Inclusivity, Usability, and the Application of *Personas* for Technology Policy Design

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Abstract:

People with disabilities and the increasingly aging populations characteristic of developed economies represent under-served populations with respective challenges and opportunities for policymakers as well as for industry and the third sector. The ability to maintain independence, quality of life, and social engagement can be facilitated by a number of technological possibilities. Policy is often developed in response to social conditions and to address consequences related to technical developments. Effectively addressing these underlying problems requires designers to have a sense of the populations and contexts they are designing for. Given the nature of social systems, this applies to the design of solutions for policy problems as well as physical design. The inclusion of target populations in persona development and application helps designers, researchers, engineers, and industry collectively innovate solutions to the challenges faced by the aging population and people with disabilities, and the society they exist within. More broadly, it can impact and inform the development of policy. In this article, we explore how the concept of design personas could be applied in the development of policy that could impact the design, development, and adoption of useable, inclusive connected technologies.

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1.0 Introduction: Disability and the context of technology design and development

In many societies globally, people with disabilities and the increasingly aging populations characteristic of developed economies represent under-served populations with respective challenges and opportunities for policymakers as well as for industry and the third sector. From the perspective of the individual, the ability to maintain independence, quality of life, and social engagement can be facilitated by a number of technological possibilities. Conversely, technologies are often designed and developed in response to user needs, new innovations, or dynamic environmental considerations such as regulatory change. Similarly, policy is often developed in response to social conditions and to address consequences related to technical developments. In any case, effectively addressing these underlying problems requires the designer to have a sense of the populations and contexts they are designing for. It is a truism in design that "it is difficult to design for that which you have no experience of." Given the nature of social systems, this applies to the design of solutions for policy problems as well as physical design. In this article, we explore how the concept of design personas could be applied in the development of policy that could impact the design, development, and adoption of useable, inclusive connected technologies.

Internet of Things (IoT) related technologies, such as wearable devices, voice assistants, and sensor-based applications, can be used to help a person increase their personal independence by reducing inaccessibility. However, confounding considerations include the characteristics of the end user, as well as the environmental context of use. A useful tool in design, be it technology, services, or policy, is the use of personas. Design tools such as *personas* allow creation of reliable and realistic representations of key user segments for reference (usability.gov). The development of personas can help inform designers, researchers, and engineers on the unique challenges faced by vulnerable populations (e.g. people with disabilities and aging populations) so that they may be able to develop technological, social, and policy approaches to mitigate those challenges.

Iteratively, the inclusion of target populations in persona development and application, helps designers, researchers, engineers, and industry collectively innovate solutions to the challenges faced by the aging population and people with disabilities, and the society they exist within. In doing so, the development and use of personas that reflect target populations can further increase independence and social participation by incorporating the innovated solutions with inclusive policy and accessible technology. More broadly, it can impact and inform the development of policy. "Policies and healthcare systems should rely on quantitative data to ensure the best impact on society, but no database exists that represents the aging population in a holistic and deep way, making it difficult to create effective personas" (Gonzalez de Heredia, et al., 2018, p. 2645).

2.0 Wireless and Information Technologies: Accessibility, Usability and Inclusion

Full social engagement, active participation, and maintaining independence are critical social objectives for all individuals, but can be especially challenging for people with disabilities and the aging. Recent digital and information-based (ICT) advances such as wearable devices, voice assistants, Internet of Things (IoT) applications, and intelligent agents, made possible by the implementation of faster wireless networks (e.g. 5G), provide new technologically mediated avenues that can help maintain independence for people with disabilities and individuals as they age. A key concern of disability research relates to technologies (e.g. design, accessibility, usability, etc.) and the ways in which they function in an assistive manner. Digital and communication technologies can enhance inclusion and increase engagement for the aging. IoT and 5G networks, for instance, applied in healthcare settings, necessitate integrating relevant policies surrounding these technologies with health information and design policies. Designers, developers, and policymakers often operate independently of each other, resulting in products, services, and even policy, that do not meet the needs of the users, lack interoperability, or are hindered by obstructive implementation (Gandy, Baker, & Zeagler, 2017). By incorporating inclusive policy design, digital technologies are more likely to be aligned to the needs of the target audience (Ratwani et al. 743). Such systematic change will also result in future applications of

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these technologies facing less challenges moving forward. But, the success of these technologies depends on the effectiveness of their design and modes of adoption (Denker and Baker, 2020).

