

# Personas, the Pandemic, and Inclusive, Synthetic, Smart City Planning

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## ABSTRACT

In the era of COVID-19, planners, and more broadly, city administrators and policy makers, have learned to cope with the accelerated pace of change, the broad band of uncertainty, and the need for rapid decision-making strategies. In the context of ever more diverse communities and greater reliance on technology as an effective response to the social and public health challenges of the pandemic, “smart” cities harness distributed communication and service delivery technologies to enhance the quality of urban life. The voices of citizens from marginalized and under-served populations, such as older adults and people with disabilities, are vital to the development of inclusive smart cities. In this paper, expanding an inclusive policy design approach is proposed that uses ‘personas’ to actively engage those citizens.

## KEYWORDS

Citizen Engagement, Inclusion, Older Adults, People With Disabilities, Personas, Policy Innovation, Smart Cities, Technology

## 1. INTRODUCTION

The COVID-19 pandemic is at once a global social, governance and economic crisis (Levy, 2021; Maffettone & Oldani, 2020), and a prolonged lesson in the importance of systemic responses that engage citizen stakeholders (Dominguez, et al., 2020; Engelbrecht, et al., 2021). Several challenges have become clear for planners and policymakers: the accelerated pace of change, the broad band of uncertainty, and the need for rapid decision-making strategies (Costa & Peixoto, 2020; LoGiudice, et al., 2020). It has also become clear that crucial stakeholder involvement in coping with these changes involves more diverse communities (Brouselle, et al., 2019; Shin, et al., 2021). Smart cities, undergirded by information and communication technologies (ICT) and other ambient technologies such as mobile devices and the Internet of Things (IoT) have the potential to yield sustained benefits to the aspirations, service and resource needs of all citizens, provided that they are able to participate in the policy design process (Ju, et al., 2018; Wanderley & Bonacin, 2019). If anything, COVID-19 has underscored the importance of smart cities as a response to many of the challenges brought by the pandemic (Jaiswal, et al., 2020; Webb & Toh, 2020). Innovative smart city strategies and policy

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approaches benefit from the civic participation of all citizens (Bricout, et al., 2021), including older adults and people with disabilities (Zanwar, et al., 2021) with the stakeholders on the ground best suited to engage with vexing urban problems in a balanced, value-based fashion (Cairns & Wright, 2020; Mehdi, 2020). For older adults and people with disabilities specifically, COVID-19 has led to sudden and stark social isolation due to health and safety concerns (Castillo, et al., 2021; Zasadzka, et al., 2021). COVID-19 has had a disproportionately negative effect on the health of people with disabilities and older adults compared to the general population, with both groups being at greater risk for health problems. Underlying social disparities and social isolation have further exacerbated the direct and indirect ill effects of the pandemic (Kimura, et al., 2020; Totsika, et al., 2021).

During COVID-19 off-the-shelf technology was rapidly deployed to allow for continuity of operational, administrative, and governance functions. Technologies developed using universal design approaches have demonstrated effectiveness in supporting the inclusive employment of people with disabilities, both commercially available (i.e., off-the-shelf) as well as intentionally developed as assistive technologies (Damianidou, et al., 2019). However, key constituencies have not always been considered in the development and deployment process, owing to the rush to maintain work in the uncertain environment; whether in terms of technology access (Woyke, 2019), or in planning (Pineda and Corbun, 2020). The opportunity to make smart cities more accessible and inclusive, can be realized if planners, policy makers and administrators adopt more innovative approaches to develop policies addressing use and deployment of emerging technologies that facilitate citizen participation and engagement. This is particularly the case during the COVID-19 period which has pushed access many services online. Information based communication technologies used in smart cities, such as social media, virtual reality, and teleconferencing rapidly adopted in mainstream life, can also enhance the social connectedness and health of older adults and people with disabilities (Castillo, et al., 2021; Zasadzka, et al., 2021), particularly when supported by inclusive planning approaches such as ‘personas’.

