OCASIO ADORNO, JESSICA M., M.F.A. Micro-dwellings as Housing for Young Adult Professionals. (2018)
Directed by Dr. Maruja Torres-Antonini. 216 pp.

Millennials 20-29 years old were disproportionately affected by the housing crisis resulting in 31% of them still living at home; shut out of the rental housing market (Johnson, 2010). They are cash-strapped due to mortgage inaccessibility and lack of affordable housing options. With aspirations to live in “exciting urban settings”, as studies suggest, many of them are amenable to living in smaller spaces presumed to be affordable, such as micro-dwellings. As different types of these surface in the housing market, this assumption remains untested, suggesting the need for further research. Therefore, this study explores micro-dwellings as a potential rental housing option for this population and addresses the following research question: *What is the possible fit between the housing aspirations of young adults, and the micro-dwelling housing model?*

1. What do young adults value most in housing?
2. Which, among the different micro-dwelling housing types available in the rental market, might be viable housing options for young adults?
3. What is the optimal design of micro-dwellings as housing for young adults?

This exploratory study combines data-driven, qualitative, and empirical components for a mixed-methods approach. Observations of existing micro-dwellings were documented to assess their characteristics through site visits and a design charrette. Millennials’ housing aspirations were identified through literature review and examined via an online survey distributed to young adults in a mid-size city in the Southeast. Descriptive statistics analysis of the data found that: 1) Out of 32 responses recorded, 65.6% would prefer to live in an urban location; 2) 60.9% showed a high

desire for proximity to neighborhood and community amenities, confirming previous published studies' claims; 3) 40.7% would live in a micro-dwelling, suggesting that current models partially satisfy the needs of the population; 4) 53.1% would find micro-dwellings more desirable if they offered communal spaces to satisfy their socialization needs.

The information gathered from the review of literature, site visits, design charrette, and survey informed a pattern language. This pattern consisted of twelve design guidelines which were then tested through an empirical component. To provide the necessary proof of concept and accept or reject the hypothesis that micro-dwellings are a viable housing option for young adults; a comprehensive design proposal was developed, composed of a micro-dwelling community model and its units.

MICRO-DWELLINGS AS HOUSING FOR YOUNG ADULT PROFESSIONALS

by

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A Thesis Submitted to
the Faculty of The Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Master of Fine Arts

Greensboro
2018

Approved by

_____
Committee Chair

DEDICATION

To my parents, Juana Adorno Rolón and Félix E. Ocasio Montalvo, and sister Jennifer K. Ocasio Adorno; thank you for your unconditional love and support, for always believing me and reminding me that I am capable of accomplishing anything I put my mind to. I wouldn't have been able to accomplish this without you.

APPROVAL PAGE

This thesis written by Jessica M. Ocasio Adorno has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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Date of Acceptance by Committee

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Date of Final Oral Examination

ACKNOWLEDGEMENTS

I wish to express my gratitude to everyone that has supported me throughout these past two years. To my thesis committee: Thank you to Dr. Maruja Torres-Antonini, thesis chair, who continually offered me her guidance and encouragement, motivating me to put my best foot forward. Thank you for sharing your knowledge with me, investing your time in me, and believing in me from the very beginning. This accomplishment would not have been possible without you. To Travis Hicks for being a consistent source of support and providing me opportunities to enrich my thesis through the CC-ED. To Dr. Amanda Gale for helping me approach my research from a different point of view and helping me complete my thesis despite unforeseen situations.

Thank you to the UNCG Interior Architecture Department, the Graduate School, MPA director Ruth DeHoog, SyngerG, and the Wood Properties for their collaboration and financial support, throughout my research. Thank you to Tiny Houses Greensboro, particularly Scott Jones, for their constant support and for allowing me to grow as a student and designer through the organization.

A special thank you to everybody in my family. To my immediate family, Mom, Dad, Jenn; to my grandparents, Abuela Rosa, Abuela Nereida, Abuelo; to my extended family Jorgito, Karyn, and Rafito: Your indescribable love and support was and always will be my source of strength and motivation. Thank you for always believing in me.

Thank you to all the friends I have made during this experience. Particularly to Isa, Carolina, and Zuly: Thank you for always sticking by my side and for being the rock I needed these past two years. Your love, support, and antics made this experience worthwhile.

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CHAPTER I

INTRODUCTION

Four years have passed since the first sustained recovery after the Housing Crisis in 2007, and young adults, defined as 20 to 29 year olds in this study, still don't have the means to join the housing market through renting or homeownership. This population currently makes up the greater part of the millennial generation, those born in or after 1980 until 2002, also known as Generation Y (Hayden, 2010). The Housing Crisis has particularly affected millennials among the 76% of Americans who are living paycheck-to-paycheck (Johnson, 2010). They carry low credit scores, high student loan debts, and, disproportionately, have found themselves moving back in with their parents or simply not leaving the nest.

Although young adults have been shut out of both the housing and rental market, rental housing options align with millennials' high residential mobility and desire for community. According to Timmerman (2015), in 2014, 62% of adults between 18 to 29 years old changed residences, and this percentage continued to grow, surpassing their elders also known as Generation X and Baby Boomers. This residential mobility has been attributed to their education, work and life transitions (Pew Research Center [PRC], 2010).

The participation of young adults in the homeownership and rental market could have a positive impact on the economy, and the market itself, as they form part of the largest generation yet. With 83.1 million millennials in the United States, they surpass Baby Boomers, who amount to 75.4 million (U.S. Census Bureau, 2015). This is nearly

10% more than the Baby Boomer population. In the next few decades, there will be a generational shift and millennials will become the largest generation impacting the economy and market. Knowing their inevitable impact makes it important for realtors, developers, architects, and designers to acknowledge the housing aspirations and needs of this population.

According to the National Association of Realtors, millennials should make up the majority of first-time homeowners (Xu, Johnson, Bartholomae, O'Neill, & Gutter, 2015). Similarly, Goodman (2015) states that the majority of millennials has completed their college education and should be the biggest source of first-time renters, which is crucial for a growing rental market. This generation is one that has been particularly affected by the housing crisis and ridden with student loan debts. The housing crisis occurred when housing prices increased without a change in the supply or demand that could justify this rise in prices (Baker, 2007). This resulted in one in four American homeowners with mortgage debts greater than the value of their home (Xu et al., 2015).

Although millennials should have been the largest source of first-time renters, they have not been able to break into the rental market as expected, with many of them still living at home with their parents. However, millennials entering the housing and rental market may lead to the development and sale of housing, which in turn, should generate employment, tax, and income. According to Schwartz (2015),

> The National Association of Home Builders (NAHB) estimates that the construction of 100 new single-family homes, in the average metropolitan area, generates about 324 full-time-equivalent jobs for the local community during the construction period, and about $21 million in income for local businesses and workers (p. 5).

These young adults and emerging professionals need affordable housing options; for this, it is important to understand who they are and what they value most in housing. This generation differs from past generations regarding their lifestyle and housing aspirations and needs. This is a generation that is known for their interest in, and to a certain degree dependence on, technology, their high desire for socialization and forming a community, and their tendency to delay getting married and starting a family.

Young adults are also known for their tendency to live a simpler life. They accomplish this by reducing the clutter and complexity in their life, changing transportation modes, reducing their consumption, and preferring smaller-scale living spaces (Elgin, 1993). This voluntary simplicity has an effect on the environment, economy, and society as individuals move towards a more ecological approach to living. In fact, these smaller-scale living arrangements tend to foster a sense of community, as they allow more opportunities for the residents to interact with their neighbors.

Therefore, aside from the inevitable impact this large population will have on the housing market, the relationship between humans and their residential and community environment is an important component of design that needs to be explored and addressed. According to environmental psychology, housing serves as more than a physical space that satisfies human's needs for shelter; it is also defined as the ways in which individuals interact with them (Kopec, 2006).

In particular, urban environmental psychology looks at how the relationship between people, psychological processes, and the environment impacts behavior in the community and the potentiality of creating a sense of community. This sense of community could help satisfy the target population's housing needs, as a successful

community life contributes to a successful home environment (Timmerman, 2015). Individuals' satisfaction with their residential environment is composed of more than the house and its physical qualities; it includes the neighborhood and social quality of the environment (Bechtel, 1997).

Individuals form part of a larger interconnected web where every single movement has an effect on other parts of the web. This emphasizes the importance of addressing social interactions, as they influence individuals' residential preferences, choices, and satisfaction. The idea of community also refers to a cognitive and emotional state. Feelings of community, also known as sense of community, are a form of place attachment that deepens when physical and/or psychological attributes are found in common (Kopec, 2006). Today's communities tend to be more intentional than in the past. This can be seen in communities that are created based on shared values, such as cohousing communities, which begin to reflect millennials' need and desire for becoming part of a community. However, these do not satisfy other housing needs and aspirations millennials' have, such as living in urban areas.

Furthermore, studies have shown that millennials, "want to live in exciting urban settings, and consider smaller living spaces acceptable" (Hayden, 2010, p. 6). Recent housing trends favor "small" and "not-so-big" living in an array of housing types with reduced square footage. With different types of micro-dwellings making their way into the housing market, such as tiny houses, accessory dwelling units (ADUs), and micro unit apartments; a newfound interest in these dwellings has emerged among young professionals in the United States. Not only have young adults begun to favor this rental housing type, but this trend is also becoming popular among developers, architects, and designers.

Micro-dwellings, used as an umbrella term for housing types with reduced square footage, are being designed and built with different purposes, such as housing the homeless, housing elderly individuals, and reducing the impact on the environment. These micro-dwellings have been seen in different settings: suburban, rural, and urban, serving a wide array of intents. Intentional communities, such as pocket neighborhoods, micro villages, and cohousing communities are also found in these settings.

Pocket neighborhoods are clustered groups of neighboring houses that are known for providing well-defined personal spaces, while also fostering a sense of community. This is accomplished through porches and balconies that serve as extended living spaces, as well as shared green spaces that are offered centrally to the clusters of houses.

Similarly, cohousing communities commonly offer central outdoor spaces for socialization, with streets typically located behind the dwellings. These communities also provide a common house that is the heart of the community and is used for both practical and social reasons. They are well known for advocating common spaces for people to interact. In fact, the Cohousing Association of the United States' (2017) motto is "building community one neighborhood at a time". Cohousing defines a community model that offers the social advantages of a closely-knit neighborhood, while also providing privacy, security, and belonging.

The most common type of micro-dwellings, tiny houses, are typically seen in rural settings and are known for housing individuals interested in the sustainability factor and environmental aspects of downsizing. They range from 150 to 430 square feet, resulting in major legal obstacles. However, with a new appendix in the International Residential

Code (IRC), tiny houses are rising as a way of housing homeless individuals, bringing together like-minded people, and providing affordable housing.

Micro-dwellings are also seen in the form of accessory dwelling units (ADUs), also known as granny flats or mother-in-law suites, in suburban neighborhoods, serving as rentals units. ADUs, typically smaller dwelling units located behind the primary dwelling, commonly serve as a way of providing family members, young adults, or elderly individuals a private living space while maintaining them close by. These are also on occasion used as a way of providing affordable housing, while making efficient use of the existing housing stock.

Micro unit apartments are among the newer housing types to enter the rental market and are typically found in urban settings. Typically, due to their location, the target demographic of these developments are young professional singles, young couples and roommates, and older move-down singles. Although seen as an example of luxury stock rentals, these have also been built with the intent of accommodating cities' growing small household populations and serving as affordable housing. Additionally, in order to comply with the Fair Housing Amendment Act (Barrier Free Environments Inc., 1996) for the affordable housing units, these apartments incorporate innovative design features, such as flexible furniture systems, high ceilings, oversized windows, built-in storage, and movable kitchen islands (Whitlow, B., Hewlett, C., Ruiz, T., & Witten, R., 2013).

Literature and previous studies clearly indicate young adult professionals' need for housing. They suggest that a portion of millennials are interested in living in smaller spaces due to the presumed affordability of these, as well as their potential interest in micro-dwellings to address this need. As different types of micro-dwellings continue to

make their way into the housing and rental market, there is a need for studies of the different available types through the perspective of interior architecture and design, and their potential for satisfying this population's housing needs, including cost. However, there is little documented evidence of this implementation, suggesting the need for further research that provides a proof of concept. There is currently a gap in literature and studies in which these claims are tested or proven through their application to a case.

In the next few decades, a large generational shift will occur, making millennials the largest generation impacting the economy and housing market. There is urgency in understanding how dwelling units should be designed for millennials. Research of this kind could be beneficial to developers, contractors, architects, and designers, as it may contribute to the design and development of micro-dwellings as an alternative housing type for young adults. Thus there is pressing need to provide guidelines that facilitate the design of micro-dwellings to satisfy young adult professionals' needs and aspirations. This prompts the question, *What is the possible fit between the housing aspirations of young adults, and the micro-dwelling housing model?*

CHAPTER II

LITERATURE REVIEW

Literature was reviewed on the housing crisis, rental housing options in the market, types of micro-dwellings and micro-dwelling communities, and millennials and young adult professionals' characteristics, among others, in order to better understand what issues may have been previously investigated, and identify any gaps in existing literature and studies. The body of literature reviewed is mapped in Figure 1.

The literature review explored four main topics: the millennial generation, environmental psychology, the housing market, and the micro-dwelling movement. The literature examined under the millennial generation covered young adult professionals, their demographic impact, and housing needs. The literature focused on the social needs of the generation, studying this one dimension of the generation's needs. The topic of residential and urban environments covered simple living and a sense of community. Within the latter, community factors were studied. These topics helped identify millennials housing aspirations and how the built environment relates to those needs.

The housing market topic covered the housing crisis of 2007 affecting homeownership and rental markets, homeownership among young adults, young adults and the rental market, and the social and economic impacts of the housing market on millennials. Finally, the literature examined under the micro-dwelling movement covered the International Residential Code (IRC), small living, micro communities, micro-

dwellings, and design considerations. Review of small living literature offered information on its environmental, economic, and social benefits. The micro communities studied were micro-villages, pocket neighborhoods, and cohousing communities. Finally, three conventional types of micro-dwellings were covered: tiny houses, micro unit apartments, and accessory dwelling units (ADUs). Finally, the information covered in these topics allowed understanding of the types of micro-dwellings in the market and how these may satisfy millennials' needs.

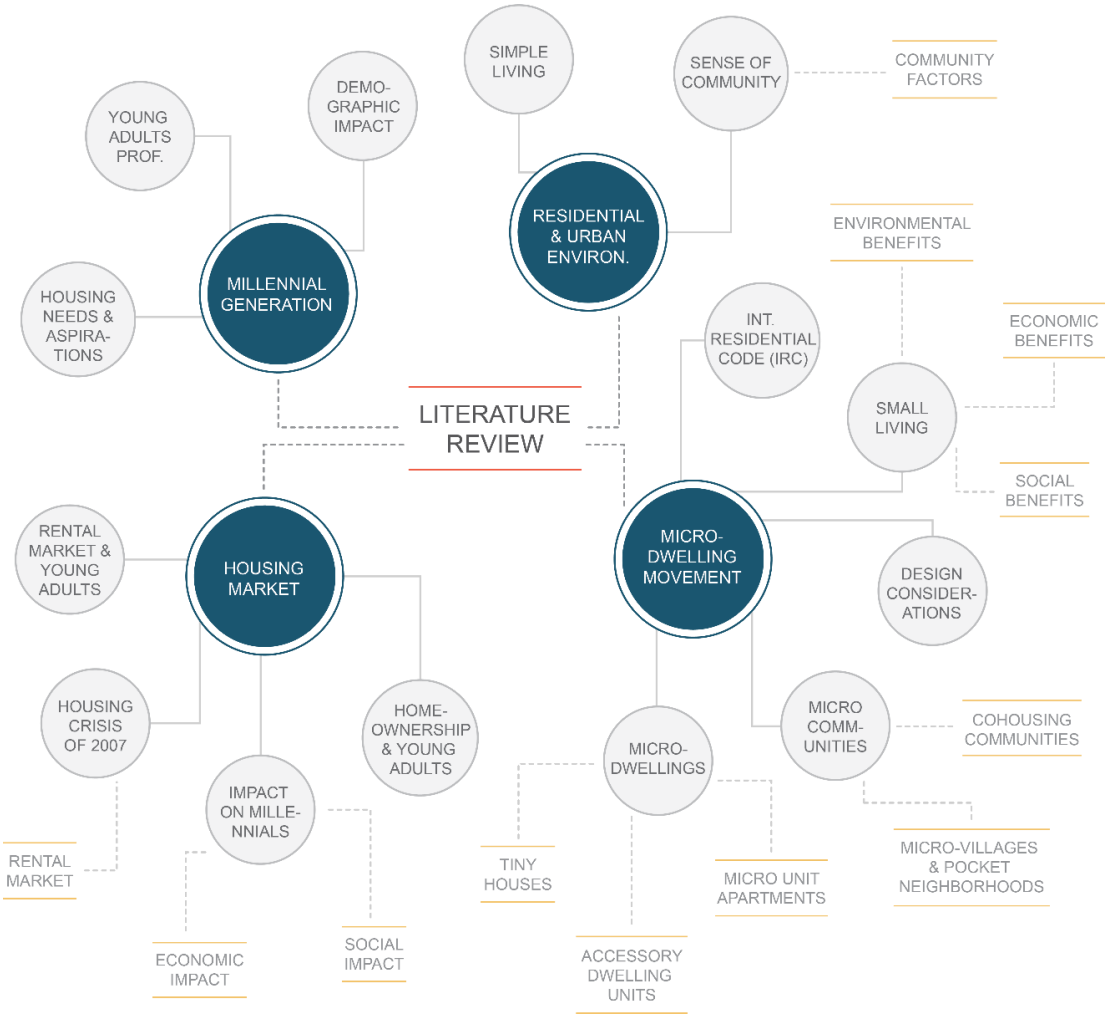


Figure 1. Literature Map

Millennial Generation

The population targeted in this study corresponds to the millennial generation, which at the time of this study refers to 18 to 38 year-olds, and is composed largely of young adult professionals. Millennials are the generation of people born in or after 1980 until 2000, also known as Generation Y (Young & Hinesly, 2012). Neill Howe and William Strauss' research on social generations led to formulating a theory that describes the generational history of the United States. The Strauss-Howe Generational Theory describes the millennial generation as similar to the G.I. generation, with their rising civic engagement, and collective confidence and spirit (Howe & Strauss, 1997). The millennials' archetype is the hero; those who grew up protected and are the team-workers during a crisis. This can be seen in that, despite the economic downturns millennials are facing, they have maintained high hopes for their future due to their collective optimism and enthusiasm.

The PRC (2010), describes millennials as "more ethnically and racially diverse than older generations, more educated, less likely to be working and slower to settle down" (p.9). Regarding their living arrangements, millennials are less likely to be married or have children than earlier generations were at the same age.

As shown in Figure 2, surveys conducted by the PRC in the past suggest that during the same age range, 18 to 28 years old, 75% of millennials have never been married, while 43% of the Silent Generation (1928-1945), 52% of Baby Boomers (1946-1964), and 62% of Generation X (1965-1980) had never been married. In fact, only 21% of millennials were married at the time of the survey and 12% were married with children at home, amounting to only half of Baby Boomers at the same age.

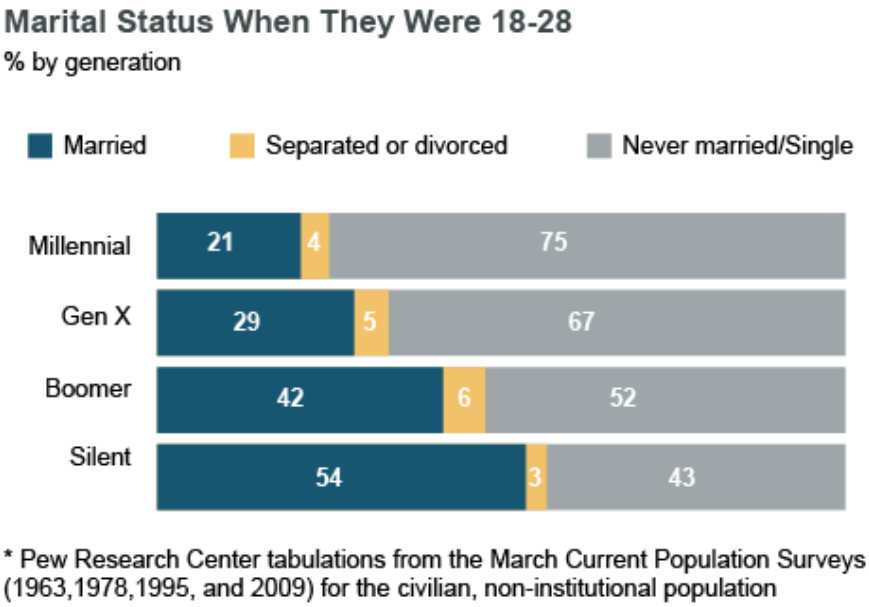


Figure 2. Marital Status When They Were 18 to 28 (PRC, 2010)

Millennials are doers; they are described as having a mix of optimism and activity (Howe & Strauss, 2000). They are technologically advanced, and embrace technology as their way of communicating and maintaining a connection with the world. According to the PRC (2010), millennials are aware of the good and bad in technology and their digital platforms. However, they claim that new technology makes people closer to their friends and family, allows a person to use their time more efficiently, and ultimately makes life easier (PRC, 2010).