In terms of technologies, while many entities—including device manufacturers, application developers, network carriers, and other organizations recognize the importance of technology usability, considerably fewer make an inclusive design process central to component development (Moon, Baker and Goughnour, 2019). In order to create digital technologies that truly meet the needs of all users, accessibility and more broadly, usability, need to be considerations during each stage in the development process. Active end-user involvement becomes particularly important when designing applications to be used by people with disabilities due to their specialized user requirements as well as applicable regulations, standards, and guidelines. If the technology development process incorporated UD and inclusive design thinking as well as the active participation of people with disabilities, the end result would be greater independent living, more personalized care, more flexibility and mobility, and better employment and education outcomes through next-generation wireless technologies.

Finally, we propose that given the nature of policy as a constructed "object," many of the objectives that apply to technology development can likewise apply to the inclusive design of public policy (Gandy, Baker, and Zeagler, 2017). Specifically, we explore the use of a design process tool – personas, to inform the formulation and implementation of policy development.

3.0 The Design of Artifacts

In design thinking, early and recurrent incorporation of representation of stakeholders offsets these flaws. The approach used in this paper is to incorporate a stakeholder perspective early and often through the development of and framing from personas. The persona is uniquely qualified in facilitating policy development because it can represent critical characteristics of a stakeholder. Basic demographic information, relevant psychological profiles, material descriptions, social circumstances, pertinent personal connections, and other significant information personalized to both the stakeholder and the policy development process can be articulated. This helps both ground the quantified and qualified aspects of the policy and its design. It also provides helpful clusters of interlocking information that helps describe a narrative of the stakeholder.

For instance, consider the broad category of people with disabilities. Normative age-related declines on top of a pre-existing mobility disability can create new barriers to everyday activities and interrupt adaptive strategies previously employed to bridge functional limitations. This gap represents a prime area for innovation, both in terms of technological solutions as well as in terms of public policy that can facilitate greater social participation and inclusion. Research conducted by Georgia Tech researchers has explored use of data-driven personas as a way to provide information about the needs of this population and to inform the design of support services, tools, and technologies. Based on end-user data collection, observations, imagery, and anecdotal data were entered into a database by activity with the following categories: assistance from others, devices used, mobility aids used, home modifications, physical environment accommodations, damages to the home, barriers to mobility, changes over time, and ideal solutions. Personas were created by selecting a major issue or challenge identified during data collection and then adding details derived from study data but assembled in ways that protected the identities of the research participants.

Personas were developed to reflect the challenges identified in the aforementioned domains. Some 30 challenges and associated adaptations were identified during the study from which were extracted 10 major issues associated with mobility challenges in and around the home, in this case, due to development of age-related declines. Each of the 10 major issues was supplemented by photographs and other data to provide context. Data and observations from multiple participants were often combined into one persona in order to both protect the privacy of participants and better represent general trends seen across participants. Components included in the persona development were insight into the environment of the individual, the remaining abilities and functional limitations experienced by the individual, as well as goals and key motivators in addition to biographic information. In this way, the persona could be described from three different perspectives. First described was the health and wellbeing of the individual, incorporating the particular diseases, conditions, or circumstances that contributed to functional limitations experienced by the user. Second, insights were included about the home environment that interacted with the user's abilities that produced some challenge from the perspective of the user. Details and imagery of the home provided crucial input for this section, highlighting the importance of in-home data collection. Third was insights on the user's goals, aspirations, and unmet needs. This data provided a framework for envisioning a design solution to a particular problem faced by the user that might be addressed through a given intervention (see Figures 1 and 2). Providing more information about the individual and the environment helped to delineate between internal issues, external issues, capacities, and social challenges in order to clarify the design challenge being presented.