‘Personas,’ are a tool consisting of imagined (constructed) “characters” that reflect a composite of shared individual or group traits (Schultz & Fuglerud, 2020; Thayer, 2014). Personas can enhance the ‘smart’ engagement of citizens, capturing their social beliefs, dignity and capacity for action, thereby providing the means of capturing underrepresented voices in a multidimensional profile (Wilson, et al., 2018). Personas can assist planners in a co-design process for developing accessible, inclusive urban environments, closing the citizen engagement gap. Personas are typically developed using a combination of naturalistic observations, records, speeches, and interviews while employing a user-centric design that puts the focus on individual needs rather than technological imperatives (Weber-Hottleman, 2021; Silva & Teixeira, 2019; Subrahmanian, et al., 2018). Personas can help inform users’ decision making, (Petsani, et al., 2020). Exploiting the persona method in the times of COVID-19 is best achieved by carefully selecting accessible technologies that enable virtual communications, user-centered design, and testing in service of persona development. It is also facilitated by ensuring sufficient digital literacy on the part of the users (people with disabilities and older adults), and the resources to participate. The multi-disciplinary team must take on some of these responsibilities, particularly around providing participation resources, education to bridge digital literacy gaps, and vetting the usability of the communication technologies

Technology affordability can be an issue for people with disabilities and older adults. While the cost of innovative assistive technologies may put them beyond reach for some, many technologies of accessibility have become common in routine devices and relatively affordable. Another tack to increase affordability is to adapt costly mainstream technologies for use in a disability context; for example, adapting mainstream mobile communication devices, thereby driving down cost, while also increasing accessibility (Barlott, et al., 2016). Hence, the adaptation of lower cost existing, off-the-shelf, or mainstream technologies may be one answer to the challenges of cost-prohibitive innovative technologies for these populations. In a complementary fashion, inclusive planning and policy making may help to address these gaps, for example making information accessible in public

buildings, schools and libraries. Equitable access to innovative technologies is clearly an issue, and points to the key role of resources in securing income in the first place, though in the United States, a number of social programs exist to subsidize the cost of accessibility (e.g. the FCC's Universal Service programs <https://www.fcc.gov/general/universal-service>).

In this paper we will discuss the process of persona development, and provide illustrative examples from a design seminar involving older veterans with disabilities. Emergent challenges for personas, together with planning and policy implications for smart city development, and recommendations for the future will also be discussed.

## 2. BACKGROUND

Smart cities are characterized by an integrated system, a distributed network undergirded by Information and Communication Technologies (ICT), and a broad array of technologies including: sensor based data, artificial intelligence, data analytics, the Internet of Things (IoT), and augmented reality, while drawing upon human and social capital (Sanchez-Corucera, et al., 2019; Wanderley & Bonacin, 2019). In the inclusive smart city, citizens are not simply passive recipients of technology-mediated resources and services, but rather engaged contributors in a reciprocal exchange (De Olivera-Netto, et al., 2016; Shin, et al., 2021). Once in possession of the tools, knowledge, and resources to participate as a 'smart populace' citizens can participate in the smart city and help realize its potential (Aljufie & Tiwari, 2021; Ju, et al., 2018).

One approach to achieving greater citizen participation can be found in a reformulation of planning processes. In this paper an inclusive policy design approach is applied to a smart planning process (Gandy, Baker, Zeagler, 2017), that employs the use of 'personas,' a tool consisting of imagined (constructed) "characters" that reflect a composite of shared individual traits (Fuglerud, et al., 2020; Thayer, 2014). Personas have been created using participatory design methods in the specific context of electronic waste disposal planning for a smart city (Wanderley & Bonacin, 2019). This context-specific problem-solving task was aimed at creating a better product, a recycling bin prototype to address the challenge of electronic waste disposal for sustainable smart cities. Personas can also assist planners in anticipating how smart environments could interact with users' abilities and aspirations more broadly for participation (Loitsch, et al., 2016; Wilson, et al., 2018). Personas help technology designers reflect on the experience of users interacting with technology, including how they interact with that technology (Petsani, et al., 2020), which coupled with the multidisciplinary design team inputs could potentially speed up the acclimation to, and adoption of remote communication technologies by older adults and people with disabilities. These same processes, as adapted for planning, offer similar advantages to help tailor inclusive policy responses. By engaging the primary stakeholders in co-design process (i.e., Blokamp, 2018; Pluchinotta, et al., 2019), planners can use the insights from disability- and older adult- focused personas to guide practices and policies for optimizing *inclusive* smart environments.