Despite the controversy and stigma surrounding millennials and new technology, this generation aims high in education. Approximately 50% want to go on to earn a graduate or professional school degree, while only 34% plan on ending their formal education after graduating college (PRC, 2010). In fact, Figure 3 illustrates that since 1980, the percentage of 18 to 34 year-olds with a Bachelor's degree or higher has

steadily increased. However, the economic downturn millennials have faced as of 2010 is beginning to affect their ability to continue attending school.

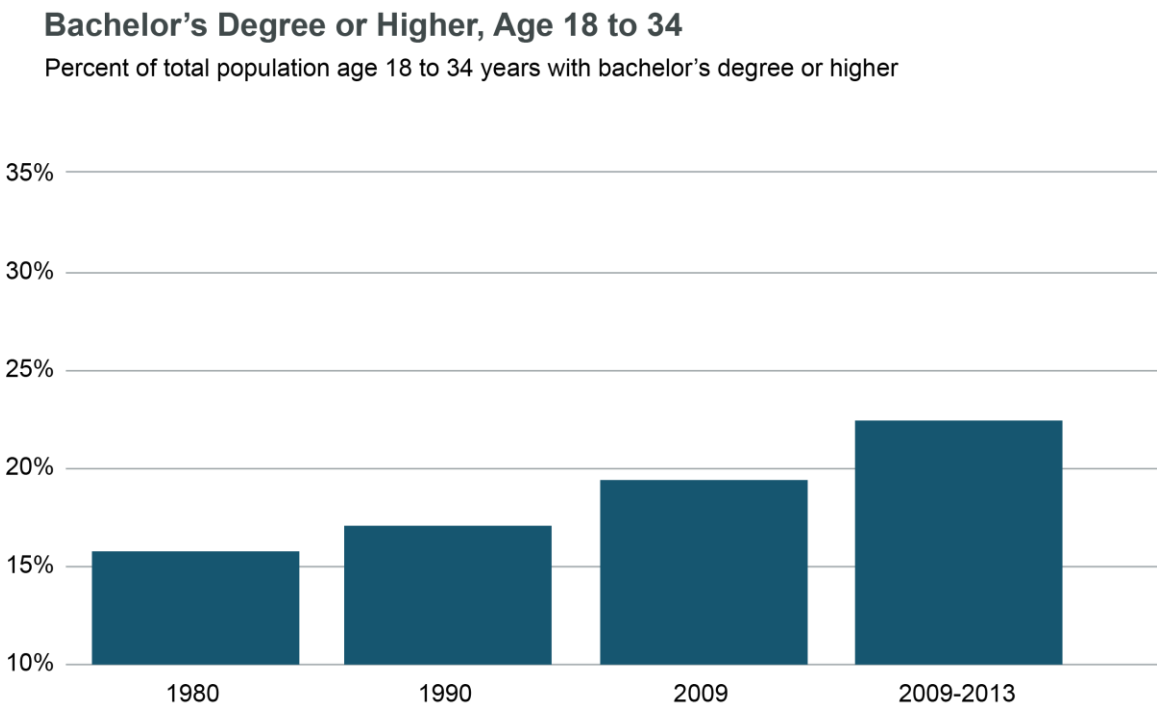


Figure 3. Bachelor's Degree or Higher, Age 18 to 34 (U.S. Bureau, 2014)

Further, millennials believe that the future is in their hands, and are certain that they will have the biggest impact in the future (Howe & Strauss, 2000). Young and Hinesly (2012) describe millennials as confident and self-reliant, open to change and diversity, closely connected to family and social organizations, and service-oriented. This generation is, "fed up with the superficialities of life" (Howe & Strauss, 2000, p. 187). They are trying to reverse many of the dominant social and cultural trends by addressing topics such as climate change, healthcare, and education, through their civic engagement.

Young Adult Professionals

Jeffrey Arnett's Emerging Adulthood Theory proposes a new development age bracket for Americans aged 18 to 29 years old; focusing on ages 18 to 25. His definition for this period is as follows: "emerging adulthood can be said to exist wherever there is a gap of at least a few years between the end of puberty and the entry into stable adult roles in love and work" (Arnett, 2015, p. 26). Although Arnett argues that emerging adulthood isn't adolescence or young adulthood, the age group he studies fits within Erik Erikson's young adulthood stage of human development, defined as 20 to 39 year olds (Erikson, 1998).

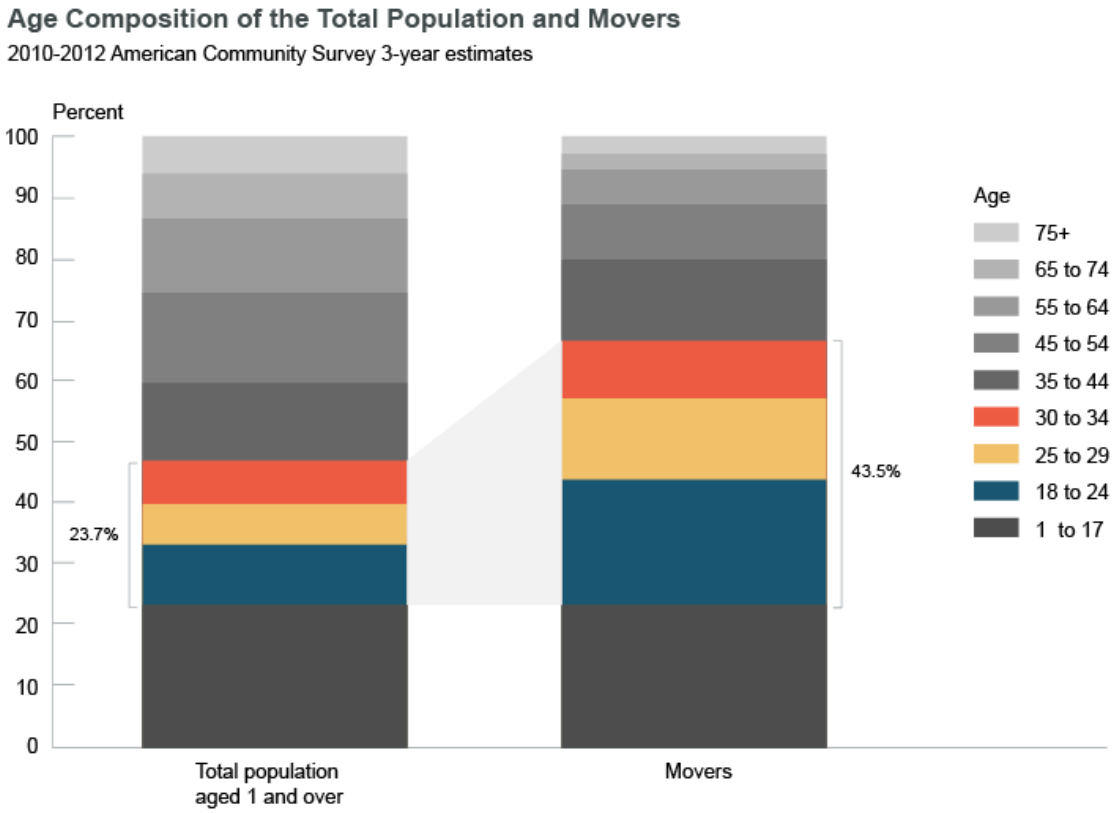


Figure 4. Age Composition of the Total Population and Movers (Benetsky et al., 2015)

According to the Benetsky et al. (2015), 18 to 34 year-olds made up 43.5% of people who have moved in the United States during 2010 to 2012. Additionally, young adults dominated in all of the factors behind a desire to move: dissatisfaction with housing, the neighborhood, local safety, and public services (Benetsky, Burd, & Rapino, 2015). Figures 4 and 5 show how most movers are aged 18 to 29 years old. Therefore, for the purpose of this study, young adults will refer to 20 to 29 year olds.

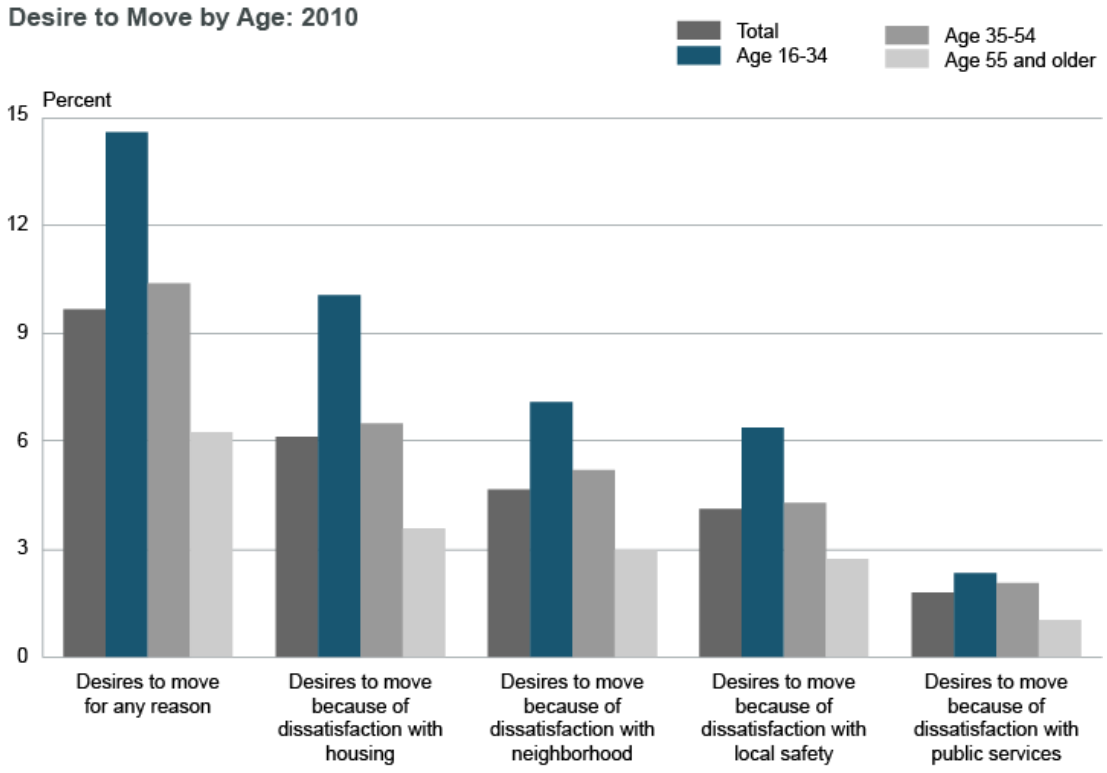


Figure 5. Desire to Move by Age (Mateyka, 2015)

Demographic Impact

The millennial generation is having a significant impact on society as they make up the largest generation yet, with approximately 83.1 million in the U.S. (U.S. Census Bureau, 2015). Due to their age range and size, this generation is currently driving the

economy and will do so for the next few decades. Figure 6 shows that millennials also became the largest generation in the U.S. labor force in 2016 and are expected to continue as such for the next few decades (Fry, 2018).

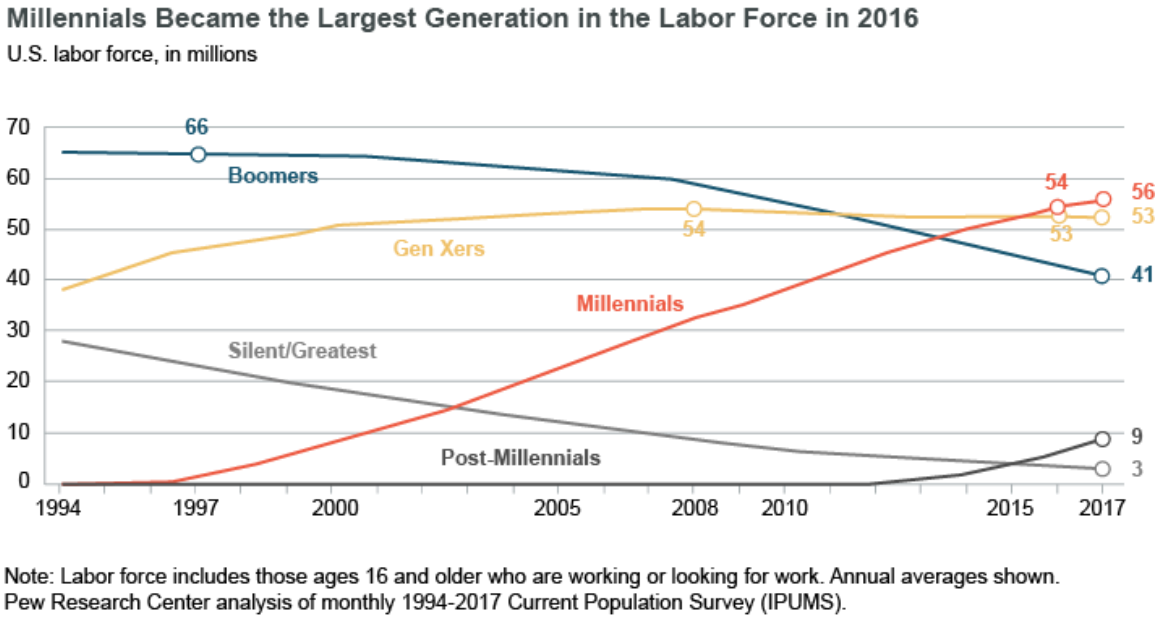


Figure 6. Millennials Became the Largest Generation in the Labor Force in 2016 (Fry, 2018)

Despite the economic downturn millennials faced in the past decade, they are expected to become a large source of first-time homebuyers, due to their age and current stage in life. Over 66% of millennials hope to purchase or rent a new home in the next five years, making a large generational shift in real estate (Desjardins, 2017). Millennials are, and will undoubtedly be, the largest generation impacting the housing market for the next few decades, marking the importance of their housing aspirations and needs.

Housing Needs and Aspirations

In *Echo Boomers Will Have Oversized Impact on Retail, Real Estate,* Gruen (2013) writes that young adults have identified ideal features that they value most in housing: uncongested central locations, areas close to shops, restaurants, and service providers, units with laundry facilities, buildings with a well-designed exterior and a smart interior layout. Additionally, some of the features that appeal to young adults are a 250 to 450 square foot range per unit, Internet connection, open and flexible spaces, and shared amenities and communal spaces (Gruen, 2013). Ultimately, this population wants spaces where they can work comfortably from their home, and they seek to live in urban settings.

However, more so than the amenities and features desired, millennials' values and lifestyles differ greatly from previous generations. Two particular and important factors are their desire for living simply and the need for community. To better explain these factors, it is necessary to first understand the relationship between humans and their environment.

Residential and Urban Environments

Environmental psychology is defined as "the study of symbiotic relationships between humans and their environments" (Kopec, 2006, p.xv). The understanding of the effect that perceptions have on humans and the built environment is fundamental in conceptualizing and creating spaces that will enable people to interact more effectively with each other and their environment (Kopec, 2006). This is readily seen in people's reactions to the design of their residential and community environments, for instance.

The integration theory of human-environment relationships, states that combinations of design features influence human behavior. The term integration theory

is used to describe models that describe the complexity of human-environment relationships. Chein (1954) describes five major elements that integrate to facilitate behaviors: *global environment*, general characteristics of an environment; *instigators*, stimuli that trigger specific behaviors; *goal objects and noxients*, situations that cause satisfaction or opposite; *supports and constraints*, aspects that facilitate or restrict behaviors; and *directors*, features that tell us where to go and what to do.

Roger Barker's Behavior-Setting theory highlights the role of setting on human behavior. According to Eklund and Scott, Barker (1968) defines "behavior-setting" as "a behavior-environment unit having: (a) a specified set of time, place and object props, and (b) an attached standing pattern of behavior" (pp. 83-84). These two attributes are interdependent and necessary for a behavior setting to exist. Barker's theory shows that settings influence behavior, as people's behaviors are essentially tied to the place in which they occur (Eklund & Scott, 1985).

Satisfaction in a residential environment is more than just about the house and its physical qualities; it includes the surrounding neighborhood and social quality of the environment (Bechtel, 1997). This perspective is described in the transactional framework, proposed by Werner, Altman, and Oxley, which treat events or experiences as holistic unities, as seen in Figure 7. Each one is composed of three major aspects: people and psychological processes, environmental properties, and temporal qualities. This framework assumes that humans and their environments are an integral and inseparable unit and that homes are "conceived as a dynamic confluence of people, places, and psychological processes" (Werner et al., 1985, p.2).

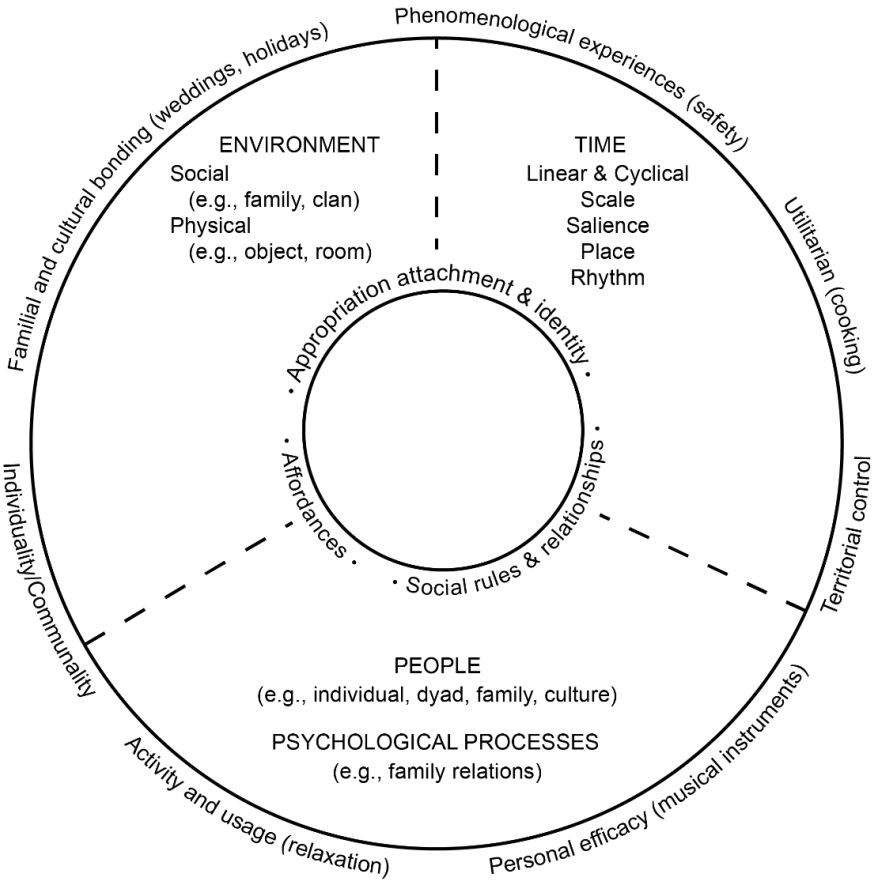


Figure 7. The Home as a Transactional Unit (Werner et al., 1985)

As mentioned before, studies suggest that young adult professionals want to live in “exciting urban settings”. Urban communities differ greatly from communities found in the suburbs and rural areas, due to the nature of their structure and composition.