4.0 The Role and design of Policy

Policy does not emerge in a vacuum. It is an iterative process by which the convergence of actions yields a change in societal structure and interactions. It can be thought of as:

> A set of interrelated decisions taken by a political actor or group of actors concerning the selection of goals and the means of achieving them within a specified situation where those decisions should, in principle, be within the power of those actors to achieve. (Jenkins, 1978, p.15)

Typically, this formulation follows a loose hierarchy where high-level abstract ideas set the framework from which mid-level granular concepts emerge, which in turn provides the environment that low-level fine-tuning ideas are experimented with (Haelg, Sewerin, & Schmidt, 2020). An alternative, somewhat inductive approach considers a design-oriented process, whether it is intentionally inclusive of end-users, or even if that design is the unintentional consequence of political, economic or social objectives. If the objective of policy development is to generate an inclusive, usable, and effective policy, a key consideration is the mitigation of undesirable constraints, whether those elements are theoretical in nature, or result from the policy's implementation.

This relatively new approach to the development of policy, the application of design thinking processes, (Lewis, McGann, & Blomkamp, 2020), can be loosely understood as a 'human-centric' approach to policy development that draws from the techniques used by industrial designers. In terms of designers, it is: "Performing the complex creative feat of the parallel creation of a thing (object, service, system) and its way of working" (Dorst, 2011, p. 525). Design thinking is an approach that may help mitigate undesirable problem elements. Design thinking "encourages end users, policy designers, central departments, and line agencies to work in a collaborative and iterative manner. The most important skill for a design thinker is to "imagine the world from multiple perspectives – those of colleagues, clients, end-users, and customers (current and prospective)" (Brown, 2008, p. 87). One helpful categorization of stakeholders is the following framework: citizens, members of industry, members of a community, not-for-profit groups, and government entities.

A further categorization series of stakeholders includes informants, testers, contributors, and co-creators (Lupton, 2017). By gathering and consolidating a varied and healthy representation of different stakeholders who both are affected and would affect the policy in the policy formulation process, from the beginning, that policy can more closely approach an inclusive outcome. Traditionally, and too frequently, there is a delay in the gathering of these stakeholders until late in the development process. Specifically, according to Mintrom and Luetjens (2016, p. 393):

> After problem definition has occurred, options have been analyzed, and broadly acceptable ways forward have been explored. Consulting at this later stage reduces the risk of policy work being subjected to major challenge and being sent back to the drawing board.

Another potential flaw in constructing a policy without suitable inclusion of all accurately represented parties exists (Lupton, 2017). Policymakers, could focus narrowly on constructing their policy solely within the assumption that the policy will be followed as planned – which all too often is not the case. Only when the policy is implemented can policymakers see how the stakeholders are affected. At best, this means the final policy may be used in an unplanned way. At worst, it may mean that the design of the policy receives or causes negative consequences. Either way, policymakers may fail to account for what the policy would achieve with the target populations, something that could have been avoided by emphasizing more inclusiveness in the design stages of the invention.

Some policymakers and innovators use prototypes (or in this case, personas) for this very reason. A policymaker will authorize the development and deployment of prototypes to provide a tactile object the stakeholders can use to provide feedback on how they can and are likely to interact with a policy implemented similarly to the prototype. This use of prototypes in the design process are themselves strategically circumstantial. Two uses include the design science perspective and the exploratory perspective. The former is helpful for "validating a set of requirements within a systematic process, helping evaluate and eliminate options;" the latter is better for "a design process which [re]-assembles current and future actors, artefacts, practices, identities and outcomes" (Kimbell and Bailey, 2017, p. 219). The earlier a prototype is introduced, the more information can be gleaned from stakeholders as to what the effect of the policy may look like in practice.

A holistic way of viewing these practices of collaborative design for policymakers uses an inclusive policy design approach, where policymakers take into account as fully as is possible of the impact the policy will have on different groups—families, businesses, ethnic minorities, older people, the disabled, women—who are affected by the policy (Gandy, Baker, Zeagler, 2017). A frequently touted strategy in the inclusive policy approach is the Diverse Voices method, which is intended to strengthen "pre-publication technology policy documents from the perspective of