## 3. DESIGN WITH SMART CITIZENS

In many societies, people with disabilities and older adults represent under-served populations with respective challenges and opportunities for a variety of stakeholders: policymakers, industry and the public at large. The ability to maintain independence, quality of life, and social engagement can be facilitated by a number of technological possibilities in the smart city context (Zanwar, et al., 2021). Technologies are often designed and developed in response to user needs, new innovations, or dynamic environmental considerations such as regulatory change. Similarly, policy, and frequently city planning, is developed in response to social conditions and to address consequences related to technological developments. To be effective, designers must have a sense of the relevant populations and contexts.

It is a truism in design that “it is difficult to design for that which you have no experience of.” This applies to the design of solutions for policy problems, as well as application in a smart city setting.

Wirelessly connected devices such as IoT, wearable devices, voice assistants, and sensor-based applications, can be used to help a person increase their personal independence by improving contextual accessibility. However, confounding considerations include the characteristics of the end user, as well as the environmental context of use; in this case the smart city. Design tools such as personas allow creation of reliable and realistic representations of key user segments, such as older adults and people with disabilities for reference and help ensure usability (Queirósa, et al., 2014; Usability.gov, n.d.). Iteratively, the inclusion of target populations in persona development and application, in a participatory process helps designers, researchers, engineers, and industry collectively innovate, capacity building solutions to the challenges faced by the aging population and people with disabilities, incorporating the innovated solutions with inclusive policy and accessible technology. More broadly, it can impact and inform the development of policy, assuming the underlying technological systems, data collection, and analysis are suitably designed and deployed. “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).

#### **4. CULTURAL AND SOCIAL PLANNING**

Full social engagement, active participation, and maintaining independence of living are critical social objectives for all individuals, but can be especially challenging for people with disabilities and older adults. A key concern of disability research relates to technology characteristics (e.g. design, accessibility, etc.) and the ways in which they can function in an assistive manner. Digital and communication technologies can enhance inclusion and increase engagement for older adults and people with disabilities. IoT and 5G networks, for instance, applied in public health settings, necessitate integrating relevant policies surrounding these technologies with health information and design policies. Designers, developers, and policymakers too often operate independently of each other, resulting in products, services, and even policy that do not meet the needs of the users, or are hindered by suboptimal implementation (Gandy, Baker, & Zeagler, 2017, Moon, Baker and Goughnour, 2019). By incorporating inclusive policy design and planning processes, smart cities are more likely to be aligned to the needs of the citizens, and the success of enabling technologies iteratively depends on the effectiveness of their design and modes of adoption (Denker and Baker, 2020). Privacy is a key issue that must be addressed in the collection and exchange of data. The co-creation of policy design, beginning with policy formulation for government and governance, must be founded in data transparency, clarity and accountability. This ensures that all stakeholders can comprehend the meaning of the data and the parameters of data exchange, in addition to legal and regulatory safeguards (Maffei, et al., 2020).

In order to ensure that smart city related digital technologies truly meet the needs of all users, accessibility, and more broadly, usability, need to be considerations during each stage in the planning 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 – an observation that has become apparent during the COVID-19 pandemic. If the smart city planning process incorporated universal design (UD) and inclusive design thinking as well as the active participation of people with disabilities, the end result could be greater independent living, more personalized care, more flexibility and mobility, and better employment and education outcomes through next-generation wireless technologies. As is the case of policy, planning can be thought of as a constructed “object,” (or process) and 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, the use of a design process tool – personas, is explored to

inform the formulation and implementation of planning process; in this case, for individuals with disabilities and older adults.

Planning can be thought of as the application of a set of design principles that guide the development of the smart city context. Further it can be applied to other public sector approaches such as legislation, regulations and standards. It is an iterative process by which the convergence of actions yields a change in societal structure and interactions. Typically, this formulation – policymaking – 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, et al., 2020). Planning, as the term is used in this paper, is a design-oriented process, intentionally inclusive of end-users, even if that design is the unintentional consequence of political, economic or social objectives. The implementation process, which speaks to how practices are actually carried out, is a key element, and requires sensitivity to changing circumstances, tapping into real case examples, and also calls for some foresight, so specific interactions and conditions can be prefigured prior to implementation (Maffei, et al., 2020). Developing personas in the time of COVID-19 is a case in point. COVID-19 has drastically changed circumstances of living for older adults and people with disabilities, while also accelerated trends towards greater technology use and social inequities, and requires that policy implementation planning that take those trends into consideration.

While more common in traditional planning, the application of design thinking processes to policy, (Lewis, et al., 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, or 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, planners, central departments, and line agencies to work in a collaborative and iterative manner. The *Inclusive Policy Design Process* presented in this paper, draws upon many design-thinking principles in the development of inclusive policymaking. 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.