Urban environmental psychology studies the relationship between people, their psychological processes, and their environment. This relationship impacts the behavior in the community and the potentiality that a sense of community might therefore emerge. A sense of community is defined as the social connectedness that occurs when individuals interact with and depend on others, belong to something greater than oneself, and feel safe and secure within a community (Shaffer and Anundsen, 1993).

Figure 8 describes a model for urban environmental psychology. It shows how the physical community has a direct impact on the residents, which in turn, influences their behavior in the community.

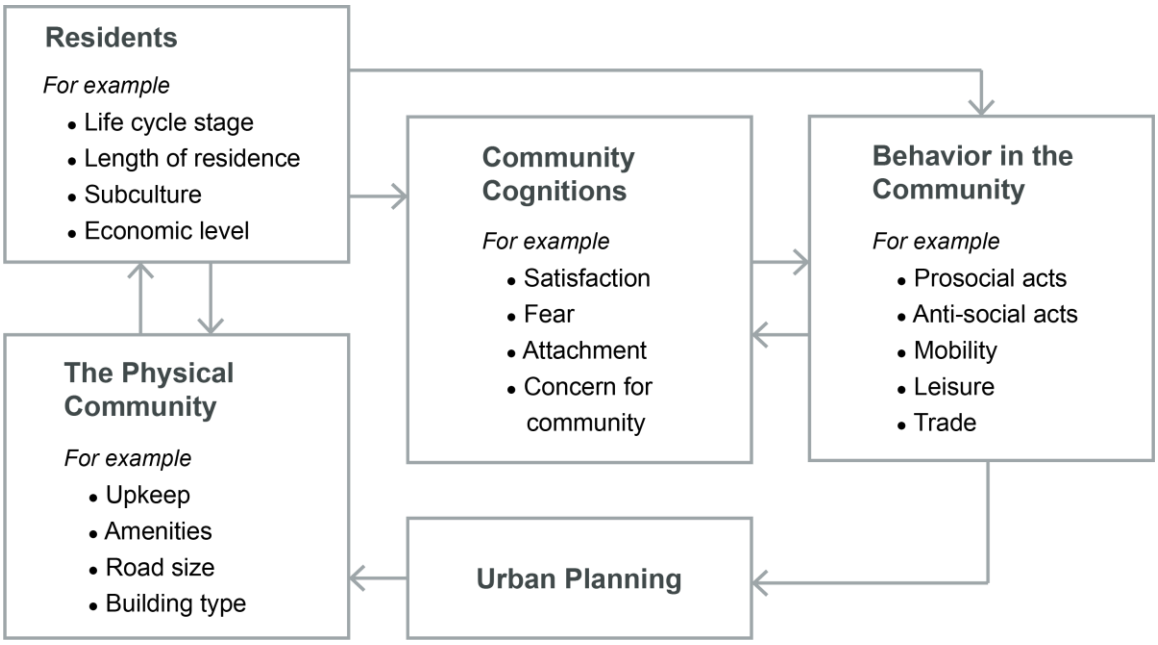


Figure 8. Model for Urban Environmental Psychology (Shaffer and Anundsen, 1993)

Simple Living

As the size of single-family houses in the market continued to increase in the last two decades, a desire for downsizing and adopting a simpler lifestyle has emerged, which can be seen at different stages in life. Downsizing is commonly associated to adults or elderly individuals who desire to simplify their lifestyles due to a significant change in their lives. This could be due to their children leaving the nest to lead independent lives, the inability to maintain a large house due to medical conditions, or other. However, as of late the desire to downsize is also being seen in young generations. As mentioned by Surat (2015), millennials are learning to do more with less

and are amenable to living smaller. This desire may arise from economic, environmental, or social reasons.

An example of this is the growing popularity of voluntary simplicity. Living voluntarily is defined as living more deliberately, intentionally, and purposefully. Living simply is to unburden one self and live more lightly, cleanly, and aerodynamically. Elgin (1993) thus defines voluntary simplicity as,

> …singleness of purpose, sincerity and honesty within, as well as avoidance of exterior clutter of many possessions irrelevant to the chief purpose of life. It means the ordering and guiding our energy and our desires, a partial restraint in some directions in order to secure greater abundance of life in other directions (p.23).

Typically, people who choose to live a simpler life tend to feel a closer connection to the earth, lower their level of personal material consumption, and alter their patterns of consumption in favor of more durable products. More so, they tend to reduce clutter and complexity in their lives, change transportation modes, and—most importantly—prefer smaller-scale living environments (Elgin, 1993). Embracing voluntary simplicity is a key factor that supports young adults' presumed willingness to live in micro-dwellings, as they claim to want to reduce their consumption, freeing themselves of things they no longer need (Surat, 2015).

Aside from the interest in living their most authentic and alive selves, voluntary simplicity could be seen as a path to what Elgin calls "an ecological-era". This is an era that changes every aspect of life: consumption levels, living and working environments, political attitudes, international relations, and education (Elgin, 1993). The ecological-era's goal is to evolve both the material and spiritual aspects with harmony and balance. It puts an emphasis on life-serving behavior and on connectedness and community.

Living a simpler life has an impact on time, energy, personal growth, and relationships. In the ecological-era, everything is related to and connected with everything else, making interpersonal relationships an important factor. The design of these smaller-scale environments foster a sense of community, as they allow more opportunities for individuals to interact, which is another factor that is highly important to young adult professionals.

In *Voluntary Simplicity*, Elgin (1993) mentions the importance of community support, both for those who choose to live more simply and those who don't. He claims that mainstream values are shifting in a direction of acceptance of voluntary simplicity, meaning that the idea of a sense of community will grow rapidly (Elgin, 1993), which almost 20 years later seems clear judging from the emergence of this approach in popular culture publications and products. This can be seen through the tendency and desire to live in more compact spaces; such as the Tiny House Movement, which continues to become more accepted.

Voluntary simplicity does not only have an effect on the individual, but it also has an impact on the environment, economy, and society. By moving towards a more ecological approach to living, energy conservation is becoming widespread and turning away from the "hard energy path" to passive strategies. Energy-efficient modes of transportation are surfacing and passive solar heating and the use of photovoltaic sources are gaining popularity. The economy is changing as well, as the desire to support local businesses is growing, allowing small businesses to flourish (Elgin, 1993). Finally, there is currently a rebirth in the importance of local neighborhoods and communities as areas of mutually helpful living. Eco-villages, micro communities,

cohousing communities, and other forms of co-living and co-working are just some of these types of communities, which are proliferating.

Sense of Community

Social interactions influence an individual's residential preferences, choices, and satisfaction. A community does not only refer to an environment, but also to a cognitive and emotional state. Feelings of community, also known as a sense of community, are based on sharing a space, attitude, and behavior. It is a form of place attachment that begins when a physical space is shared, and deepens when a number of physical or psychological attributes are found in common (Kopec, 2006). Furthermore, Kopec (2006) states that,

> The idea of fitting in or belonging are both comfortable and comforting; people derive the most satisfaction and, as a result, the greatest community spirit from sharing spaces with others who are similar to or at least compatible with them. Therefore, it is not surprising that cultural activities, aesthetics, and physical amenities are becoming increasingly important to residents of urban communities (p.297).

The need for a community that provides a balance between separation and togetherness among neighbors is highly important among millennials (Shaffer and Anundsen, 1993). Young adults desire to be part of a community, while also having a sense of privacy when necessary. They look to live in areas that help forge social relationships and seek a sense of belonging within their environment and surroundings. When young adults identify with their surroundings, they feel integrated to their community as this provides emotional safety, personal connection, and interpersonal relationships (Timmerman, 2015). People today are intentionally creating communities

based on shared values, which can be seen reflected in young adults and their strong desire for being part of a community.

Community Factors

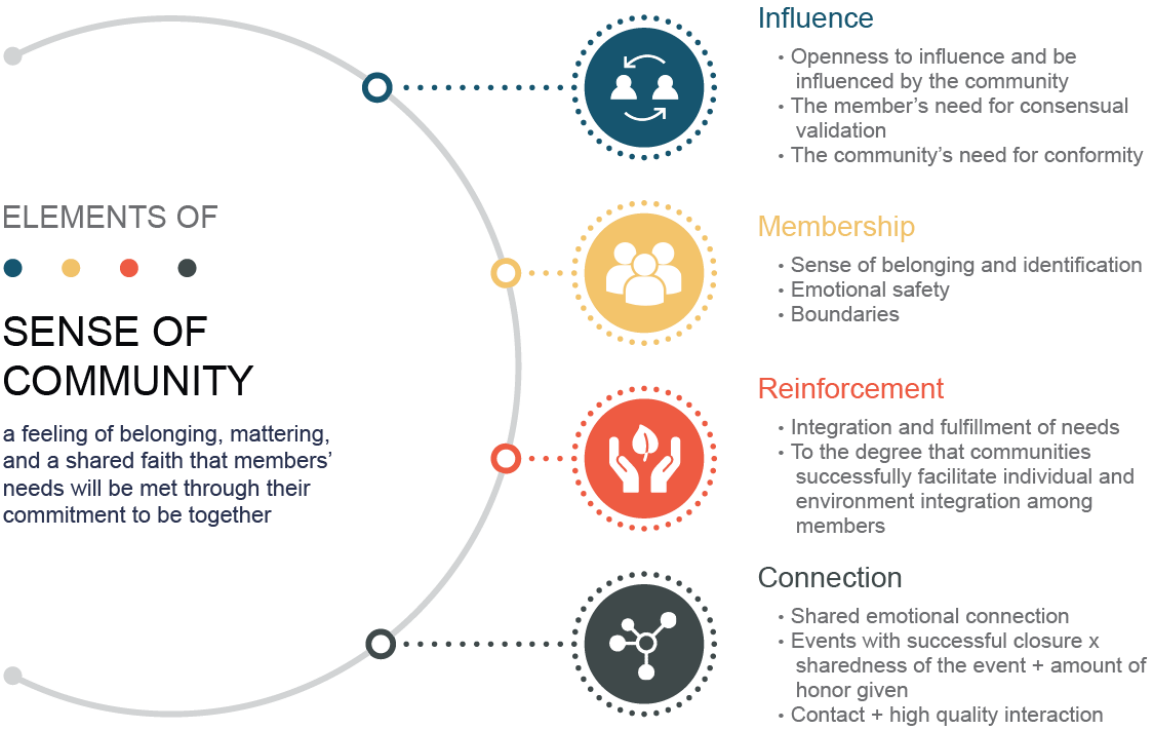


Figure 9. Elements of "Sense of Community" (McMillian and Chavis, 1986)

According to McMillan and Chavis (1986), two leading researchers in community psychology, a community is composed of four elements: membership, influence, integration and fulfillment of needs, and shared emotional connection. Membership refers to the sense of belonging or personal relatedness to a space. Influence touches on the sense of mattering within a group and its members. Reinforcement, or integration and fulfillment of needs, makes reference to the individual's feeling that their needs will be met through their membership in the group. Finally, shared emotional connection is

fulfilled when the individual shares history, common places, time, or similar experiences with others. Figure 9 further describes these four elements, as per McMillan and Chavis (1986).

Communities provide a sense of belonging; and rather than interfering with personal development, they enable individuals to grow psychologically and fill their life with enriching discoveries (Shaffer and Anundsen, 1993). Although there may be people who are hesitant about communities, Shaffer and Anundsen (1993) remind us that individuals exist only in the context of a larger interconnected whole. Therefore, the stronger and healthier the community is, the stronger and healthier the individual is, and vice versa. Furthermore, from a systems thinking point of view, individuals are all open systems that are continuously exchanging energy with other systems (Stroh, 2015). Every movement made in the web has an effect on other parts of the web. Therefore, these arguments make it clear that the need for community is a fundamental aspect that must be addressed when designing housing.

The Housing Market

As mentioned previously, the relationship between humans and their residential and community environment is an important component of design. However, more than being a physical space that satisfies the basic human needs for shelter, a house also expresses the aggregate of the many ways in which people interact with them. Housing must be able to provide residents protection, as well as meet their physical and psychological needs (Kopec, 2006). Maslow's Hierarchy of Basic Needs, shown in Figure 10, further describes the levels of basic human needs.

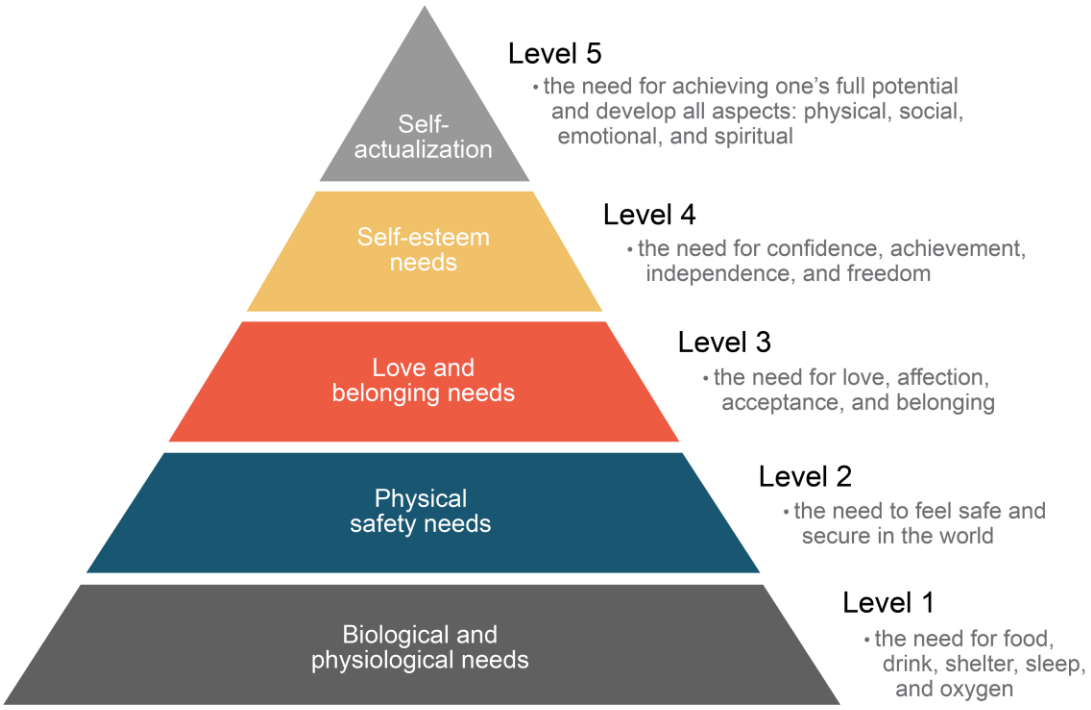


Figure 10. Maslow's Hierarchy of Basic Human Needs (Maslow, 1954)

In Maslow's pyramid, Level 1 refers to biological and physiological needs, the first and most basic needs for survival. These are the need for food, drink, shelter, sleep, and oxygen. Maslow (1954) highlights their importance claiming that, "if all the needs are unsatisfied, and the organism is dominated by the physiological needs, all other needs may become simply nonexistent or be pushed into the background" (p.37). This means that if an individual cannot satisfy their basic survival needs, such as the ones mentioned above, these needs will dominate their interest and concern. Extending this idea, Schwartz (2015) states that housing is more than a shelter from the elements; it is the primary setting for domestic life, a place of refuge from daily routines, a private space.

Level 3 of Maslow's pyramid addresses the need for love, affection, acceptance, and belonging. This tier encompasses the need for community that is claimed to be

essential for satisfying young urban professional's housing needs and aspirations. As mentioned previously, communities provide a sense of belonging within the surrounding environment. They allow individuals to grow psychologically, rather than interfere with their development. Ultimately, the desire for a sense of community and forging relationships is considered a basic human need.

Housing Crisis of 2007

The first decade of the 21st century will most likely be known for years to come for the destructive housing bubble of 2007 in the United States. Since the mid-1990's housing prices began to increase at a rapid pace, and only accelerated in the early 2000s. Housing prices were increasing, however, there was no change in the supply or demand that could have justified this rise in prices. The stock recession of 2001 only fueled the growth of the housing bubble. The rising home prices led construction and home sales to record levels. This fueled consumption as homeowners withdrew equity from their homes, which caused saving rates to plummet (Baker, 2007). Ultimately, this pattern of growth could not be sustained. In the end, low mortgage interest rates, low short-term interest rates, and relaxed standards for mortgage loans were the main determinants that caused the destructive Housing Bubble Burst of 2007.

After 2000, housing prices rose at a higher rate than usual, which led to an increase in mortgage lending for home purchases and refinancing. From 2001 to 2007, homeowners extracted $1.8 trillion in home equity, the value of a home minus the amount owed on the mortgage, due to the increase in housing prices (Schwartz, 2015). After 2007, sales fell rapidly and below their levels in 1997. In fact, by 2008, prices were dropping at an annual pace of 10% and by 2009 prices dropped at an annual pace of 20%. The Housing Bubble left almost one in four American homeowners "underwater",

meaning that their mortgage debt was greater than the value of their home (Xu et al., 2015).

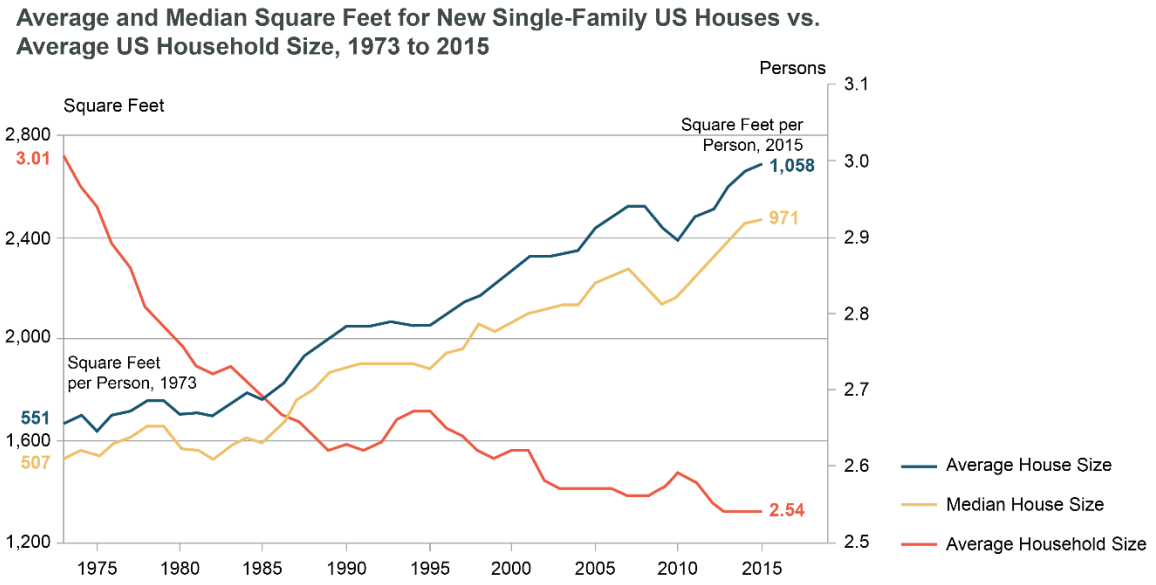


Figure 11. Average and Median Square Feet for New Single-Family U.S. Houses (Perry, 2017)

It wasn't until 2012 that the first sustained recovery occurred since the Housing Bubble burst in 2007. Even so, "the housing market is currently composed of elevated mortgage default rates, higher foreclosure rates, fewer mortgages being originated, and greater difficulty qualifying for a mortgage" (Xu et al., 2015, p. 204). Figure 11 shows how the size of new single-family houses continued to increase, and is currently at 2,687 square feet (Perry, 2016). However, the average household size continues to decrease and has resulted in elevated per capita per resident footprint, as shown in Figure 12.

