develop an intervention responding to concerns or specific needs they have articulated. What this means is that the researcher/designer, as someone familiar with creative problem-solving processes, needs to develop methods that allow the elderly partner to think like a designer/inventor and co-create a way to address their concerns. This approach places the researcher/designer as a teacher, and to do so in a way that is sensitive to the changes and fears that older adults are confronted with. Moreover, while the older adult partner may never again be able to address their own needs alone, the researcher/designer can help them obtain the tools they need to continue to have agency going forward.



Figure 5. Example of a place development.

The Participation step involved developing methods and tools for giving a member of the aging community a process by which they can become the designer’s creative partner in addressing concerns they have articulated (see Figure 6).



Figure 6. Example of participation through a meal preparation.

The goal is to develop a process, service, product or space that addresses these concerns, and include the larger community in the solution. The participation can be in the form of cultural probes such as booklet that in text and image lays out the process of the entire endeavor [16]. However, other participatory methods can be envisioned for collecting insights building on the previous steps.

F. Potential

The goal of this step is to propose possibilities—design interventions to make a change on the health and well-being of the aging population. Design interventions are defined as innovative older adult applications not limited to artifacts, but systems, platforms, programs, services, experiences, digital and non-digital (see Figure 7). The goal is to develop interventions which allow the community to take charge of generating the change.

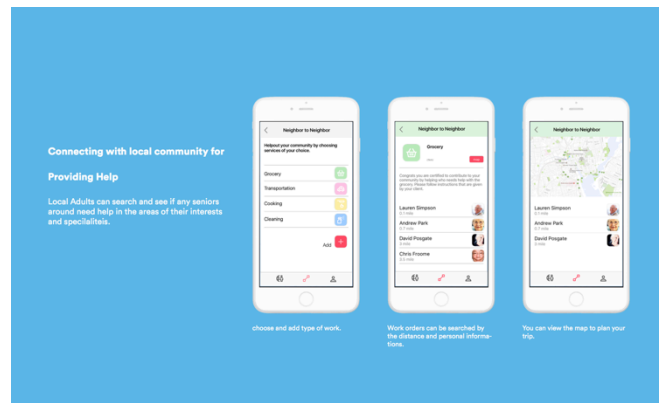


Figure 7. Examples of potential interventions.

Students were guided in the design of the interventions and encouraged to consider the following: How the interventions are designed as a creative response connected to health? How stakeholders are engaged with the designed intervention? How implementable, feasible is your designed intervention? Can the interventions be designed to be socially adopted and self-sustainable? Do designed interventions respond to the principles of the class (Independence, Progression, and Integration)?

G. Presentation

As the last step of the process, students build a presentation of their final projects. While a “potential” proposition may evolve across the length of the project, students needed to look back at every step of the process and

develop a presentation supporting their design decisions. In addition to describing the overall goal and the criteria used to envision programs, the presentation should also discuss details about use and implementation. Such details should be presented with the stakeholders in the program and visualize/map the value for each of them (i.e., the gains for the older adult might be different from the gains of the community). In addition, it should discuss incentives for the stakeholders: Why should they participate in the program? What are their gains?; the feasibility of the program: Is it a realistic solution? What resources are needed?; the financial needs: Who would sponsor the program? Of what organization would finance the program?; the implementation plan: How it would unfold the first months versus the first year, growth in next years? ; and lastly and more importantly, its sustainability: How would the program would survive through time? What resources would keep it alive? How can its enrollment be guaranteed? And how does this program address the principles presented in this class.

IV. CONCLUSION

Building on the strengths of design thinking, this paper discusses the curricular process of a class exercising empathy with users, cooperative activities, design prototyping and contextualization. This paper introduces a system for design thinking for older adults. The system is comprised of a seven-phase “P” methodology: Position, Purpose, Prosthetics, Place, Participation, Potential and Presentation. These steps allow to interchangeably mix the roles of researcher, designer, and participant into one system to advance better solution for the aging population. The methodology is built on a research-through-design approach with the goal of integrating stakeholders and designers in a unified system. More importantly, it is a methodology that celebrates a systematic understanding of issues from different scales ranging from the designer to the user and place. This paper is an attempt to provide an organized methodology that the design for aging community and related disciplines can adopt for course curriculum to speculate in the future place of aging. The significance of this paper is to introduce approaches that better identify critical opportunities when designing for the older adults. It is to discuss approaches that are contextual and personal, in the realm of designing for one in the context of many aiming at redefining care for healthy aging.

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