Another potential flaw in constructing planning and more broadly, policy, occurs when suitable inclusion of all accurately represented parties is overlooked (Lupton, 2017), which occurs in the absence of stakeholder involvement and due consideration of conditions on the ground. Here, policymakers, 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. In this case, it is only after the policy is implemented that 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, planners may fail to account for what the embedded 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 planners and public sector innovators use prototypes (or in this case, personas) for this very reason. In the case of technology related policy, policymakers authorize the development and deployment of prototypes to provide a physical object that stakeholders can use to provide feedback on how they can and are likely to interact with a prototypical design. An example of this might be the user testing of say, the operation of certain wireless devices. Recognizing that policy makers may be removed from those who deliver services, there is a strong case to be made for citizen-centered governance intelligence for smart cities that compliments on-the-ground assessments of the units charged with service delivery (Ju, et al., 2018).

## 5. INCLUSIVE DESIGN PROCESS

In an inclusive design process, early and recurrent incorporation of representation of stakeholders offsets some flaws of the traditional design and deploy approach. The approach described in this paper incorporates a stakeholder-centric perspective early and often through the development and framing of personas. The persona tool is innovative in application when facilitating policy development because it can represent critical characteristics of a stakeholder, which might be overlooked or not otherwise taken into account. 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. The Centers for Disease Control and Prevention (CDC) delineates functional disability types into the following six categories: serious difficulty with regards to cognition, hearing, mobility, and vision, and any difficulty with self-care and/or independent living (Stevens et al., 2016). The personas outlined in this paper focused on individuals with serious difficulty with mobility who are also over the age 50 years (and therefore potentially facing normative, age-related physical declines). The World Health Organization's International Classification of Functioning, Disability and Health (ICF), a multidimensional approach to defining disability in terms of: functioning and disability, composed of body functions and structures, and activities and participations, in combination with contextual factors - environmental and personal factors, in a unifying framework (Koutsogeorgou, et al., 2014). Using the ICF as a lens to understanding disability, it is important to note that an individual's functioning may vary from context to context; in other words, specific domain functioning is a product of the interaction between health conditions and environmental and personal factors. Therefore, the individual experiences of two individuals with "identical" mobility disabilities will not be the same. It is here that multi-dimensional personas may be particularly useful; distinct, disparate personas can be applied to the same technology or policy problem to represent stakeholders' situations, contexts and the interactions between them.

Authors of this paper explored use of data-driven personas as a way to provide information about the needs of target populations 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. These are all factors that affect the ability of citizens to independently navigate the city environment.

Personas were developed to reflect the challenges identified in the aforementioned domains. Some 30 challenges and associated adaptations were identified during the study. From these, 10 major issues associated with mobility challenges in and around the home, were extracted. 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 an 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. The third was insights on the user's goals, aspirations, and unmet needs. These 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. 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. A case is presented, featuring a STEM innovation network for military veterans with disabilities, in which this process was applied to provide input into a broader policymaking process. Insights from the iterative stakeholder workshops were used to help establish the user characteristics, barriers and objectives for the design of an inclusive innovation network of STEM related start-ups.

## **6. USE CASE: INCLUSIVE PLANNING**

How then might design tools such as personas be used in an inclusive planning approach? When incorporating personas, which can be thought of as a type of policy input, a policymaker or planner is informing the framing of the policy. All data considered relevant reflects on the objectives of the designer. A holistic way of viewing these practices of collaborative design for planners 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 way to frame this method is to envision planners as composed of three primary sets of interpreters, or designers. The interpreters of technology (engineers, coders, developers, etc.), the interpreters of process (legal policy, regulation, standards), and the interpreters of change (social economic technological, etc.) who have an interest in the outputs, and outcomes of the designed policy. This third listed group of interpreters-- those who will be affected in some way by the policy--should be viewed as interpreters of “what a policy accomplishes” to add to the other two primary designers of how planning could inclusively operate.

Intentionally engaging a more inclusive set of participants early in the planning/design process can help better focus the initial frame of policy design. With each question, decision, and inclusion involving those stakeholders, their influence in the 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 planning processes. 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. By gathering and consolidating a varied and healthy representation of different stakeholders who both are affected and would affect the process, from the beginning, planning can more closely result in inclusive outcomes. Traditionally, and too frequently, there is a delay in the gathering of these stakeholders until late in the development process. Consulting users at this point increases the risk of policy work being subjected to major challenge and being sent back to the drawing board.