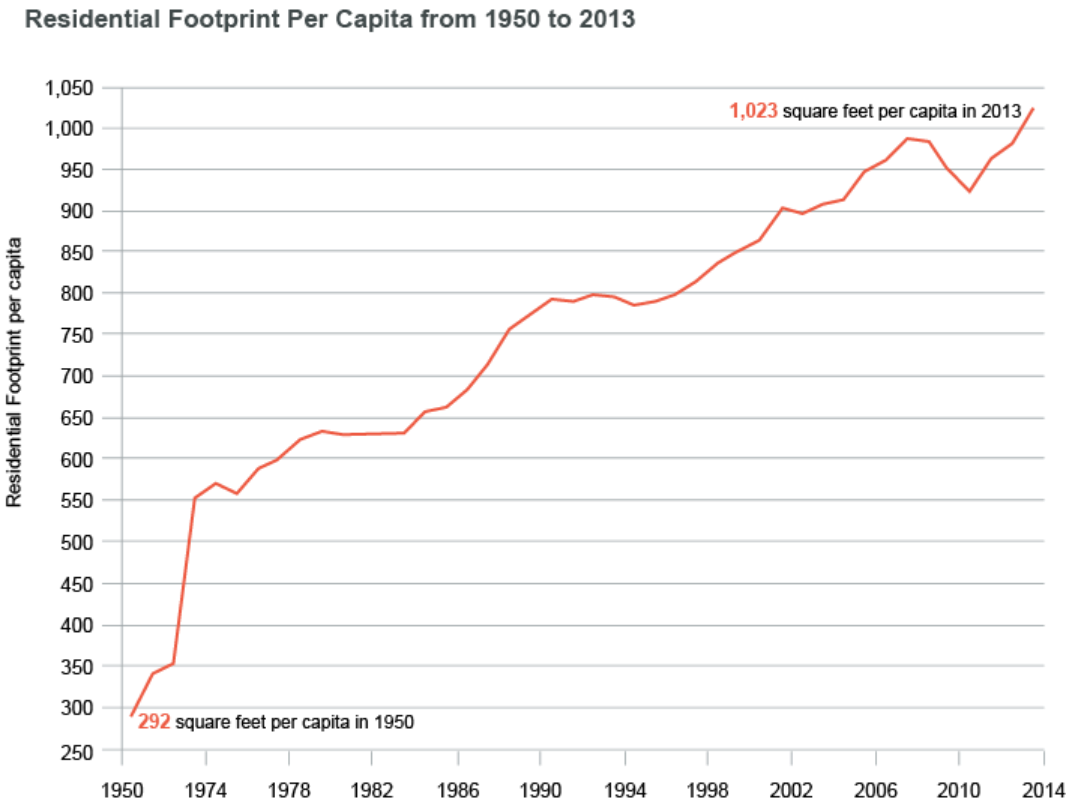


Figure 12. Residential Footprint Per Capita from 1950 to 2013 (Peterson, 2018)

Rental Market

Figures 13 and 14 show how the median earnings of 18 to 34 year-olds in the U.S. have decreased, as the median asking rent of unfurnished apartments in the U.S. has increased. As a consequence, this has resulted in an increase of poverty among 18 to 34 year-olds in the United States. This is said to have prompted approximately 89% of builders to begin to offer smaller homes as affordable housing options (Whitlow et al., 2013). Aside from the cultural and lifestyle-oriented reasons, previously outlined, affordability is yet another reason that different types of smaller homes are making their way into the housing and rental market.

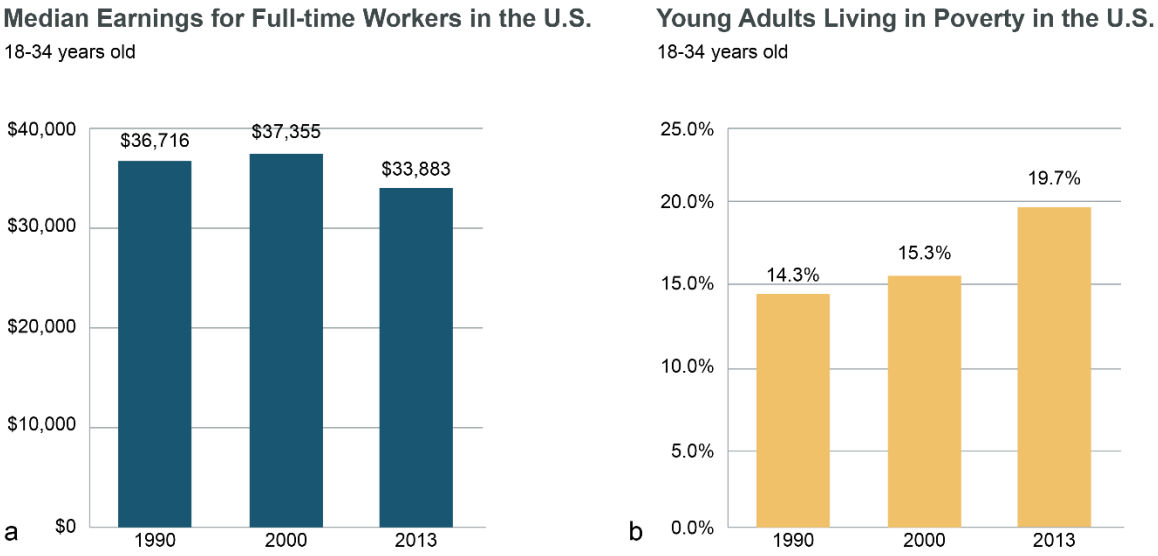


Figure 13. (a) Median Earnings for Full-Time Workers in the U.S. (Josephson, 2017); (b) Young Adults Living in Poverty in the U.S. (U.S. Census Bureau, 2014)

Josephson (2017) suggests that the median earnings for full-time workers in the United States has decreased in the last 20 years. In 1990, the median earnings were $36,716. This amount increased to $37,355 in 2000, but began to plummet after the housing crisis. In 2013, the median earnings for full-time workers was $33,883, approximately 7% less than in 2000. More so, data from the U.S. Census Bureau (2014) demonstrates that the percentage of young adults living in poverty in the U.S. has continually increased. From 1990 to 2000, there was an increase of 1% of young adults living in poverty. However, there was a 4.4% increase from 2000 to 2013, proving that young adults being shut out of the rental and housing market is a significant issue.

Additionally, data from the U.S. Census Bureau (2014) makes evident that while the median earnings of workers in the U.S. has decreased, the median monthly rent for dwellings has increased exponentially in the past decade. As financial viability is

considered when the resident pays no more than 30 percent of their income, Figure 14 compares the median monthly rent in the U.S. with this percentage of workers' median monthly income. From 2005 to 2015, there was a significant increase of approximately 34.6% in the median monthly rent, and decrease of approximately 9.3% in the median monthly income for workers in the U.S. This suggests that the increase in rent could potentially be influencing the percentage of young adults living in poverty, mentioned previously.

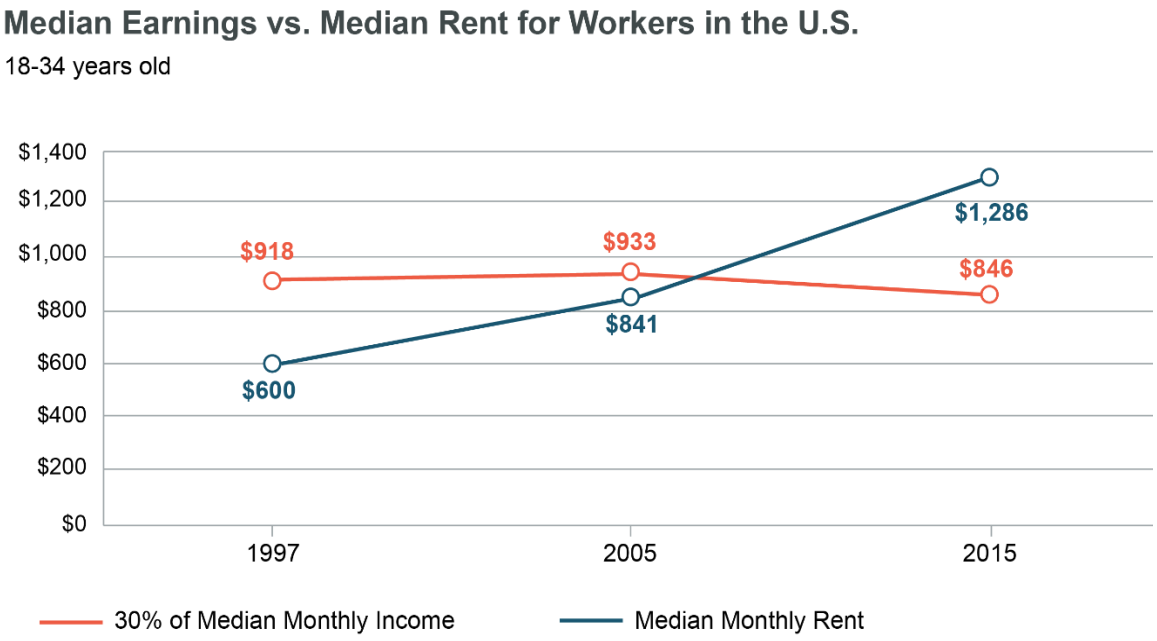


Figure 14. Median Earnings vs. Median Rent for Workers in the U.S. (U.S. Census Bureau, 2014)

Impact on Millennials

Due to their economic circumstances, research suggests that young adult professionals are having trouble "leaving the nest". In fact, 30.3% of millennials are currently living at home, compared to 23.2% of young adults living at home in 2000 (U.S.

Census Bureau, 2014). According to the Washington Post, 83% of young adults that returned to their family's homes during the recession did so due to financial hardship (Goodman, 2015). The majority of this age group has completed its college education, and should be the biggest source of first-time renters and homebuyers. However, millennials have entered the workforce, earning too much to qualify for affordable housing, yet not enough to afford moving into large stock rentals. As a result, millennials are facing not only economic impacts, but also social impacts that are prohibiting them to enter the housing market.

Economic Impacts

As mentioned previously, millennials are cash-strapped, with 31% of them still living at home and shut out of the rental housing market by mortgage inaccessibility—due to low credit scores associated to high debt ratios—and lack of housing options. Therefore, millennials are seeking viable housing options that align with their particular housing aspirations and needs. Viability is defined as being capable of working, functioning, or developing adequately, and having a reasonable chance of succeeding (Merriam Webster, 2017). This includes being financially viable. In order for a house to be considered financially viable and affordable, it must satisfy sound budgeting. To this end, it is advised that the occupant should pay no more than 30 percent of their income for gross housing costs, including utilities (Office of Policy Development and Research, 2017).

Apartment List publishes monthly reports on rental trends in cities and states across the United States. Salviati and Woo (2018), who belong to this organization, compiled rent data from five different providers and compared them: American Community Survey (ACS), Abodo, Zumper, Zillow, and most importantly the U.S.

Department of Housing and Urban Development (HUD). They corrected for limitations that are inherent in both public and private data, and resulted in the rent data for one- and two-bedroom apartments shown above. The data presented focuses on ten key metropolitan areas in the United States. As the data in Table 1 clearly shows, current rental prices in the housing market are not affordable for young adult professionals.

Table 1. Monthly Rental Rates in 10 Key Metropolitan Areas in the U.S. (Salviati and Woo, 2018)

Monthly Rental Rates in 10 Key Metropolitan Areas			
U.S. Cities		1 bdrm.	2 bdrm.
1	New York City	$2,060	$2,460
2	Los Angeles	$1,350	$1,730
3	Chicago	$1,070	$1,260
4	Dallas	$880	$1,100
5	Washington DC	$1,310	$1,510
6	Houston	$830	$1,020
7	San Francisco	$2,420	$3,040
8	Philadelphia	$960	$1,160
9	Boston	$1,660	$2,060
10	Atlanta	$1,010	$1,160

With $1,061 being the average monthly housing payment (Daily Real Estate News, 2012), and young adults' monthly income being approximately $2,700 (Josephson, 2017), it is clear that current housing options in the market are not affordable for this population. According to this data, the maximum rent young adults can

afford is $810, which is 23.7% less than what is currently available to them. This is due, in part, to the lasting effect of the housing crisis of 2007 that disproportionately affected millennials. In addition, the PRC conducted a survey in 2006 where it found that half of 18 to 29 year-olds had full-time jobs. However, in another survey conducted in 2010, only about 41% of 18 to 29 year-olds were employed in a full-time job, for a drop of 9% over four years. In comparison, within the same time span, the same proportion of older adults reported having full-time jobs in the 2006 and 2010 surveys (PRC, 2010).

Social Impacts

As has been pointed out before, millennials' housing aspirations and needs emphasize their desire and need for a community. Due to the lasting effects of the recession, millennials have, for the most part, moved back in with their parents as they are facing a significant economic downturn (Goodman, 2015). However, as millennials enter a transitional stage of their life, they are looking to leave the nest and become part of a new community (Timmerman, 2015).

Residential communities that attempt to satisfy sense of community aspirations offer an array of housing types. There are numerous types of intentional communities, such as cohousing communities and pocket neighborhoods, many of which are suburban in character. Even though these address a sense of community in one way or another, millennials also demand the cultural activities, aesthetics, and physical amenities that are more typically found in urban communities.

Yet economic circumstances are having an adverse effect on millennials' ability to move to these desired locations and create a sense of community. According to Pennington, Ben-Galim, and Cooke (2012), although young people aspire to be in their own home in the next 10 years, they are uncertain how they will meet their housing

ambitions. Furthermore, young adults aged 18 to 27 years old prioritize flexibility and independence. They are interested in spending as little money as possible on housing, and sacrifice permanence for flexibility and affordability, as they are in a “free roaming” stage of their life (Pennington et al., 2012). These economic and social impacts are affecting not only their homeownership, but their ability to join the rental housing market as well.

Homeownership Among Young Adults

Currently, 31% of millennials are still living at home, and approximately 2.4 million millennials have not entered the rental market. This proves that there is a lack of millennials, most of which are young adult professionals, breaking into the housing market. The average age for first-time homebuyers has been approximately 30 years old since the 1980s. However, that age has increased by more than six years among millennials as they have delayed joining the housing market (Dickerson, 2016). Figure 15 illustrates how annual homeownership rates in the U.S. have decreased, particularly with those under 35 years old.

According to Xu et al. (2015), mortgage accessibility is a factor that directly affects homeownership for this population. One of the main determinants of lack of homeownership among millennials is their low income and limited credit access. The average single-family house in the United States costs approximately $358,000 to build, which is about $200,000 more than in 1998. However, the annual income in the U.S. has remained unchanged for the last couple of years (as cited in Hammer, Morrison, & Morrison, 2016). Another factor is their student loan debts, which frequently disqualify them for mortgage loans, due to low credit scores associated to high debt ratios.

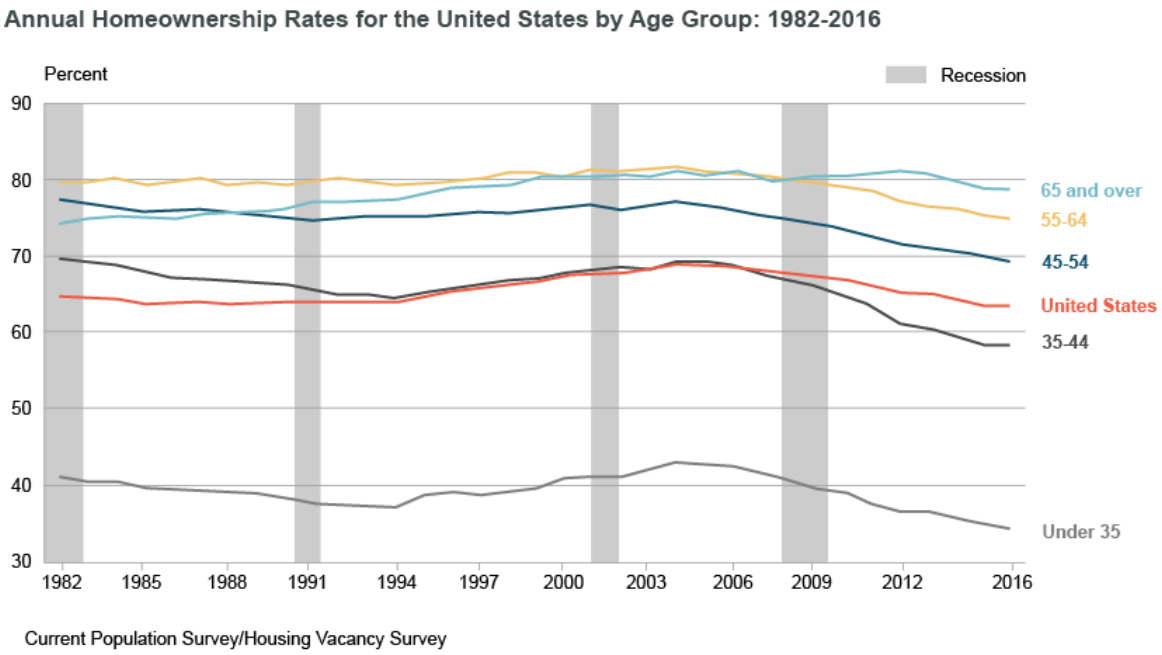


Figure 15. Annual Homeownership Rates for the U.S. by Age Group: 1982-2016 (U.S. Census Bureau, 2014)

A third factor is housing and family decisions. According to Howe and Strauss (2000), marriage and forming a family are not millennials' priorities. They typically remain single for longer than past generations, which leads to a delay in marriage that, in turn, delays homeownership (Xu et al., 2015). In fact, compared to Baby Boomers, millennials seem to not be getting married. According to Dickerson (2016), "while only 28% of millennials were married in 2014, 48% of boomers were married at that same age" (p. 456). More so, young adults are delaying their forming a family, due to remaining in college longer, stagnant wages, and high unemployment rates. Given these factors, it is easy to predict that there will not be a significant increase in millennials joining the housing market any time soon, as the amount of millennials as first-time homeowners has been consistently declining since 2007.

The Rental Market and Young Adults

Much like with homeownership, the rental housing market is facing difficulties enticing young adults to join it. As stated previously, data from the U.S. Census Bureau (2014) shows that the median rent price for unfurnished apartments has increased, while young adults' median income has decreased. As a result, this population has made up the bulk of missing renters in the market. Compounding this issue, as millennials have entered the workforce, they tend to earn too much to qualify for affordable housing. However, they do not earn enough to afford moving into large stock rental units (Goodman, 2015). Ridden with student loan debts and low credit scores, it has become increasingly difficult for young adult professionals to join the rental housing market.

Fry (2017) also claims that, one in five 25 to 34 year-olds in the U.S. are not part of the rental market, as they are living with their parents or in a similar multi-generational home. In fact, the amount of 15 to 34 year olds living at home has increased 36.7% in ten years, being at its highest level since 1950 (Goodman, 2015). This recent trend of young adults returning to the nest is a barrier to the balancing of rental housing supply and demand. Due to these factors, the rental housing industry has increased their efforts to entice young adults into the market, mostly focusing on the amenities, facilities, and communal spaces provided. Offering these community spaces has practically become a prerequisite for developers, in order to engage young adults as prospective renters (Goodman, 2015).

Perhaps due to these efforts, and as interests in homeownership have decreased, there has been an increase in millennials joining the rental market. In the past ten years there has been a 9% increase of households renting their homes, as illustrated in Figure 16 (Cilluffo et al., 2017). It is believed that renting appeals to

millennials, due to their flexibility and the fact that this format aligns with their residential mobility. In recent years, millennials have had the largest number of migrations compared to other cohorts (Garcia, 2015). In fact, between 2009 and 2013, 49% of millennials moved to metropolitan areas (Benetsky et al., 2015).