underrepresented groups" (Young, Magassa, & Friedman, 2019, p. 89). The Diverse Voices method requires the development and use of an environment where a diverse and representative body of perspectives may freely comment on and critique elements of design. Upon receiving this feedback the method involves a follow up where the contents of the feedback are used to improve the policy in question and then must be presented in a way that is "compelling and actionable to authors" (Young, Magassa, & Friedman, 2019, p. 100). A way to frame this method is to envision policy designers as composed of three primary sets of interpreters, or designers. The interpreters technology (engineers, coders, developers, etc.), the interpreters of process (legal policy, regulation, standards), and the interpreters of change (social economic technological, etc.) who have either a direct or near-direct interest in not just the outputs, but also the outcomes of the proposed policy. This third listed group of stakeholders are those who will be affected in some way by the policy, and should be viewed as interpreters of "what a policy does" to add to the other two primary designers of "what a policy should do."

Stakeholders included early in the design process helps define the early frameworks of policy design. Then with each question, decision, and inclusion involving those stakeholders, their influence in the design process becomes more solidified, trust between stakeholders and policymakers is enhanced, and there is potential for more agentic participants (Blomkamp, 2018). The framework involving their input and consideration becomes further enmeshed in the designer's decision-making. It can be viewed as a sort of compounding effect where the earlier a stakeholder is included, the more ingrained they become in the design. Alternatively, incorporating a stakeholder late may be construed or even conceptualized as rendering them a smaller role in the growing design, or resulting in policy which needs to be altered later at greater costs, or reduced efficacy.

5.0 Towards a more nuanced and inclusive policy design

How then might design tools such as personas be used in an inclusive policy design approach? When incorporating personas, which can be thought of as a type of policy input, a policymaker is informing the framing of the policy. All data considered relevant reflects on the objectives of the policymakers. Consider the collection and use of user data. Personas derived from extensive interviews and open-ended questions provide a large basis of subjective information that can advise the narrative structure of policy. Consider the case of internet of things (IoT) technologies designed to be worked on or adjacent to the body – wearables, for instance. The same basic set of technologies – sensors, data collection and manipulation, processing (e.g., software application), wireless connectivity, and display can have very different uses and contexts. A health or fitness app or device collects essentially the same data as a medical device but is treated and regulated quite differently. The Food and Drug Administration (FDA) has stated their intention to observe high-risk products (e.g. medical technologies) that facilitate the treatment of patients by clinicians; they also stated "lower-risk products, such as fitness tracker apps and other software not considered a medical device, will not be subject to FDA oversight" (Advisory Board, 2019, para. 7). The reasoning provided is that:

> Certain digital health technologies – such as mobile apps that are intended only for maintaining or encouraging a healthy lifestyle – generally fall outside the scope of the FDA's regulation. Such technologies tend to pose a low risk to patients, but can provide great value to consumers and the healthcare system. (Office of the Commissioner, 2019, para. 11)

Unregulated wellness products branded as having positive health consequences can be sold with significantly fewer restrictions and under simpler criteria than medical technology if the technology is not branded as medical in nature. Policymakers, when generating a persona, may instead prefer qualitative study over quantitative. Instead of inquiring as to regular numerical data from a lengthy and expensive clinical trial, the policymaker may instead authorize questions such as "how do you feel using our application?" A cell phone with an application that gauges heart rates during a morning jog may facilitate positive health behaviors and feedback for the stakeholder. If it does, a series of qualitative questions for stakeholders of a potential product could be used to discern design elements such as value, marketability, reliability, and ease of use of the application. Therefore, the stakeholder's values, beliefs, and perceived value proposition can be incorporated as design elements (Wilson, et al., 2018). These elements can then be included in the adoption of user personas into the policymaking process.

That said, the application of personas in the formulation of policy requires reliability and sophistication to be useful. Specifically, "to be useful, they also need to convey the multiple types of information that affect aging and impact policy and healthcare. These include not only medical information but also social, psychological and functional data" (Heredia et al., 2018, p. 2646). In practice, it is desirable that the converging lived experiences of stakeholders with disabilities and aging stakeholders can be captured (Loitsch, et al., 2016; Schulz & Fuglerud, 2020). As this can be complicated due to various constraints, as an alternative, a narrative can be developed around additional personas, here representing a wider range of stakeholders. As more personas are developed, connections between the

personas can allow the narrative to continue developing in complexity and even reliability. This narrative can be a driving framework not merely for policymakers involved in the development of these personas, but also for other policymakers who have been informed in part by the spread of these narratives. Moreover, personas can aid in bridging gaps between policymakers and stakeholders, enhancing the latter's capacity to take action and be agentic (Wilson, et al., 2018). Recalling the Jenkins (1978) definition of policy, these narratives can help provide an upper level understanding of representative goals and situations to more accurately, reliably, and effectively tackle policy not merely as a measure of what is theoretically desirable, but as a measure of what can practically be accomplished given a set of factors and how.