But how then are personas applied in the policy and planning design process? Consider the collection and use of user data. The personas tool was generated based on extensive interviews and open-ended questions which provide a large basis of subjective information that can in turn, inform the narrative structure of policy. Consider an example from the design of a technological artifact - 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. 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. Planners, 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 designer 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). An emphasis on values and beliefs drawn out through a co-design process allows the developing narrative to be situated in local circumstances and experiences. Variations in behaviors and perspectives among stakeholders are captured, with attention paid to their agency and choices, rather than positing uniform reactions to blanket needs. Persona development avoids approaches imbued with stereotyped assumptions (i.e., ‘rigid’ older adults, ‘distractible’ people with disabilities), as the process is situated ‘life worlds’ scenarios, alternative viewpoints, and multi-disciplinary development teams with distinct perspectives (Turner & Turner, 2011; Silva & Teixeira, 2019). The richness of such personas mitigates against false self-consistencies that may emerge from stereotyped user profiles created by others, such as experts in Human-Computer Interactions (HCI) (Wilson, et al., 2018). In fact, personas can be developed as ‘contradictory tools’ outright challenging stereotypes. For example, challenging the notion of elderly individuals as frail and out-of-touch, a persona representing a modern older adult could incorporate digital literacy as a trait of varying ability levels (Petsani, et al., 2020).

Turning to the policy design application, the persona design as introduced in this paper represents a jumping off point for the application of the personas to various categories of disability within a policy or planning domain. In the Policy Design Process model (Gandy, Baker and Zeagler, 2017), used in this paper, the final 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.

A prototype application of this model was used to help design a policy proposal that would facilitate deployment of an inclusive innovation network for military veterans with STEM training. The proposed network was intended to increase the participation of the target group in technology related start-ups – a relevant set of stakeholder in smart cities. The collaborative network was also intended to help develop a better understanding of the needs of the target population, and in particular the operation, motivation and makeup of relevant veteran owned small businesses, and to the ways in which their STEM education and skills have been useful. A day-long visioning/design workshop *Veterans STEM Innovation Network: Participatory Design Workshop* was held with 12 participants at a major Southeastern public research university. Following introduction of framing material which (while not specifically personas based) contained elements of the key policy context and stakeholder characteristics, including voices of several of representative stakeholders, and an afternoon session was

convened that generated a number of policy inputs. These included: identification of characteristics/perspectives of STEM trained veterans and what barriers exist to participation in STEM Innovation activities; discussion of existing opportunities, what unmet needs are present, and what tools could address these (policy/technology/practice); and delineation of potential solutions addressing veterans needs and ways of bringing together industry, innovation support intermediaries and veterans. Findings of the workshop were incorporated into a National Science Foundation Policy Report (Husbands Fealing, et al., 2018), that offered new ideas for the development of policy to enhance participation of Veterans with disabilities in the STEM economy. Although outside the scope of this paper, it is worth noting that interactive approaches to capacity building, such as enhancing planning education, have the potential to inform future STEM skill building in different use contexts.

## 7. DISCUSSION

In the COVID-19 context, personas offer a valuable tool to enhance the inclusive research of individuals with disabilities and aging populations more broadly across a range of policy settings, of which smart city planning provides a key use case, owing to its increasing prevalence and sophistication, bolstered by the trend towards greater technology use and technology-mediated services in the wake of COVID-19 concerns around public health. The resulting research findings can then be used, rather than erasing or minimizing the experiences of underrepresented demographics, to position these experiences in the early developmental stages of policymaking and planning. The use of the constructs of “policy” and planning in this paper is applied broadly to a number of different realms, one which is technology. It is proposed that these perspectives are both relevant and support stakeholder and user related research in support of policy development and associated planning processes. As a result of the insights developed from the Veterans STEM Innovation Network: Participatory Design Workshop, it became clear that the inclusive policy design process, while successful, could have benefited from the use of additional constructed personas, which would have expanded the context provided to the participants in the workshop. The process, as employed, followed the iterative policy framework

Applying personas in the formulation of policy and planning initiatives aimed at fostering greater inclusion in smart cities requires reliability and creativity to be useful. 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 planners directly involved in the development of these personas, but also for other policymakers whose perspectives on the utility of multi-dimensional citizen profiles to drive innovation have been informed in part by the spread of these narratives. Moreover, personas can aid in bridging gaps between planners 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 be applied to provide an upper level understanding of representative goals and situations to more accurately, reliably, and effectively tackle planning efforts not merely as a measure of what is theoretically desirable, but as a measure of what can practically be accomplished given a set of contextualized factors captured in an iterative process that responds to the changing dynamics of the COVID-19 pandemic and its effects on urban life.