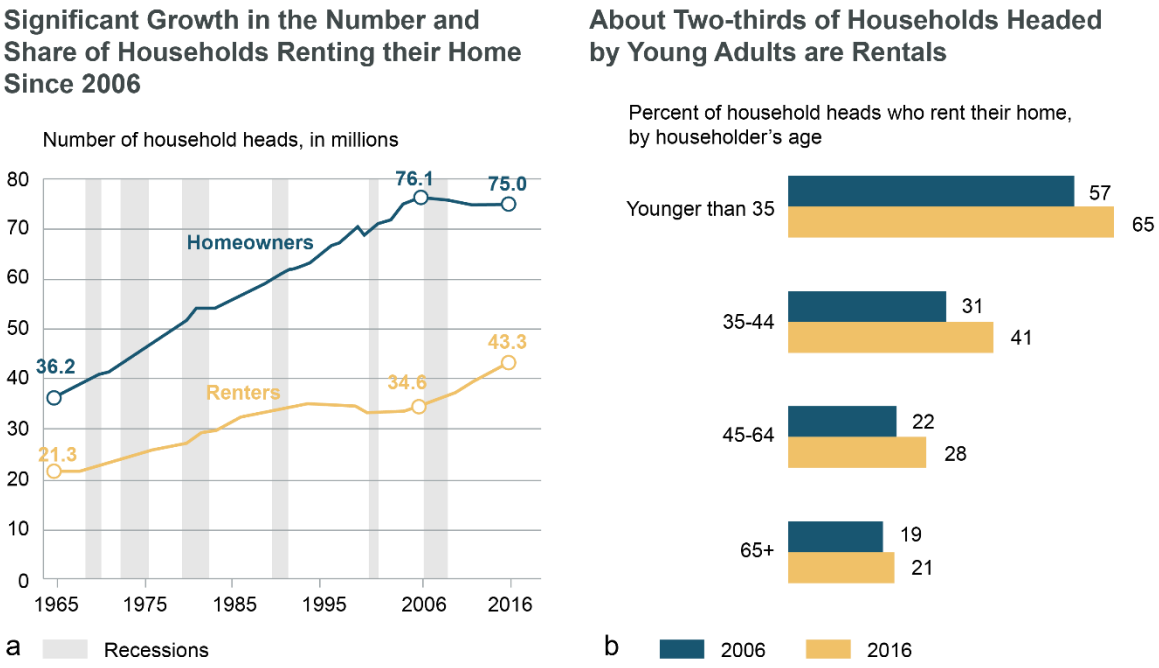


Figure 16. (a) Percentage of Household Heads that Rent Their Home; (b) Percentage of Household Heads that Rent Their Home, by Age (Cilluffo, Geiger & Fry, 2017)

The Micro-dwelling Movement

Micro housing or micro-dwellings refer to residential units that are smaller than traditionally sized units. These typically range from 150 square feet to 430 square feet and have made an appearance as individuals are finding themselves in the need of downsizing. However, for the purpose of this study, micro-dwellings will be defined as residential units that are smaller than conventionally sized units and are less than 500 square feet. Small Housing BC (2015), an advocacy and educational non-profit

organization, suggests that this newfound move towards embracing smaller dwelling units is a neo-traditional movement. Smaller houses have been built before; however new types of small housing are making their way into the market.

People's lifestyles have transformed, making them seek new alternatives to housing, tenure, and size. This demand for smaller housing is not just driven by financial means, but also by the lifestyle changes that have occurred over the last few decades (Small Housing BC, 2015). For example, individuals are downsizing as a way of living a more sustainable life and consuming less, echoing voluntary simplicity ideas. Small housing is seen as a way of housing different populations, such as the homeless and seniors, and has the potential to also house millennials.

The concept of compact spaces has been around since before 1973, when Lloyd Kahn and Bob Easton released the book *Shelter*, and has gained popularity as time has passed. Jay Shafer is credited for having jump-started the Tiny House Movement in 1999 with his article about the merits of simple living. That same year he founded the Tumbleweed Tiny House Company in California, the first U.S. company to sell mobile tiny houses (Nonko, 2017). This movement progressed so much that as of 2016, a tiny house appendix was added to the 2018 International Residential Code (IRC). Figure 17 illustrates how the Tiny House Movement has progressed throughout the years.

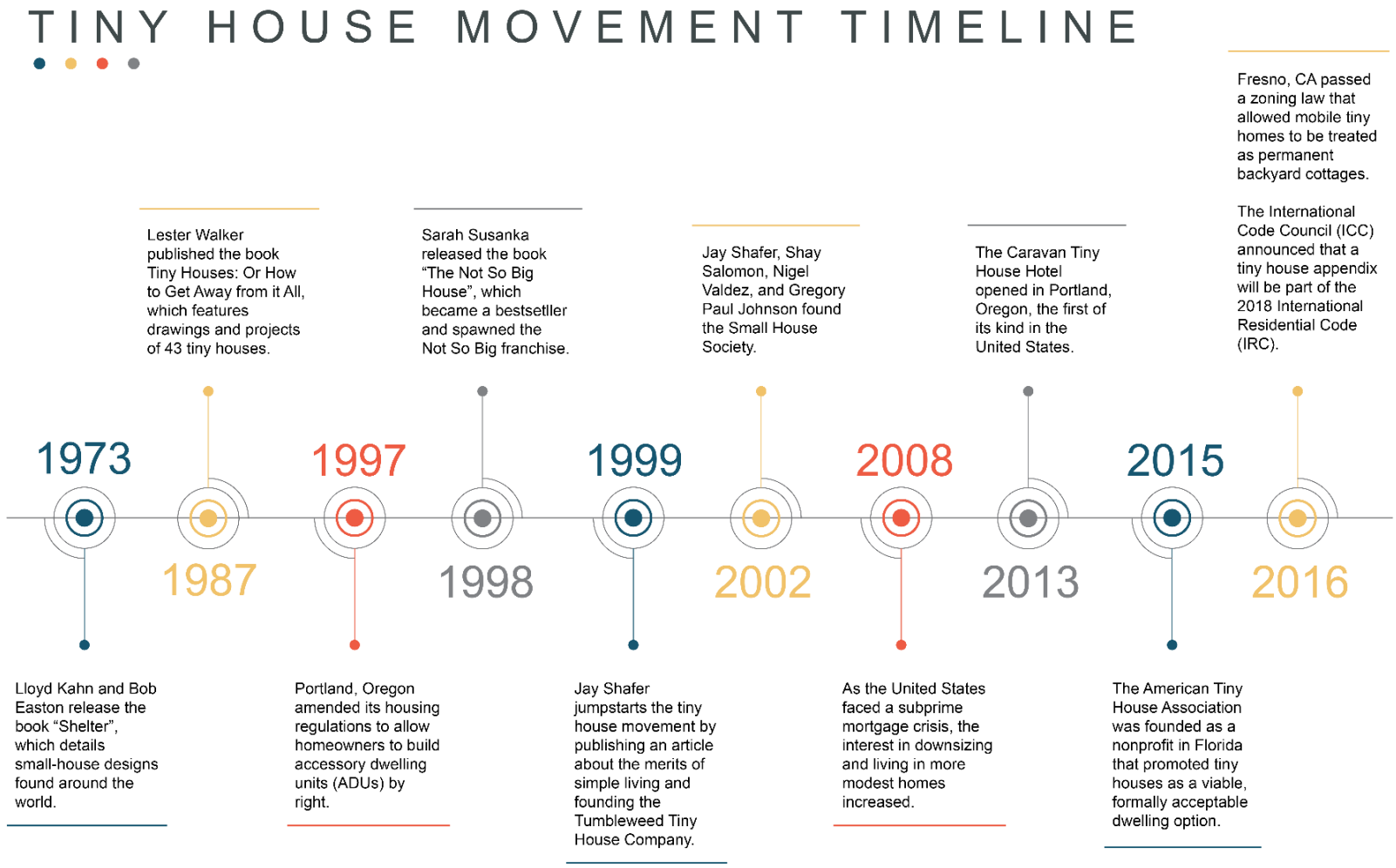


Figure 17. Tiny House Movement Timeline (Nonko, 2017)

The Tiny House movement is a social initiative of people who choose to downsize the space in which they live. Dissemination of these ideas has been advanced by the ideas fostered through *Small is Beautiful: A Tiny House Documentary*, a documentary that follows four people building their own tiny houses, in the pursuit of living a mortgage-free life (Beasley, 2015), and *The Not So Big House* a book by designer Sara Susanka whose idea is that a house should favor the quality of its space, rather than the quantity. This book precedes the tiny house movement but has been associated to it over time. It advocates for putting more money towards the quality of the design, equipment, and materials rather than towards its square footage. Susanka (1998) states,

> It's time for a different kind of house. A house that is more than square footage; a house that is Not So Big, where each room is used every day. A house with a floor plan inspired by our informal lifestyle instead of the way our grandparents lived. A house for the future that embraces a few well-worn concepts of the past (p.5).

International Residential Code (IRC)

These movements and the overall tendency to live in more compact spaces have progressed over time. A group of tiny house advocates submitted and gained approval for a new appendix in the 2018 International Residential Code (IRC). The IRC, in developing model codes and standards to build safe, sustainable, and affordable structures, regulates one- and two-family dwellings of three stories or less (International Code Council [ICC], 2018). Tiny house advocates used the ICC's Public Comment process to develop the new Appendix Q* Tiny Houses (Appendix A), which responds to the urgent need for building code provisions for micro-dwellings.

In April 2016, a code change proposal for the 2018 IRC was submitted for small houses no more than 500 square feet, but failed to gain approval. However, the architect Martin Hammer along with Andrew Morrison, a tiny house advocate, worked on an appendix for tiny houses to replace the failed code change proposal. The new proposed appendix, which was approved, provides code requirements for different aspects of tiny houses on foundation, as opposed to mobile tiny houses, which up to now have been the norm. It addresses the dimensions, safe access to and egress from habitable lofts, as well as ceiling height and emergency escape and rescue openings (Eisenberg, 2018).

Approval of these regulations was a challenging issue. Even where forms of micro-dwellings are allowed, another pressing challenge is seeking a building permit for movable tiny houses, also known as tiny houses on wheels (THOW). However, this issue was not addressed in the appendix due to it being beyond the scope of the original code change proposal. Below are excerpts from the appendix that was proposed and presented to the ICC's Committee Action Hearing, whose title later changed to *Appendix Q* Tiny Houses* when it was approved.

> **Appendix V Tiny Houses**
> **Section AV103:** Ceiling Height
> **AV103.1** Minimum ceiling height. *Habitable space* and hallways in *tiny houses* shall have a *ceiling height* not less than 6 feet 8 inches (2032 mm). Bathrooms, toilet rooms, and kitchens shall have a *ceiling height* not less than 6 feet 4 inches (1930 mm). No obstructions shall extend below these minimum ceiling heights including beams, girders, ducts, lighting, or other obstructions.
> **Section AV104:** Lofts
> …**AV104.1.1** Minimum area. *Lofts* shall have a floor area of not less than 35 square feet (3.24 m^2).
> **AV104.1.2** Minimum dimensions. *Lofts* shall be not less than 5 feet (1524 mm) in any horizontal dimension.
> **AV104.1.2** Height effect on loft area. Portions of a *loft* with a sloping ceiling measuring less than 3 feet (914 mm) from the finished floor to the finished ceiling

shall not be considered as contributing to the minimum required area for the loft.
AV104.2.1 Stairways.
…**AV104.2.1.1** Width. Stairways accessing a *loft* shall not be less than 17 inches (432 mm) in clear width at all points at or above the permitted handrail height. The minimum width below the handrail shall not be less than 20 inches (508 mm)
AV104.2.1.2 Headroom. The headroom in stairways accessing a *loft* shall not be less than 6 feet 2 inches (1880 mm) measured vertically from the sloped line connecting the tread nosings in the middle of the tread width.
AV104.2.2 Ladders.
…**AV104.2.2.1** Size and capacity. Ladders accessing *lofts* shall have 12 inches (305 mm) minimum rung width and 10 inches (254 mm) to 14 inch (356 mm) spacing between rungs. Ladders shall be capable of supporting a 200 pound (75 kg) load on any rung. Rung spacing shall be uniform within 3/8-inch (9.5 mm).
AV104.2.2.2 Incline. Ladders shall be installed at 70 to 80 degrees from horizontal.
…**AV104.3** Loft guards. Loft guards shall be located along the open side(s) of lofts located more than 30 inches (762 mm) above the main floor. Loft guards shall be not less than 36 inches (914 mm) in height or one-half the clear height to the ceiling, whichever is less.
Section AV105: Emergency Escape and Rescue Openings
AV105.1 General. *Tiny houses* shall meet the requirements of section R310 for *emergency and rescue openings.* (Hammer et al., 2016, p.1-3).

Though movable tiny houses could not be included in the Public Comment for the 2016 development cycle, the authors of the appendix plan to address this topic in a code change proposal that is being developed for the ICC's next cycle. As the tendency for living in compact spaces continues to grow, it is gaining attention at a national level and advances are being made to regulate and permit this housing type.

Small Living

As mentioned by Kilman (2016), the tendency to live in more compact spaces has garnered much attention due to the environmental, economic, and social benefits these offer. The size of these dwellings, as well as the lifestyle they suggest, offer clear benefits. There is a presumed affordability in more compact spaces, as well as an

implicit idea that these small spaces are sustainable and that they help the residents lead a more environmentally conscious lifestyle (Kilman, 2016). As this innovative movement continues to gain attention, it is having an impact on the triple bottom line: environment, economy, and social responsibility.

Environmental Benefits

One of the reasons micro-dwellings have captured people's attention is that their reduced footprint not only has a direct impact on the environment, but also directly influence the owner's lifestyle: their lack of space results in lower energy use and limited utilities, more interaction with the outdoors and surrounding environment, and a need to downsize and decrease consumption (Kilman, 2016). The most evident way micro-dwellings contribute to sustainability is their reduced footprint. Compact housing lessens the amount of materials and resources used in their construction, as well as the waste generated in the process, and on the energy used in their construction and operation. In fact, developing intentional tiny house communities could have a significant impact on the environment, as an emphasis is put on walkability and connectivity within the greater community.

Micro-dwellings also reduce their carbon footprint exponentially through need for smaller and fewer appliances, and by having less space to heat and cool. This results in reduced fuel and electricity use, both during the construction process and the building's lifecycle (U.S. Green Building Council [USGBC], 2017). Tiny houses can save 26,000 pounds of CO_2 being released into the atmosphere every year (Tiny House Build, 2014). Much like with energy saving features, tiny houses can contribute to water efficiency through the appliances and design strategies used. The total water use can be reduced through grey water systems, rainwater harvesting, and fixtures, such as composting

toilets (USGBC, 2017). Even more energy savings can be seen in production, transportation, and construction when intentional tiny house communities are built, as these savings are multiplied (USGBC, 2017).

Economic Benefits

Micro-dwellings are well known for their presumed affordability, although this claim has been met with skepticism. However, as different types of micro-dwellings, such as accessory dwelling units (ADUs) are being accepted in the housing market, this assumption is increasingly gaining validity. As discussed, the size of single-family houses has continually increased, directly affecting the price of these homes, and contrasting with young adults' earnings, which disqualifies them for affordable housing, but not enough to join the housing market as expected (Goodman, 2015).

The cost of building a 200 square foot micro-dwelling can be as low as $35,000; whereas a typical total cost on a conventionally sized unit is $72,000, which is more than twice the cost of a micro-dwelling. Another economic benefit to more compact houses is the lack of a mortgage. In most cases, buying a tiny house is worth the upfront cost, which can lead to living debt free (Kilman, 2016). Aside from the upfront and construction costs of micro-dwellings, these small spaces also decrease the cost of utilities as less energy and water is being consumed.

Social Benefits

The social benefits of micro-dwellings stem from the increasing desire for community, as well as from the paradigm shift occurring. These small spaces challenge their owners to reconsider how they value physical goods, personal relationships, and the environment (Kilman, 2016). Micro-dwellings attack the "go big or go home" mentality. They differ from the idea of the "American Dream", which places an emphasis

on the material aspects of housing, rather than on the experiences and relationships that occur within it, and align with ecological principles and voluntary simplicity. Small living drives a change from a self-centered mindset to a community-centered mindset; it drives a need for community and interpersonal relationships (Kilman, 2016).

Additionally, availability of micro-dwellings can inherently produce a demand for local services, such as laundromats, gyms, or recreational areas. Moreover, by frequenting these public spaces, micro-dwelling residents are more likely to integrate into and appreciate the value of a community (Kilman, 2016). “The core principles of the tiny house lifestyle consist of creating a better environmental ethic and community values through the mechanism of the home” (Kilman, 2016, p.9). Ultimately, the importance of micro-dwellings is not based on its niche aspects, but rather on its values and implications. Small living allows people to understand that downsizing is beneficial, not only for their finances, but for the environment and community as well.

Micro Communities

Micro-villages and Pocket Neighborhoods

Micro-dwelling communities, such as micro-villages and pocket neighborhoods, have started to have a presence around the United States as a type of intentional community (Brown, 2016). Intentional communities have been around for decades and are defined as “a group of people who have chosen to live together with a common purpose, working cooperatively to create a lifestyle that reflects their shared core values” (Kozeny, 1995). These communities can be found in rural settings, suburban areas, and even urban neighborhoods; wherever people have chosen to live together in a single residence or a cluster of dwellings.

Boneyard Studios built in 2012, was an early example of a micro-village; its goal was to promote the benefits of tiny houses, and model what a tiny house community could look like (Figure 18). This community served as an advocate for Washington D.C. zoning and code changes to allow the construction of accessory dwelling units and tiny houses.

Figure 18. (a) Boneyard Studios; (b) Third Street Cottages (Priesnitz, 2014)

The Boneyard Studios' tiny houses ranged from 120 to 210 square feet; the community featured a fruit orchard, green open space, community garden, cistern for water and a bike storage and workshop space were also on site (Priesnitz, 2014). This micro-dwelling community showcase was located at a vacant and unkempt, triangular alleyway. This space, previously full of overgrown grass, pooling water, and garbage, was turned into a community that successfully illustrated and promoted the benefits of tiny houses. However, with the desire to find a place that offered more space for more tiny houses, local art, and agriculture; two of the tiny house owners decided to move elsewhere in Washington D.C., causing Boneyard Studios to close in 2014 (Austin, 2014).

Pocket neighborhoods refer to clustered groups of neighboring houses, or apartments, gathered around a shared open space (Priesnitz, 2014). An example of these is Third Street Cottages, a cluster of eight small cottages, typically 650 square feet with 200 square feet lofts, around a shared garden in Langley, Washington. This neighborhood provides well-defined personal spaces, while still fostering a sense of community. This is achieved through porches that extend living spaces, as well as the green space offered in the middle of the clusters (Priesnitz, 2014).

An important design element of pocket neighborhoods is that all roads are located behind the dwellings, in order to create a shared outdoor space or commons at the center of the unit clusters (Priesnitz, 2014). This community design persuades the residents to interact with each other more and forge relationships with their neighbors. On the other hand, these communities are designed to ensure privacy among the residents as well. The dwelling units are oriented so that the “open” side of a house, featuring large windows, faces the “closed” side of the adjacent house, which has high windows and skylights (Priesnitz, 2014). This community design creates a balance between encouraging social interaction and providing privacy to the residents.

Cohousing Communities

The Cohousing Association of the United States’ (2017) motto “building community one neighborhood at a time” is a well-defined representation of what cohousing communities advocate for. Cohousing offers a community model that creates a sense of place, while also responding to the need for a less constraining neighborhood. Cohousing is claimed to offer the social advantages of a closely-knit neighborhood within the context of twentieth century life, providing privacy as well (McCamant & Durrett, 1988). It represents a sense of community, security and

belonging. McCamant and Durrett (1988) define cohousing through four main characteristics: participatory process, intentional neighborhood design, common facilities, and resident management.

- **Participatory process:** The residents are active in the organization and design process of housing development, and are responsible as a group for the final decisions made. The residents make major decisions regarding their housing and typically partner with nonprofit housing associations or private developers to develop the project. A sense of community begins to emerge the moment the residents start working together.
- **Neighborhood design:** The neighborhood design emphasizes the possibilities for social interaction. Play areas and the common house are placed in central areas, in order to incite people to visit them more often. The neighborhood design is crucial to achieving a sense of community among the residents.
- **Common facilities:** The common house is the heart of the community and is used for both practical and social benefits. These facilities supplement the individual dwelling units and provide a place for community activities. According to McCamant and Durrett (1988), “the common house is an essential element. Through the activities there, life is added to the streets. Without it, the sense of community would be hard to maintain” (p.42). The common facilities extend far beyond the common house and encompass gardens, courtyards, and any other outdoor space meant for interaction.
- **Resident management:** The residents are responsible for the management of these units. All decisions are made as a group and majority rules. This

helps forge stronger relationships among the residents, as they must work out any problems among themselves. This characteristic ties into the participatory process, post design and construction and ensures the continued maintenance of the social community (McCamant & Durrett, 1988).