The persona design as introduced in this paper represent a jumping off point for the application of the personas to various categories of disability, or more broadly other target groups. In the Policy Design Process model (Gandy, Baker and Zeagler, 2017), used in this paper, the final policy output – the "product" – comes from a set of input factors, evidence-based input of applied research, project design components, policy considerations, clear identification and articulation policy of outcomes, and ideation by stakeholders and end-users. This model deviates from the traditional linear policy formulation process, as it is iterative, where each stage can simultaneously impact and be impacted by other stages in an intentional cycle. Representation within the design process involves a series of decisions based on consultation with a wide range of stakeholders and users. In the negotiation and development of policy, it is not uncommon for policymakers to rely on established thinking within certain frameworks if those frameworks have helped them with their policy design previously. This, of course, runs the risk of reinforcing social inequity or maintaining existing economic or technological barriers.

6.0 Conclusions – What can be done/next steps

While the use of personas is well established for design and technology development purposes, personas offer a valuable tool to enhance the inclusive research of individuals with disabilities and aging populations more broadly in a range of policy settings. The resulting research can then be used, rather than erasing or minimizing the experiences of underrepresented demographics, to position these experiences in the early developmental stages of policy and policymaking. The use of the term "policy" in this paper has been applied broadly to refer to a number of different realms, one which is technology. We argue that these perspectives are both relevant and support stakeholder and user related research in support of policy development.

A truism in using personas for research is that the depth of research is often considered more useful than the breadth. In other words, scarce resources and time may force a research group to decide on how detailed they want their examinations and individual persona creations to be. A significant aspect in developing personas is maintaining a strategy in research to gather as much reliable depth of each persona as is feasible. The process of writing the story and getting it validated, either by experts or by users, helps to reveal potentially wrong assumptions among the project participants. For example, the application of personas inclusive of minorities can educate other population entities to spread awareness, increase the inertia for policy reforms, reduce stigma, increase empathy, and challenge narratives sustained by majority groups. Thus, personas can act as a nexus for education (Loitsch, et al., 2016), which is one instrument of policy intervention.

In furthering research based upon the inclusion of different groups and perspectives, personas are one of several frameworks that can be used. Furthermore, discussions for enhancing the democratization of research to more actively engage the "hard to reach" can happen within the wider scope of a research framework (such as co-design) that engages concurrent themes with that of the personas framework (Blomkamp, 2018). Beyond the engagement and participation of actual different groups, use of personas to enhance public policy perspectives can more effectively generate "innovative ideas, ensure policies and services match the needs of citizens, achieve economic efficiencies by improving responsiveness, foster cooperation and trust between different groups, … and achieve support for change" (Blomkamp, 2018, p. 729). Discussions between those invested in these frameworks could help foster more creativity in research development, narrative framing, and the construction and implementation of policy.

Figure 1 - Example Persona Background Information
Alt text: Example persona includes an image of the persona character, brief bio, health and wellbeing stats, information about the home environment, and the goals and unmet needs of the character.