## 8. CONCLUSION

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, by experts,

by users, or preferably both, helps to reveal potentially wrong assumptions among the project participants. Assumptions can easily be embedded in urban policy scripts that are rendered invisible when the key parties are not invited to the table and cultural norms prevail unquestioned (Visser, 2019). By contrast, the application of personas inclusive of marginalized groups involved in their co-design can educate mainstream population entities to spread awareness, increase the momentum for policy and planning reform, 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 intervention.

As we contemplate the use of personas in the future we must also consider several emergent challenges. Personas are tasked with being relevant, dependable, accurate, credible and representative, and thus dynamic enough over time to accommodate changing scenarios, while also catalyzing better designs that bridge the experiences of the primary stakeholders and the gaps in understanding of the researchers (Silva & Teixeira, 2019). One way to capture this dynamism is to make them ‘refreshable,’ as data-driven persona (DDP) development permits, using algorithms along the lines of ‘personified big data’, using machine learning, either in concert with the manual, qualitative methods used in our study or independently (Petsani, et al., 2020; Salimen, et al., 2021). DDP can support new data using re-analysis of standard algorithms, avoiding the cost of manual approaches, provided that the nature and volume of data are adequate. In the future, as behavioral web analytics data and textual social media data, coupled with virtual persona-user interactivity may lead to fully automated persona systems, but qualitative methods still have a complementary role to play (Salimen, et al., 2021).

Another key to developing more robust personas will be to make them more durable, dynamic and customizable, such that they can be updated to reflect changing contexts. Personas can become outdated quickly, which calls for enhancements to reflect a changing personal and societal contexts: for example, willingness to be supported, current living conditions, impairment, and comfort level with technology (Petsani, et al., 2020). Attention needs to be given to ‘transferability,’ attuning the developmental process to the contexts of time and/or place, setting the groundwork for infusing new and complimentary information into the overall persona characteristics to meet the specifications of new use scenarios (Silva & Teixeira, 2019). Real participants can also provide feedback on the credibility, consistency, and consistency of personas, using a Personal Perception Scape (PPS) providing a ‘gap analysis’, and that feedback can be used to enhance the personas (Petsani, et al., 2020).

The data-driven smart city is both situated in, and contributes to the social, political and cultural context of urban life. In this context, application of personas can be part of large-scale online analytics data, inclusive of artificial intelligence analytics (Salminen, et al., 2018; Salminen, et al., 2020) consonant with the use of smart city analytics in the era of COVID-19, which include important considerations of making smart cities safer, more resilient to change, more sustainable, and in alignment with the United Nation’s Sustainable Development Goal 11 (Allam & Jones, 2020; Visvizi & del Hoyo, 2021; Wanderley, & Bonacin, 2019). Anticipating the future impact of personas on the social sustainability of smart cities, that is social inclusion and equity (Rebernik, et al., 2020), personas can tap into, and help synthesize, the tacit stakeholder knowledge, employing social media, user review and peer checks with empirical/numerical data in a complementary fashion (Mahamuni, et al., 2018; Salminen, et al., 2020). The multidimensional, adaptive nature of personas can assist planners and policy makers align strategic priorities with a deeper understanding of the fluid and changeable smart city environment. On a micro scale, the design of distributed smart city service systems, including intelligent assistive technologies, could be better adapted using personas to match the dynamic needs and aspirations of people with disabilities and older adults as growing segments of the population. The net effect is to add another tool to the store of civic engagement approaches in the smart city. Because personas require relatively modest investments of resources, they may provide disproportionate benefits toward creating smart policies, and more effective planning. Most importantly the COVID-19 era smart city, evolving in the context of pandemic public health concerns, more diverse communities, and a rising social consciousness, argues for planning approaches that are

participatory, iterative, and contextualized. Personas can serve as a ready tool for planners, policy makers and institutions to respond to this dynamic change environment effectively.

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