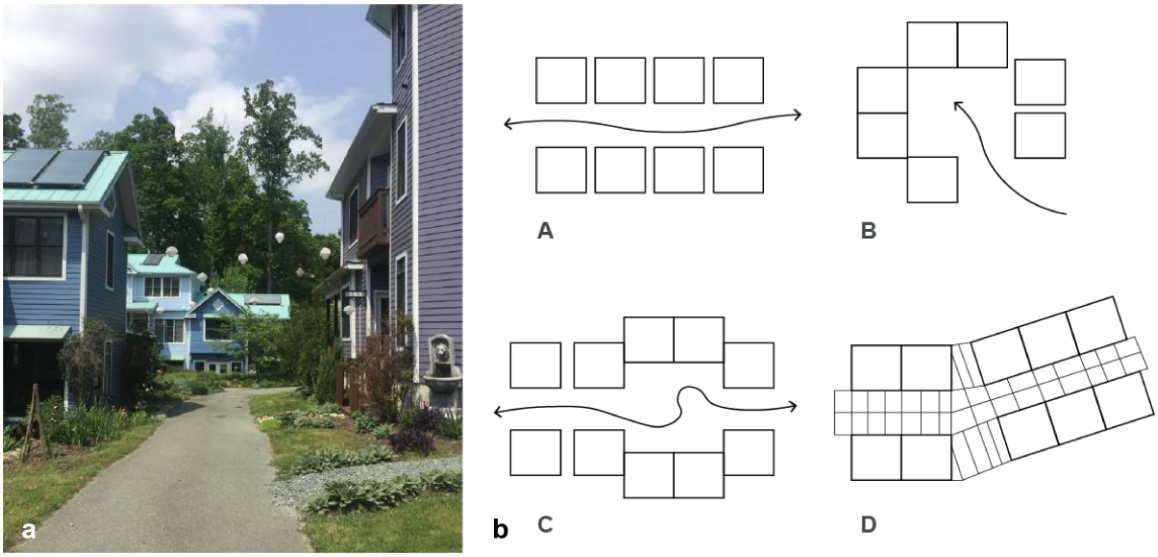


Figure 19. (a) Pacifica Cohousing; (b) Different Types of Cohousing Site Plans (McCamant & Durrett, 1988)

Cohousing developments typically accommodate fifteen to thirty households and are normally located outside of the metropolitan area, where sites are more affordable. However, they tend to still be located within reach of diverse uses, such as schools, medical offices, and parks, among other attractions. As discussed, these cohousing developments also offer communal spaces within the community. Figure 19 illustrates that their design commonly consists of dwellings that are clustered around pedestrian streets, courtyards, and common areas (McCamant & Durrett, 1988). Much like pocket neighborhoods, they advocate common spaces for people to interact.

A sense of community is addressed in different types of housing, such as cohousing communities. This housing type typically incorporates a structure on the site that houses common facilities, provides practical and social benefits, and is an important aspect of community life. Common houses act as the heart of the community and are effective ways of helping the residents form a sense of community. Finally, aside from creating a sense of community, residents also focus on ecological concerns such as solar and wind energy, recycling, and organic gardens; much like tiny homeowners.

Micro-dwellings

Tiny Houses

Tiny houses include homes that are mobile or stationary and are typically of less than 430 square feet (Mutter, 2013). The Tiny House Movement is a novelty that has captured people's attention, for many reasons. According to Kilman (2016), most tiny houses are priced below $100,000, which is $182,800 less than the median price of a typical American home. Despite the attractive initial pricing, many factors affect the availability of this housing model. The price of tiny houses could be extremely affordable if buyers are capable of paying the upfront cost. The lack of access to mortgage financing, however, may pose a major financial obstruction. Despite these financial drawbacks, tiny house communities are being developed in an effort to offer affordable rental units for particular populations, such as individuals experiencing homelessness.

However, tiny houses face mayor legal obstacles: zoning laws in the United States do not allow tiny houses, and when tiny dwellers build their homes on trailers, building codes no longer apply to these houses (Vail, 2016). Some loopholes have been identified to make tiny homes legal, and thus possible, such as tiny dwellers remaining mobile; using tiny houses as an accessory dwelling unit where allowed; or getting a

variance for exemption from the regulations. According to Vail (2016), a proposed resolution to these obstacles is the creation of communities, such as pocket neighborhoods and tiny house communities. This can be seen through the efforts of micro-villages such as Quixote Village in Olympia, Washington (Figure 20), which houses dwellings under 200 square feet, in contrast to Third Street Cottages, which houses dwellings over 600 square feet (Quixote Village, 2018).

Figure 20. (a) Tiny Houses Greensboro; (b) Quixote Village in Olympia, Washington (Jenkins, 2014)

Accessory Dwelling Units (ADUs)

An accessory dwelling unit (ADU) is a smaller home or apartment that is located behind or attached to the principal dwelling on the same property lot (Peterson, 2018; Vail, 2016). There are three main types of ADUs, interior attached, attached, and detached, as shown in Figure 21. The first refers to spaces located inside the primary dwelling and are typically converted spaces, such as attics and basements. Attached ADUs are living spaces that are added to the primary dwelling, sometimes seen as

attached garage conversions. The third and debatably the most common is a structure that is separate from the primary dwelling. ADUs are always subordinate to the primary dwelling in size and location.

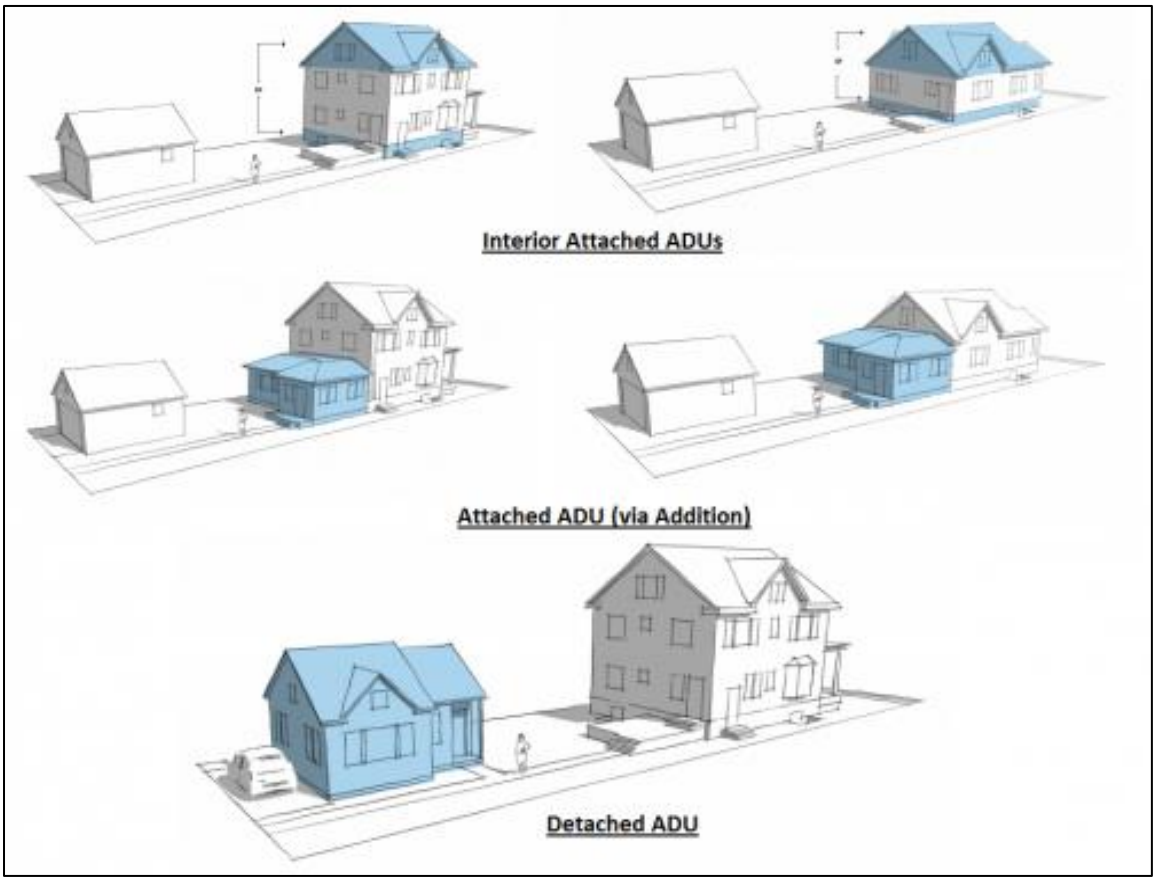


Figure 21. Types of Accessory Dwelling Units (Cecchini, 2014)

ADUs and the like have been used for over a century. In the 1910s and 1920s, policies widened residential property lots from 25 feet to 40 feet, created uniform setbacks, and supplied backyard garages, in order to maintain lower densities in neighborhoods (Chapple, 2011). During the 1950s and 1960s, the growth of suburbs reinforced the high demand of lower-density development, ultimately leading to the

prohibition of accessory dwelling units (Sage Computing Inc., 2008). However, in the 1970's to 1990's they began making an appearance again and are currently gaining more attention.

Figure 22. (a) Sellwood Home Addition: Attached ADU; (b) Cully ADU: Detached ADU (Hammer & Hand, 2017)

Municipalities started to adopt accessory dwelling unit programs in order to increase the affordable housing supply, and make efficient use of the existing housing stock, without dramatically changing the neighborhood's character (Krass, 2013; Peterson, 2018). This entailed the participation of the city or town, in order to change the existing zoning laws, and permit the construction of a second livable dwelling unit on the same lot of an existing dwelling. This had the biggest impact on suburban neighborhoods, due to the existing zoning laws, and the neighborhood pushback caused by the Not in My Back Yard (NIMBY) mentality (Krass, 2013). However, today there is a growing awareness and acceptance of accessory dwelling units as a form of affordable housing. Examples of accessory dwelling units are pictured in Figure 22.

The main benefits accessory dwelling units provide are additional financial (typically rental) income for the primary dwelling user, lower costs and quicker permitting

processes than those of conventional dwellings, use of the existing housing stock, and provision of affordable housing. In fact, the existence of an ADU on a property may be seen as an opportunity for business organizations, or investors, to rent out both the primary living unit and the ADU as a source of steady income. However, there are three main concerns about ADUs: economic, social, and physical. Financially, two perceived threats to rental housing are the people they attract, presumably less desirable than neighborhood residents, and the assumed negative impact on property values (Hulse, 2015). However, the latter has not been proved to be true.

In terms of social issues, the existence of an ADU on a property may introduce a change in the demographics and ensuing social dynamics of the neighborhood. One major factor that prevents ADUs from being an appropriate fit for young adults is their lack of a community. As described before, creating a sense of community and offering spaces for social interaction are key for young adult professionals. However, accessory dwelling units tend to be isolated, and therefore lack the communal spaces that may help forging social relationships among the residents. Physically, ADUs may impact the total ratio of impervious surfaces to unpaved open spaces, as well as cause vehicle and parking (Hulse, 2015).

Micro Unit Apartments

A housing option that aligns with young adults' interest to live in urban settings is micro unit apartments, which tend to be built in denser areas with multistory construction (Figure 23). These refer to a small studio apartment, typically less than 350 square feet, with a fully functioning, and accessibility compliant, kitchen and bathroom (Whitlow et al., 2013). In fact, the target demographic for these micro units is young professional singles, mostly under 27 to 30 years of age. Secondary demographics include young

couples and roommates, and older move-down singles. Although micro units are typically less than 350 square feet, the square footage depends on the location, and they can span from a small studio apartment (approximately 200 square feet), to a one-bedroom apartment (approximately 500 square feet) with or without communal areas. This housing model has been in use in Japan since before the 1990's. However, following the economy bubble burst of 1989, the emergence of micro-dwellings in Japan was seen at a larger scale (Richmond, 2012).

Figure 23. (a) Carmel Place in Manhattan, New York; (b) Micro Lofts at the Arcade Providence in Providence, Rhode Island (Whitlow, 2013)

The consumer research and case studies conducted by Whitlow et al. (2013); claim that a segment of renters are truly interested in smaller units. They state that nearly 25% of renters, who are currently living in conventional units, say that they would be interested in moving to a smaller unit. They suggest that smaller and micro units may be more successful in the marketplace than conventional units, as they achieve higher occupancy rates, and collect significant rental-rate premiums (rent per square foot). This

is why, “micro unit apartments are a new type of residential community being designed to provide small, but affordable housing in urban areas” (Whitlow et al., 2013, p. 16).

Although the main selling point of these micro unit apartments is the economic factor, place and privacy have a great influence on people’s attraction to these spaces as well. Whitlow et al. (2013) found that most renters interested in these spaces are looking for lower rental rates, a desirable location (urban and walkable), and more privacy by living alone, which agrees with similar assertions about other types of micro-dwellings, such those stated by Goodman (2015). Regarding the design considerations of these micro units, flexible furniture systems, high ceilings, oversized windows, built-in storage, gadget walls, and movable kitchen islands are some of the innovative features incorporated, in order to comply with the Fair Housing Amendment Act (Whitlow et al., 2013). Furthermore, these communities also put an emphasis on amenities, gathering spaces, and services that enable residents to experience the community outside.

Design Considerations

Japanese micro-architecture is an example of the development of affordable apartments within the constraints of limited floor area to achieve small footprint size, space-efficiency, and quality of space. Although micro-architecture arose in Japan for specific cultural and socioeconomic reasons, it provides a good example of how these spaces are designed (Richmond, 2012). Examples typically consist of one-bedroom apartments that are approximately 400 to 550 square feet (Hayden, 2010). Japanese micro-architecture maximizes the space through the manipulation of the space itself, natural light, exterior and interior views, and furniture. Richmond (2012) identifies eleven strategies used to design these spaces:

- **Internal sight lines and views:** Allowing sight lines to connect one space to another creates the perception of a larger space. This can be achieved with partial-height walls, interior windows, and open riser staircases. Providing an internal view greater than the space occupied, allows the occupant to feel they are in a larger space.
- **External sight lines and views:** “With little room, spatial elaboration and visual complexity must often be borrowed from outside” (Richmond, 2012, p. 81). This can be achieved by opening out to courtyards, internal gardens, and terraces. Providing views to the exterior blurs the barrier between the occupant and the external environment, heightening the connection between the inside and out.
- **Increasing height of spaces and rooms:** Enlarging the volume vertically can compensate some of the spatial size experience lost by reduced footprints.
- **Rooms and spaces stacked vertically:** Vertically stacking various functions of a program usually results in fewer partitions because floor planes divide the functions.
- **Vertical circulation:** Stairwells have secondary functions, such as dispersing light while simultaneously acting as a void space. These can also include storage or utility rooms, making more efficient use of the space.
- **Split-level:** These permit shorter stair runs between different levels and functions, while also achieving a stacking effect. It allows for visual connections and light shared between multiple spaces. This strategy also maintains a distinction between different areas.

- **Rooms as circulation space:** Circulation is given as little dedicated space as possible. Rooms can be given secondary functions as circulation spaces, which eliminate the need for assigned circulation space between rooms, such as corridors.
- **Voids:** Carving out the building's volume can decrease the floor area. However, it increases the quality of the space by creating a greater sense of space. Voids can be used to create spaces such as courtyards, light wells, and double-height spaces.
- **Natural lighting:** The placement and planning of day lighting is important for small dwellings. Borrowing light can be extremely beneficial when there are spaces that are unable to have windows for privacy reasons or otherwise. Top lighting is a useful way of introducing light into a space while still maintaining privacy. Natural light can be accomplished through fenestrations, skylights, translucent or perforated materials, and screens.
- **Multi-use furniture and spaces:** Spaces as well as furniture can adapt and transform with fluidity to facilitate the lives of the inhabitants. This serves to not only increase the perceived size of small spaces, but simplify the amount of furniture items required as well. This can be done with sliding partitions, fold-down furniture, and transformable or convertible furniture. While convertible furniture saves space, convertible spaces allow for the dwelling to adapt to the lives of the inhabitants.
- **Custom furniture and built-ins:** Incorporating built-in furniture that becomes part of the architecture is another way of making a small space seem larger. This can be done with shelving, cabinetry, or seating with incorporated

storage, all of which contribute to the preservation of the continuity and openness of the interior space.

Lessons Learned from the Literature

To summarize, the millennial generation has been disproportionately affected by the housing crisis of 2007 and continues to be affected today. Approximately 31% of them are still living at home with their parents and shut out the rental housing market due to mortgage inaccessibility and high student loan debt ratios. The millennial generation, at the time of this study, refers to those between 18 to 38 years old. However, a focus is put on young adults aged 20 to 29 years old, as this age group experiences a high level of residential mobility. These young adults are going through a transitional period of their life and are in need of housing options that align with their housing needs and aspirations.

Millennials are more racially diverse, prove to strive for higher educational attainment than previous generations, put off settling down and starting a family, and embrace technology as a way of communicating. This generation makes up the largest generation yet with approximately 83.1 million in the United States. Due to this, they are expected to have a significant impact on the housing and rental market. However, their housing aspirations and needs are significantly different from past generations, and they are having trouble finding housing options that align with these needs. Millennials differ from the “American Dream” and desire to live a simpler life, also known as voluntary simplicity. This generation is interested in scaling down their lives; in order to feel closer to their environment, and reduce the clutter and complexity in their lives, among others.

Aside from their desire to live simpler lives, young adults are interested in developing a sense of community as well. Social interactions affect an individual’s

residential preferences, choices, and satisfaction. Therefore, millennials are looking to live in areas that help them forge social relationships and develop a sense of belonging. In contrast with past communities, today's communities are being developed by choice. Individuals are intentionally creating communities based on shared values, which is reflected in millennials' desire to be part of a community. As there is a rebirth of this desire for community; eco-villages, micro communities, cohousing communities, and others are emerging.

The micro-dwelling movement is believed to be an appropriate fit for the target population. Small living has a series of environmental, economic, and social benefits that are appealing to young adult professionals. They fit the voluntary simplicity ideal and reflect the desire for creating intentional communities based on shared values. Different types of micro-dwellings are making their way into the housing market, including tiny houses, accessory dwelling units, and micro unit apartments. Studies suggest that these micro-dwellings satisfy the target population's housing needs in one way or another, and are beginning to be accepted at a local and national level.

Voids in the Literature

The review of literature offered insight on the housing crisis, young adults' characteristics, and different types of micro-dwellings in the housing market. The areas above covered in the literature suggest the hypothesis that micro-dwellings might be a viable housing option for young adult professionals. Literature and previous studies clearly indicate young adults' need for housing and suggest their potential interest in micro-dwellings to address this need. However, a gap was found in this premise, as there is little documented evidence of the implementation of these claims. The claims

have yet to be empirically tested, which suggests the need for further research that tests the claims found in literature and provides a proof of concept.

There also seemed to be a lack of research done on the rental housing options that align with young adults' idea of a home. As the housing market has evolved, and housing aspirations among different age groups have changed, there is an emerging need for understanding how these correlate. The review of literature produced a general description of the topics previously mentioned. Yet, the referenced sources offer a rather vague and simple list of what appeals to young adults in housing. Therefore, the issue requires a more in-depth study. Similarly, few sources have identified specific design considerations or architectural strategies used to design micro-dwellings. Further, these have not been proven to align with the target population's interests and needs.

It is important to take all these elements into consideration when designing housing and communities, in order to provide young adults the opportunity to form a sense of community wherever they are living. Therefore, designers and developers must understand how to facilitate a sense of community through the built environment. Focusing more on the design of the community could lead to greater success in engaging populations, like young adult professionals, to rental housing options, as this is a selling point for them. Nonetheless, there is a gap in research and studies that explore housing alternatives to help young adults join the rental or housing market. Therefore, in order to test these claims, the following research question was proposed: *What is the possible fit between the housing aspirations of young adults, and the micro-dwelling housing model?* In response, these gaps are addressed and explored throughout this research.

CHAPTER III

METHODOLOGY

Research Question

The review of literature established that clear indications exist of young adults' need for housing, as well as their potential interest in micro-dwellings to address this need, suggesting the possibility that some form of micro-welling might provide a much-needed solution for the millennial generation. However, the review found gaps in this body of publications, as well as past studies, as to whether this idea has been implemented or tested, in general. This therefore suggests a primary research question for this study: *What is the possible fit between the housing aspirations of young adults, and the micro-dwelling housing model?* The answer to this main question rests on previously examining the following:

1. What do young adults value most in housing?
2. Which, among the different micro-dwelling housing types available in the rental market, might be viable housing options for young adults?

Answers to these questions set the stage for evaluating the possible fit among these two factors and thus providing a preliminary answer to the main research question. Assuming that an association may be established among young adults' housing needs and one or more existing micro-dwelling models and to ensure a more perfect fit, it might be necessary to address a third question:

3. What is the optimal design of micro-dwellings as housing for young adults?

Only through exacting answers to this progression of questions, and their derivative operational questions, can the main research query be satisfied.