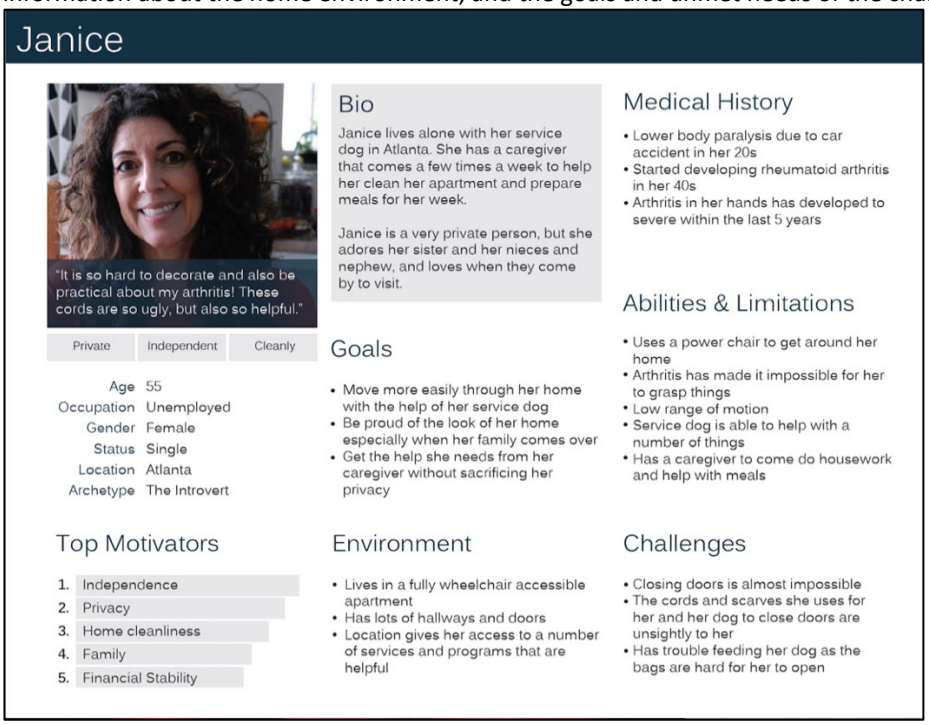
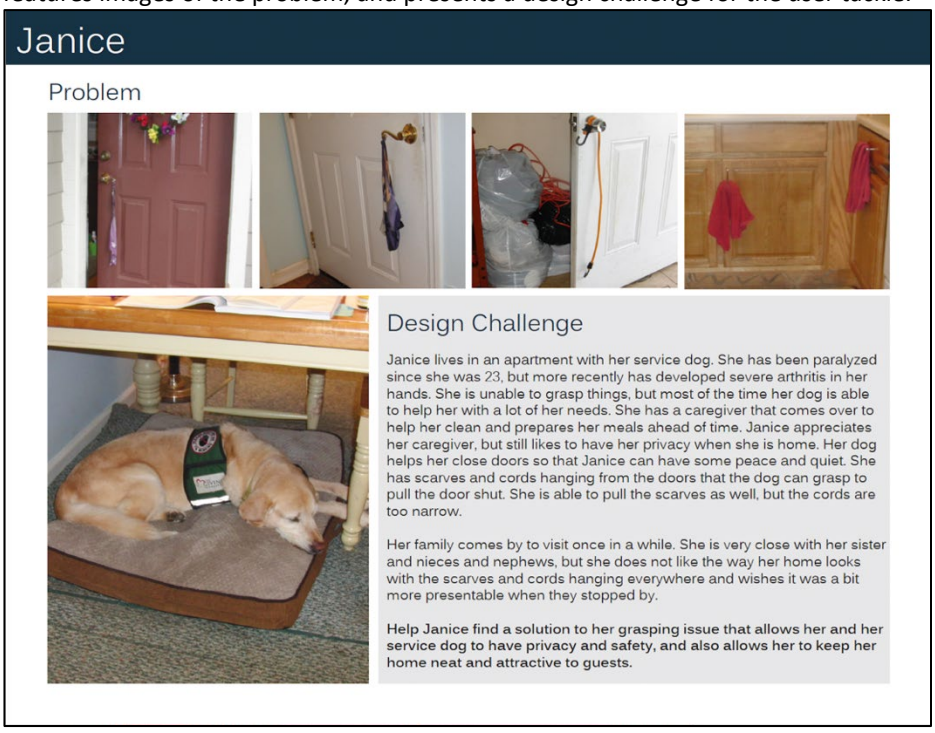


Figure 2 Example Persona Design Challenge.
Alt text: Example persona presents a problem that the persona character faces in the home environment, features images of the problem, and presents a design challenge for the user tackle.



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