Purpose and Goals

The purpose of this research is to leverage the power of design toward the satisfaction of human needs with focus on the millennial generation; its objective is to explore the premise that micro-dwellings might be a viable housing option for young adult professionals. The research focuses on and explores one dimension of what undoubtedly is a larger issue, understanding viable as being capable of satisfying the needs of the target population, including economic, seen from the perspective of design.

Shelter, in the form of housing, satisfies a basic human need that forms part of the biological and physiological needs which, as described in Maslow's (1954) pyramid, are the first and most basic for survival. The need for community is encompassed in Maslow's third tier related to belonging needs, and is claimed in the literature to be essential for satisfying the target populations' housing aspirations. This is remarked by Shaffer and Anundsen (1993), who remind us that individuals exist only in the context of a larger interconnected whole; and therefore, the stronger the community, the stronger the individual.

Study Design and Methods

This research was conceived as a *proof of concept study (PoC),* defined as a project or study that demonstrates that a design concept, business proposal or other is feasible, proving its validity (Oxford University Press, 2018b). Proof-of-concept studies are largely conducted in business, where they are seen as an opportunity to not only demonstrate feasibility but also "identify potential technical and logistical issues which could interfere with meeting success criteria... [and] gather feedback… while mitigating

risk… early on in a development cycle" (DeLuna, 2014). Proof of concept studies are gaining increasing popularity among other disciplines such as engineering and medicine, where proofs or demonstrations are arrived at by using a mix of different quantitative and/or qualitative data, and information-gathering methods commonly used in the discipline. Examples are randomized placebo-controlled treatments for a pharmacological study (Zarate et al., 2004); and behavioral observations and self-reporting for mental health studies (Harrison et al., 2011).

This study appropriated this paradigm for application to research on the design of the built environment. It aimed to proof the concept contained in the main research question, that one or more forms of micro-dwellings can be a viable housing solution for urban millennial professionals. To this end the study was exploratory and took a mixed-methods approach consisting of qualitative research and empirical testing components. It was composed of three phases: characterization, identification of a design pattern language, and empirical testing, as illustrated in Figure 24.

The characterization phase was informed by the review of literature, a survey, site visits, and a design charrette, described in the following sections. The review of literature provided a preliminary introduction to the principle topics of the study and informed the next step. The survey offered an understanding of the housing aspirations of young adult professionals, and the site visits and design charrette offered information on micro-dwelling design strategies. The pattern language synthesized the results from the characterization study, and the final phase, empirical testing, focused on application of the pattern language to a case.

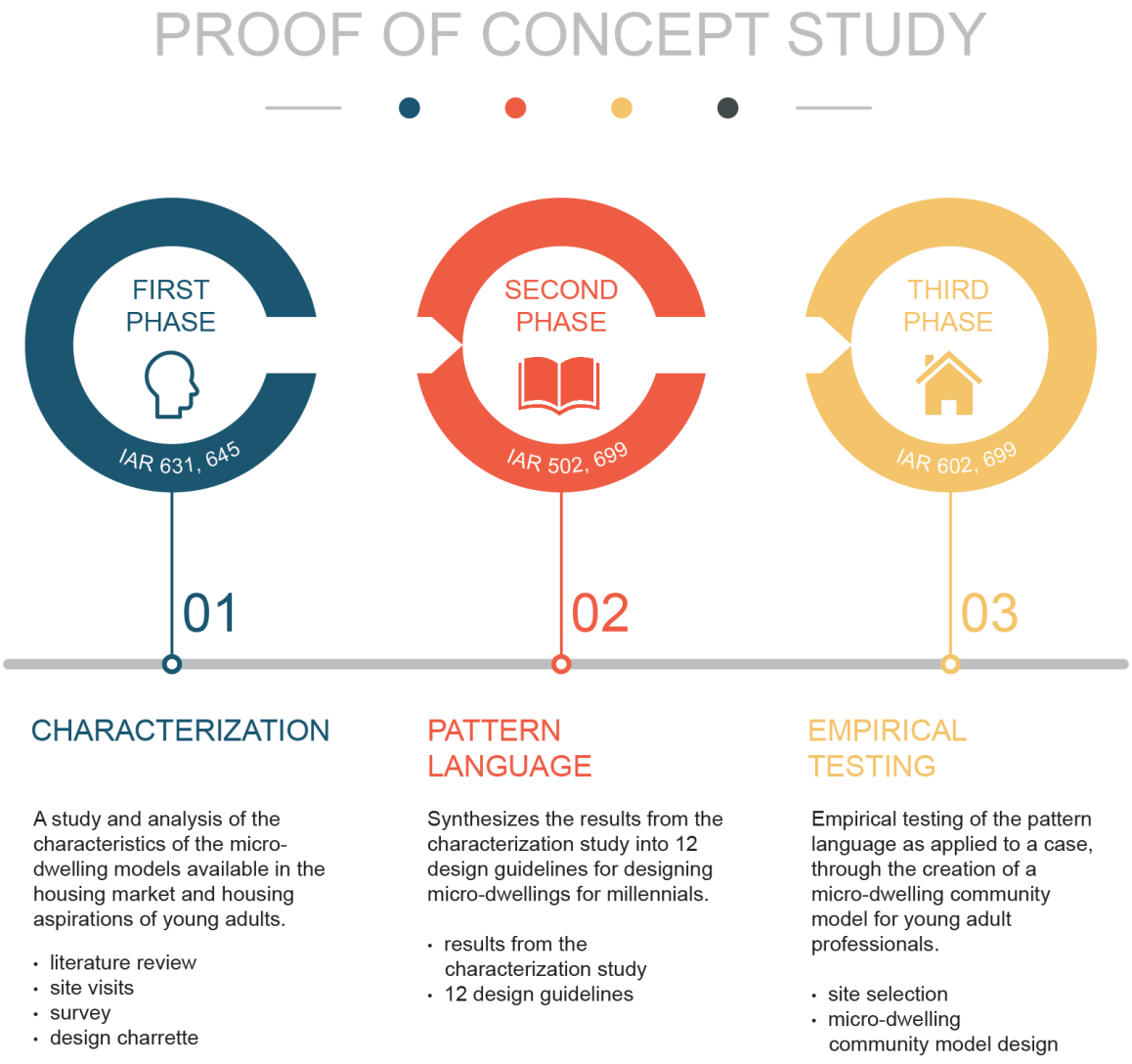


Figure 24. Mixed Methods Approach Diagram

Implementation of this study design implicates that each of its research questions unfold into derived operation questions. These are addressed in one or more phases of the study and through one or more methods as depicted in Table 2.

Table 2. Proof of Concept Study: Research and Operational Questions

PROOF OF CONCEPT STUDY								
Research Questions			Characterization				Pattern Language	Empirical Testing
Primary Question	Secondary Questions	Operational Questions	Literature Review	ADU Charrette	Survey	Site Visits	Design Guidelines	Community Model
How might the micro-dwelling model fit the housing aspirations of young adults?	1. What do young adults value most in housing?	a. How can millennials' needs be best integrated into micro-dwellings?			•			
	2. Which, among the different micro-dwelling housing types available in the rental market, might be viable housing options for young adults?	a. Which compact housing types are currently available in the rental market?	•	•		•		
		b. What is the potential for siting, location, and grouping of these micro-dwellings, and what does this look like?	•	•		•		
		c. What are the key characteristics of micro-dwellings, and how do they fit the housing aspirations of young adults?	•	•	•	•		
	3. What is the optimal design of micro-dwellings as housing for young adults?	a. What is the pattern language that is expressed in micro-dwellings for young adult professionals?					•	
		b. What design considerations and architectural strategies might satisfy the housing aspirations of young adults?					•	•

Characterization

Characterization is defined by the Oxford University Press (2018a) as “a description of the distinctive nature or features of someone or something”. The purpose of the characterization phase was to gather and examine information to identify a) the characteristics of micro-dwellings available in the housing market, and b) the housing needs and aspirations of millennials. Micro-dwelling information was collected from literature review, observations and photo-documentation of different types of micro-dwellings, and participant observation of an accessory dwelling unit charrette. Millennials’ housing needs and aspirations were identified through literature review and an exploratory survey of young adult professionals.

Literature Review

According to Groat and Wang (2013), “the point [of literature review] is that any broad topical area can be focused down to any number of different strategic approaches, or research designs” (p.162). Literature review is essential in the collection of references related to a research topic (Groat & Wang, 2013). Therefore, besides using literature review as a way of identifying gaps in previous studies and opportunities for potential contributions, this study used it as a method to inform the characterization of micro-dwellings and millennials’ housing needs and aspirations.

The literature review addressed the following operational questions: “Which compact housing types are currently available in the rental market?”; “What is the potential for siting, location, and grouping of these micro-dwellings, and what does this look like?”; and “What are the key characteristics of micro-dwellings, and how do they fit the housing aspirations of young adults?” Though the literature allowed crafting of an

initial definition of micro-dwellings and identifying of key characteristics, gaps were found in the literature, which required further research.

Site Visits

A preliminary step for the experimental segment of the study entailed conducting a series of seven site visits to manufacturers, organizations, and users of micro-dwellings, and cohousing communities. Site visits were used as precedent analyses, as they are “an evaluation activity intended to gather first-hand information about a program, usually with the intent to incorporate findings with other data collected” (Bachrach, 2004, p.3). Furthermore, Tzonis and White (1994) establish,

> Reasoning with cases, in its widest sense, includes reasoning with future and hypothetical examples, as well as with actual past and present ones. The area of overlap between reasoning with established knowledge and reasoning with cases is the use of precedents (p.19).

Precedent analyses are necessary in architecture and design as they provide knowledge and assurance of the success of a design without being exhaustive (Tzonis & White, 1994). This evaluation activity was essential in the researcher’s understanding of the micro-dwellings studied, leading to new knowledge and perspectives acquired through observations.

The site visits were conducted, in order for the researcher to identify micro-dwelling communities and developments in North Carolina and neighboring states. This allowed the filling of any gaps in the knowledge acquired from indirect sources, as well as the matching of the housing aspirations identified by the surveyed participants with the design strategies found in micro-dwellings developed in the same or neighboring geographic locations.

The site visits were accomplished during the summer of 2017. Here, observations were carried out, and the micro-dwellings' designs were analyzed to assess their characteristics and use. During the visits, these observations were recorded photographically and in a written document following a set of criteria discussed later in this chapter. The site visits were used as the basis for the creation of the precedent studies reported in Chapter IV. The site visits carried out in North Carolina and Virginia, were the following:

- Cohousing communities
    - Durham Central Park Cohousing Community (Durham, NC)
    - Arcadia Cohousing (Chapel Hill, NC)
    - Pacifica Cohousing (Carrboro, NC)
- Tiny houses and communities
    - Perch and Nest: A Tiny and Cottage Home Company (Winston-Salem, NC)
    - The Farm at Penny Lane (Pittsboro, NC)
- Micro unit apartments
    - The Harper (Washington D.C.)
- Usonian House
    - Pope-Leighey House (Alexandria, VA)

Another tiny house community was observed and documented in the course of a summer internship at Tiny Houses Greensboro (THG), a non-profit organization dedicated to the promotion of micro-dwellings. THG is working on developing two tiny house communities to help house homeless individuals in Greensboro and High Point, North Carolina. Having the opportunity to work with the design of a tiny house

community during the internship resulted in acquired knowledge that helped develop the empirical testing for the research.

The site visits consisted of a tour of the communities and dwellings. On site, the researcher was allowed to document the visits photographically. The researcher also used a template to record their observations, which included criteria such as design team, location, date built, number of units, square footage, facilities offered, and observations and assessment. These criteria were used to gain more comprehensive information on the communities and dwellings. Once all the site visits were accomplished, the observations recorded were transcribed to a Word document and later compiled into a document for presentation.

As stated previously, site visits offer a different perspective for the study and enhance the researcher's understanding of the topic (Bachrach, 2004). Visiting cohousing communities provided information on the typical programmatic elements of these communities, and how they are designed and arranged. The Pope-Leighey House by Frank Lloyd Wright was visited in order to understand the design elements and techniques used by Wright in his Usonian houses, such as the compression and release effect, which emphasize compactness. Wright's goal with the Usonian houses was to provide affordable housing for middle class Americans. These were described by Wright (2005) as modest houses that do not have a feeling for the grand at all. Therefore, Usonian houses are exceptional precedents that demonstrate how smaller, more affordable houses should be designed.

In sum, the operational questions addressed through this method were "Which compact housing types are currently available in the rental market?"; "What is the potential for siting, location, and grouping of these micro-dwellings, and what does this

look like?"; and "What are the key characteristics of micro-dwellings, and how do they fit the housing aspirations of young adults?"

Survey

A survey was conducted to bring further clarity to the issue by again addressing the question, "What are the key characteristics of micro-dwellings, and how do they fit the housing aspirations of young adults?". Additionally, it asked, "How can millennials' needs be best integrated into micro-dwellings?" Groves et al. (2004) define surveys as "a systematic method for gathering information from [a sample of] entities for the purpose of constructing quantitative descriptors of the attributes of the larger population of which the entities are members" (p.4). Surveys are the most common tactic used for gaining subject-based information, ranging from demographic characteristics to behavioral habits and opinions on different topics (Groat & Wang, 2013).

Participants

This survey intended to anonymously hear from young adult professionals about their housing satisfaction, aspirations, and needs. For the purpose of this study, *young adult professionals* referred to 20 to 29 year-olds that are in the workforce. This range was selected, given that according to Arnett (2000), there is a high level of residential mobility among this age group. This is the stage of life in which major residential changes occur; and young adults seek housing options that are affordable for them.

This survey had a sample size of approximately 3,000 young adults (homeowners, renters, and not) in North Carolina. The sample was identified through SynerG and the Master of Public Affairs (MPA) program at the University of North Carolina at Greensboro (UNCG); the entities which distributed the survey to their members on behalf of the investigator, and which may have benefited from the

outcomes of this research project. This was a convenience sample that was easily accessible to the researcher.

SynerG, part of Action Greensboro, is an organization of young adults who work to attract, engage, and connect young professionals to Greensboro, North Carolina. This organization promotes social and professional networking, leadership opportunities, and serves as a source of information for young adults aged 18 to 40 years old. They work to promote connectedness, diversity, inclusiveness, and accessibility within urban centers in North Carolina. Their collaboration with this study was sought given their fit with the age demographic of the study, and their focus on attracting young professionals to Downtown Greensboro.

The Master of Public Affairs program at UNCG was chosen to help distribute the survey due to the nature of their program, which provides education to students seeking professional development and career advancement, and that are interested in contributing to the fields of public policy, including housing. Distributing the survey through this program guaranteed the anonymous contact with current graduate students that fit the characteristics of the target population.

As stated above, the survey was distributed to approximately 3,000 individuals aged 18 to 40 years old. However, as the target population of this study was young adults aged 20 to 29 years old, the survey was structured to identify the participants' age, in order to filter the responses and identify the participants that fit the target population's description. Fifty-five individuals participated in the survey, of which only thirty-two were aged 20 to 29 years old. Therefore, there was a 1.8% response rate and 98.2% of nonresponse bias, affecting the reliability and viability of the survey results.

Instrument

The online survey (Appendix B) consisted of 19 close-ended and open-ended questions regarding what young adults look for in housing. These items included multiple-choice questions (single and multiple answers), ranking questions on a 5- or 6-point Likert scale, and text entries. The survey was divided into two sections. The first addressed the participants' demographic characteristics and social and physiological needs, while the second part addressed their housing needs and opinions on micro-dwellings. These questions were extracted from previous surveys and studies, such as those conducted by Katherine Timmerman (2015) and the Urban Land Institute with Kingsley Associates (Whitlow et al., 2013).

The second section of the survey relied on images of the types of micro-dwellings and communities addressed—tiny houses, micro unit apartments, accessory dwelling units, and pocket neighborhoods—to facilitate a comprehensive understanding of the concepts being discussed with the participants. Additionally, a brief written description and definition was provided for each type of micro-dwelling and community.

The first section of the survey consisted of 11 items. Four items were adopted from Timmerman's *Millennials and Home: Understanding the Needs of the Millennial Generation in Their Living Environment* (Timmerman, 2015), which addressed Maslow's Hierarchy of Basic Human Needs in relation to those of millennials. The following questions, from Timmerman, provided an overview of the social needs of the participants, as well as their physiological needs, such as food and shelter.

- Where do you typically eat meals by yourself, with others, or both?
- How often do you invite people to socialize in your dwelling?

    - [If never] Could you give a brief explanation as to why you do not invite others over to socialize?
- When you invite others over to socialize, activities include:
- How many people do you normally do these activities with?

Two items were adopted from the Urban Land Institute's (ULI) *The Macro View on Micro Units* (Whitlow et al., 2013), and addressed the living arrangements of the participants. These items were selected from a consumer research survey conducted by Kingsley Associates, a real estate research and consulting firm that surveys over 4 million prospects and residents annually, and reported by ULI, to gauge current renters' opinions on their living experience. According to Whitlow, et al. (2013) the Kingsley Index, a proprietary real estate tenant and resident opinion database, includes data from eight of the top ten largest multifamily management companies. Some of the items adopted from Kingsley Associates' survey were modified to address the sample more accurately and provide a wider array of options. An example of a modified question is below.

Kingsley Associates through ULI:

What are your current living arrangements?

- Single living alone
- Single with children
- Spouse/partner
- Spouse/partner with children
- Living with roommate

Modification:

What are your current living arrangements?

- Living with other kin
- Living alone
- Other independent living arrangement
- Living with significant other (married, committed, etc.)
- Living at home of parent(s)
- Other

Table 3. Survey, Part I

SURVEY ITEM DESCRIPTION			
Question	Question Type	Answer type	Source
PART I			
1. Please identify your age range:	Multiple choice	Single answer	Researcher
2. If you had to move, where would you plan on moving to?	Multiple choice	Single answer	Researcher
3. What is your labor status?	Multiple choice	Single answer	Researcher
4. What are your current living arrangements?	Multiple choice	Single answer	Whitlow, Hewlett, Ruiz, & Witten (2013)
5. If you have roommates, how many roommates do you live with?	Multiple choice	Single answer	Researcher
6. What living arrangements would you prefer?	Multiple choice	Single answer	Researcher
7. Current living arrangement satisfaction:	Ranking - Likert scale - Satisfaction	Single answer	Whitlow, Hewlett, Ruiz, & Witten (2013)
* [if you marked 0-2 for any category] Could you briefly explain why?	Text entry	Text	Researcher
8. Where do you typically eat meals by yourself, with other, or both?	Multiple choice	Single answer	Timmerman (2015)
9. How often do you invite people to socialize in your dwelling?	Ranking - Likert scale - Frequency	Single answer	Timmerman (2015)
* [if never] Could you give a brief explanation as to why you do not invite others over to socialize?	Text entry	Text	Timmerman (2015)
10. When you invite others over to socialize, activities include:	Multiple choice	Multiple answer	Timmerman (2015)
11. How many people do you normally do these activities with?	Multiple choice	Single answer	Timmerman (2015)

* Follow-up questions to the preceding item

The researcher developed five items, to capture the profile of the participants and their demographic characteristics. These questions addressed the participants' age range, preferred housing location, labor status, and preferred living arrangements. Ultimately, this section of the survey helped identify the type of housing, location, and rooms that are most desired by the target population. Table 3 lists the questions used in Part I of the survey.

The second section of the survey consisted of eight items, seven of which derived from Kingsley Associates' survey through the Urban Land Institute's report, *The Macro View on Micro Units* (Whitlow et al., 2013). These questions were adopted to identify potential renters' opinions on micro units, their satisfaction with their current amenities and facilities, as well as factors that influence their rental decision. The multiple choice and ranking questions adopted from this source were the following:

- Would you be interested in owning a micro-dwelling?
- I would choose a micro unit over a conventional-size dwelling unit in exchange for:
- Satisfaction with current amenities and facilities:
- Importance of neighborhood amenities:
- Importance of community amenities:
- Importance of unit amenities:
- Homeowner priorities in initial lease decisions:

The researcher developed one item; in order to identify what community amenities were currently offered to the participants and understand the reasoning behind their satisfaction with these amenities. As shown in Table 4, this section helped identify what millennials housing aspirations are in terms of the amenities, facilities, and design

features offered. These questions allowed the researcher to understand the relationship between the level of satisfaction the participants had with their current living arrangements and their desired location and amenities.

Table 4. Survey, Part II

SURVEY ITEM DESCRIPTION			
Question	Question Type	Answer type	Source
PART II			
12. Would you be interested in owning a micro-dwelling?	Ranking - Likert scale - Consideration	Single answer	Whitlow, Hewlett, Ruiz, & Witten (2013)
13. I would choose a micro unit over a conventional-size dwelling unit in exchange for:	Multiple choice	Multiple answer	Whitlow, Hewlett, Ruiz, & Witten (2013)
14. What community ammenities are offered at your current living arrangements?	Multiple choice	Multiple answer	Researcher
15. Satisfaction with current amenities and facilities:	Ranking - Likert scale - Satisfaction	Single answer	Whitlow, Hewlett, Ruiz, & Witten (2013)
* [if you marked 0-2 for any category] Could you briefly explain why?	Text entry	Text	Researcher
16. Importance of neighborhood amenities:	Ranking - Likert scale - Importance	Single answer	Whitlow, Hewlett, Ruiz, & Witten (2013)
17. Importance of community amenities:	Ranking - Likert scale - Importance	Single answer	Whitlow, Hewlett, Ruiz, & Witten (2013)
18. Importance of unit amenities:	Ranking - Likert scale - Importance	Single answer	Whitlow, Hewlett, Ruiz, & Witten (2013)
19. Homeowner priorities in initial lease decision:	Multiple choice	Multiple answer	Whitlow, Hewlett, Ruiz, & Witten (2013)

* Follow-up questions to the preceding item

Data Collection and Analysis

A set of steps was taken during the summer of 2017 in preparation for the survey, which was conducted in the fall of 2017. A sample for the survey was identified, questions were drafted, and the Qualtrics online survey engine was selected for its distribution, as it helps analyze the data collected and create customizable reports. This engine also provided a time estimate of ten (10) minutes for completing the survey.

Upon submission to the Institutional Review Board (IRB) an exemption from further review was received (Appendix C). After receiving the IRB approval and stamped consent form (Appendix D), the survey was distributed to SynerG's database by the organization on behalf of the investigator. The survey was distributed to the database through the organization's weekly newsletter. A brief description of the research and survey (Appendix E), as well as a link to the survey, was incorporated to the newsletter and sent to the email listserv once a week from September 25, 2017 to October 23, 2017.

The survey was open for a month but did not receive the response rate expected. An ensuing modification was submitted to the IRB to distribute the survey to an additional database, which was also exempt from further review (Appendix F). This modification allowed the survey to be distributed to the MPA program database and to be open for three additional weeks. The director of the MPA program sent an email to the program's current students, in which the same brief description of the research and survey, as well as a link to the survey was attached. This email was sent once from January 8, 2018, to January 26, 2018. This additional distribution allowed the researcher to obtain the minimum amount of responses required (30) to run descriptive statistics, and base the analysis on the normal distribution.

Once the survey closed and the data was collected, a qualitative content analysis was done. The results collected were transferred to and organized in an Excel spreadsheet. Here, descriptive statistics were used to analyze the data acquired, summarize the sample, and describe findings, including important relationships among variables, as suggested by Groat and Wang (2013).

Univariate analysis was used to describe the distribution of the individual variables identified per item. This looked at the distribution or frequency of values for a variable, as well as the central tendency or estimate of the "center" of the distribution of values. The central tendency for this study was the mean or the average of the number of values. Distribution of values was used to analyze and summarize the responses of the multiple-choice questions. Central tendency, particularly the mean, was used to analyze the ranking questions using the Likert scale. These analyses were depicted in graphical and tabular format, in order to visually describe the results.

Additionally, the researcher coded the responses to the open-ended questions, in order to identify reoccurring themes and topics. This analysis helped the researcher better understand the responses provided for the multiple-choice and ranking questions, by categorizing them into groups.

Design Charrette

The opportunity for studying accessory dwelling units (ADUs) was offered through participation in a design charrette as a facilitator and participant. Lindsey, Todd, Hayter, and Ellis (2009) define charrette as

> …an intensely focused activity intended to build consensus among participants, develop specific design goals and solutions for a project, and motivate participants and stakeholders to be committed to reaching those goals. Participants represent all those who can influence the project design decisions (p.1).

This design charrette was employed in a community-based project, which according to Staub and Lulo (2011), allows for development of preliminary design ideas, immediate assessment by the participants, confirmation of assumptions based on research, and input from community members that provide insight on the community's

needs. The design charrette as a research tool drew out information that adjusted the design outcomes; which in this case were design guidelines that informed a pattern language.

The charrette was hosted by the Center for Community-Engaged Design (CC-ED) at UNCG, during the 5th Annual Novem Mason Symposium. The purpose of the two-day charrette was to engage diverse stakeholders in developing site plans and accessory dwelling unit designs for three sites located in Greensboro, NC (Spring Garden Street, South Mendenhall Street, and Kensington Road).

The sites are owned by individuals that are interested in building an ADU on their lot, for their personal use or to rent it out. The three sites were visited beforehand by a group of facilitators including the researcher, in order to identify any lot constraints, understand what the owners' design parameters were, take measurements of the lot, and document the visit photographically. The charrette was held during two days, March 13, 2018 and March 14, 2018. On both days, the charrette was prefaced with an introduction to accessory dwelling units. Kol Peterson, a renowned author and expert on ADU design and implementation, spoke about his experience with ADUs, and what the participants should take into consideration when designing the site plans and ADU units.

A schedule was provided to the participants and facilitators (Appendix G), which highlighted the goals of the first and second day of the charrette. Both days were set to begin at 9:00 am and end at 12:00 pm with a pin-up session, concluding with a total of six hours. Due to unforeseen circumstances, during the first day, the charrette began at 11:00 am and ended at 1:30 pm, while the charrette began at 9:00 am and ended at 1:30 pm on the second day.

During the first day, the charrette consisted of twenty-one participants, including the researcher, who reviewed the data provided to them and set on the task of developing schematic site plan drawings. During the second day, twenty participants, including the researcher, worked on schematic floor plans, interior and exterior elevations, and perspectives. The participants on both days included students and professors from the Interior Architecture department at UNCG, students from the Virginia Commonwealth University (VCU), architecture professionals, and community members. This charrette lasted a total of seven hours and resulted in a series of sketches that were then compiled into poster documents for presentation.

The researcher was present throughout the entirety of the charrette as one of the facilitators and participants. Once the charrette was completed, the researcher collected all of the data developed throughout the event, which consisted of schematic site plan and floor plan drawings. The researcher reviewed them and developed a site plan and floor plan for each site, in order to synthesize the information acquired. These plans were developed applying the feedback received from the owners of the dwellings, as well as the participants' observations. This charrette informed the study, by filling any gaps found in literature regarding the design of ADUs. Additionally, the design strategies identified in the charrette helped inform the development of the design pattern language. Ultimately, this charrette addressed the same operational questions as the site visits.

Pattern Language

The second part of the research, development of a design pattern language, was accomplished through a comparison between the design strategies that were identified in the site visits, design charrette, and literature review and the housing aspirations defined by the survey. The focus of this part of the study was to create a set of

guidelines that synthesized the results from the characterization study. Alexander (1979) defines the concept of a pattern language as being “a finite system of rules which a person can use to generate an infinite variety of different buildings” (p.191). In other words, a pattern language is a method for describing design practices or patterns. Each pattern describes a problem that occurs in the environment, and then describes the solution to the problem in a way that it can be used more than once (Alexander et al., 1977).

Despite receiving substantial criticism for its prescriptive emphasis, the idea of a system of parts that can be integrated following a logic, to produce a viable product, has become widespread and has been embraced beyond design to fields such as software engineering. *The Language of School Design: Design Patterns for 21st Century* Schools by Prakash Nair, Randall Fielding, and Jeffery Lackney (2009) is an example of a recent application to architecture and interior design. It suggests the possibility of applying this method to the present study.

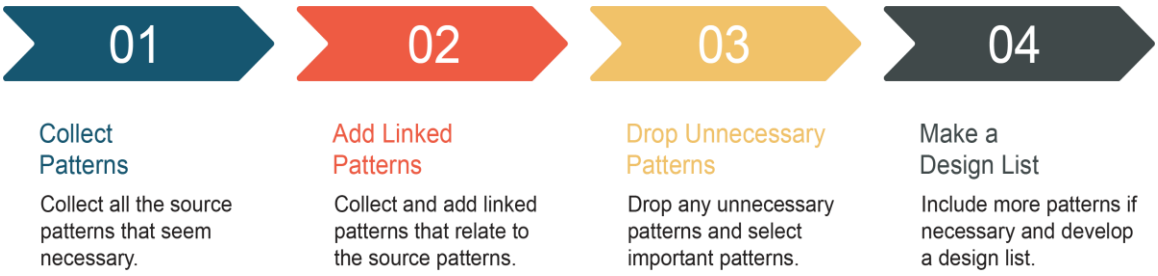


Figure 25. Pattern Language Research Process (Alexander et al., 1977)

In this study, the pattern language applied the findings from the previous phase for a representation of design guidelines or strategies recommended for designing micro-dwellings for young adult professionals. To identify the design guidelines that

would integrate into the pattern language, the researcher used Alexander et al.'s (1977) steps to create a list of design patterns. These steps are illustrated in Figure 25.

In order to develop the pattern language, the information that resulted from the review of literature, site visits, and charrette was compared to the data collected from the survey. First, common design strategies used when designing micro-dwellings were identified in the review of literature, site visits, and charrette and compiled into a list. The strategies identified in the literature review emerged from publications that describe common design strategies seen in current micro-dwelling models. These included *Backdoor Revolution: The Definitive Guide to ADU Development* (Peterson, 2018), *The Not So Big House* (Susanka, 1998), and *Micro-Living: Learning to Live Large in Small Spaces* (Richmond, 2012).

The design strategies associated to the site visits and the charrette were identified through participant observations, as well as photo-documentation and design analysis of the micro-dwellings visited. After these patterns were identified, millennials' housing aspirations were identified in the survey and compiled into a list as well. The questions in the survey that helped identify young adult professionals' housing aspirations were those that asked the participants to rank different amenities by importance (neighborhood, community, and unit), as well as questions related to their social needs and homeowner priorities.

Once both lists were completed, they were analyzed and compared in order for the researcher to identify common strategies between the two. During this process, the common strategies were selected as important patterns and compiled into a synthesized list, which formed part of the pattern language. Finally, the researcher reviewed the original lists once more to identify any other important patterns that should be included.

These patterns were either highly desired among the survey participants, proving that current housing models don't address some of the population's needs, or heavily supported by previous studies and proved to be beneficial to the population.

In sum, following Alexander et al.'s (1977) steps to create a list of design patterns, the researcher made two lists of design patterns. One included patterns identified in the characterization study and the other patterns identified from the survey. These lists were compared in order to identify common design strategies among them. After identifying the common strategies, the researcher reviewed the original lists in order to identify any additional patterns that should be included.

The comparison and analysis between the two lists allowed identifying twelve essential patterns that were characterized within three large categories: general requirements, architecture, and unit design. These categories were used to group the identified guidelines by their use or the type of problem they addressed. Ultimately, the pattern language addressed the following operational questions, "What is the pattern language that is expressed in micro-dwellings for young adult professionals?" and "What design considerations and architectural strategies might satisfy the housing aspirations of young adults?"

Empirical Testing

The third and final part of the study tested the pattern language identified as applied to a case. Meeden (n.d.) states "empirical methods cluster loosely into exploratory techniques for visualization, summarization, exploration, and modeling; and confirmatory procedures for testing hypotheses and predictions" (p.1). This study empirically tested the hypothesis stipulated, micro-dwellings might be a viable housing

option for young adult professionals, through the exploration and modeling of a micro-dwelling community model for the target population.

The micro-dwelling community model consisted of tiny houses and a micro unit apartment. Here, the design guidelines and strategies identified for the pattern language were put to the test through their application to a case. The purpose of this part of the study was to contribute evidence of the claims made in the literature, that micro-dwellings could be a viable housing option for millennials based on implementation of the design patterns generated in this study.

For this micro-dwelling community model, two sites were identified in mid-town Greensboro, currently the location of Seminole Court and Whilden Place Apartments. Mid-town Greensboro was selected as a favorable location for a study site, as it is an up-and-coming area that is home to many shops, restaurants, service providers, and recreational areas. These sites are in an urban setting, which aligns with studies suggesting that millennials desire to live in urban environments. This setting also aligns with the results from the survey, proving millennials' desire to live in the city or urban areas. Due also to their close proximity to hospitals, universities, shopping malls, and the future extension of the City Greenway; Seminole Court and Whilden Place Apartments were favorable sites that could appeal to the target population. Therefore, these served as sites to test the design of the micro-dwelling community.

The program for the community consisted of tiny houses, micro unit apartments, and a common house, as well as recreational outdoor spaces that helped address the need for community. Four different floor plans for the units were designed: one unit using a shipping container footprint, one that incorporates the use of a loft, an accessible unit, and a unit designed for a small family. The range of units intended to address the

housing needs of a large portion of the target population, as it acknowledged single young adults, couples, small families, and disabled young adults.

The design of these units and the community incorporated the design guidelines identified in the previous part of the study, and tested them through their implementation in a conceptual design. This part of the study answered, “What design considerations and architectural strategies might satisfy the housing aspirations of young adults?”

CHAPTER IV

RESULTS AND FINDINGS

This chapter reports the results and findings from the survey, site visits, design charrette, pattern language, and empirical testing. The chapter discusses the descriptive statistics used to analyze the survey, the results and findings from the site visits and design charrette, the development of the pattern language, and its application to a micro-dwelling community model. As discussed previously, the methods used in this study were destined to answer the following primary and secondary research questions: *What is the possible fit between the housing aspirations of young adults, and the micro-dwelling housing model?*

1. What do young adults value most in housing?
2. Which, among the different micro-dwelling housing types available in the rental market, might be viable housing options for young adults?
3. What is the optimal design of micro-dwellings as housing for young adults?

Precedents

In order to collect information on micro-dwelling communities and their design, a series of site visits were completed with funding from a University of North Carolina at Greensboro Summer Graduate Assistantship grant. The visits comprised seven sites, including cohousing communities, a tiny house RV company, micro unit apartments, and tiny house communities. The information and observations from the visits were gathered through annotations and photographs. Three of the most salient site visits are described below as precedents.

Durham Central Park Cohousing Community

Durham Central Park Cohousing Community, also referred to as Durham Coho, is located in downtown Durham, North Carolina and houses mostly elderly individuals and families. Durham Coho is within walking distance of the Farmers' Market, Carolina Theater, the library, restaurants, shops, and parks, among other service providers. This intentional community was designed and built by Landmark Builders of the Triad and Ken Friedland, with participation of the future residents of the community. The development was completed in 2014 and is composed of 24 units, housing 36 residents.

Figure 26. Front Façade of Durham Central Park Cohousing Community

Durham Cohousing, seen in Figure 26, is an innovative condo-style cohousing project. Four types of units are available: extra-large (1,700 square feet), large (1,500 square feet), medium (1,200 square feet), and small (800 to 900 square feet). The development emphasizes the importance of creating a sense of community through the shared values and facilities. The facilities offered at this community are a communal vegetable garden, mailroom, communal kitchen and dining room, laundry room, guest

bedrooms, project and game room, entertainment room, meeting room, parking deck, and terrace.

The project followed a process in which the social community was developed before the building of the community took place. Though this may be considered a non-traditional development process, it is typical of the cohousing model. The future residents coalesced as a group before building the cohousing, emphasizing their desire to develop a strong sense of community. Later, the community engaged in the design process of the housing, and financed the project themselves. This gave each resident the opportunity to choose their own design and to personalize their unit. Although the community currently mostly houses elderly individuals, there are also young residents such as college students, making this a multi-generational community.

Figure 27. (a) Outdoor Terrace and (b) Built-in Furniture and Murphy Bed at Durham Coho

According to the residents, the interior layout and design of the building also emphasizes communal areas and thus reflects the community members' desire to

socialize. In order to reduce isolation among the residents, an attempt was made to create a balance between private and public areas. All the residents have their own space, however, they share many common living areas, as seen in Figure 27. Spaces, such as libraries, an outdoor terrace, project and game room, entertainment room, and dining area help promote a community-oriented atmosphere. Additionally, all the floors have lounge areas that entice the residents to use them as a place for socialization.

On the other hand, the smaller units in the building incorporate design elements that help save space, such as custom and built-in furniture. This is consistent with the cohousing emphasis on compact living, sustainability, and a voluntary simplicity life view (Elgin, 1993; McCamant & Durrett, 1988). Some of the design elements used throughout the community that align with those of micro-dwelling models include high ceilings, an outdoor terrace, balconies, and the use of built-in and custom furniture, among others. Many of the units had built-in shelves, pullout desks, pocket doors, and Murphy beds as a way of saving space and making more efficient use of the same (Figure 27). Additionally, many of the units visited put an emphasis on having abundant storage, which is a key element of micro-dwellings. As the residents were involved in the design process, they were able to personalize their units and design their space according to their desires.

Perch and Nest

Perch and Nest Company, formerly known as Thomas E. Elsner Custom Carpentry, is a firm specializing in tiny and cottage home designs and is located in Winston-Salem, North Carolina. The company made the transition to tiny houses in 2007 and although they offer a standard model (360 square feet at 8 ft. 6 in. maximum width), they can range from 24 feet to 40 feet long. Additionally, the maximum interior height is

10 ft. 6 in. and the maximum exterior height is 13 ft. 6 in. These units are completely customizable and can be designed to have any layout the resident prefers. For example, the kitchen or living room can be located under a loft, there can be staircases or a ladder, and lofts can be used as storage or as a bedroom space, among other options.

Figure 28. (a) RV Under Construction; (b) Perch and Nest's Showcase Home: Roost 36

The type of tiny houses Perch and Nest design are considered recreational vehicles, as they are mounted on a trailer (Figure 28). During the tour, the company owners stated that their principal clients are single women of all ages. Their process begins with the financial aspects and estimates, and later moves on to the design process. They begin by offering the client cost estimates for the trailer depending on the size they want. Once the purchase agreement is signed and the trailer is purchased, the design process begins. Throughout the whole design process, they make sure that the client is as involved as possible, in order to create custom designs that reflect what they are looking for. Some design elements seen in all designs, as fit, are hurricane ties, a holding tank, engineered siding, and waterproof insulated bases.

Perch and Nest has designed many custom layouts, all of which optimize the use of limited space. Incorporating lofts for bedroom space or storage seems to be the main design element used to maximize space, which makes the best use of the vertical space provided. The company's prototype, RV-based Roost 36, illustrates how their micro-dwellings are designed. This model has an abundance of natural light that makes the space seem larger. This is accomplished through skylights, large windows, and panoramic glass doors. As mentioned above, lofts are a prevalent feature in many of Perch and Nest's designs. Roost 36 is not the exception with a loft designed for storage and a second loft used as a bed space, which can be seen in Figure 29.

Figure 29. Views of the Interior of Roost 36 (Perch and Nest, 2017)

Another design feature incorporated in this model is a porch, in order to create a relationship with the surroundings and provide more living space. This porch can also be used as a communal space for socialization. In Roost 36, a second bed space is provided under the lofted bed, and a third bed space is provided in the living area with a sofa bed. This allows for additional storage, as well as making use of the vertical space, allowing for more functions to be provided on the ground floor. Other elements identified

in Perch and Nest's designs are built-in furniture, storage, and transformable or foldable furniture, all of which offer additional storage and a clutter-free effect in the space.

Pope-Leighey House

Frank Lloyd Wright designed Usonian houses with the goal to provide affordable housing for middle class Americans. "A modest house, this Usonian house, a dwelling place that has no feeling at all for the "grand" except as the house extends itself in the flat parallel to the ground. It will be a companion to the horizon" (Wright, 2005, p.493). In the book *An Autobiography*, Wright described what he considered to be essential in the design of the Usonian houses. This included a living room with as many views to the exterior as possible, open bookshelves, benches and built-in living room tables, among others. He mentions the importance of having the cooking and dining spaces adjacent to, if not part of the living room, as well as puts an emphasis on having a good garden space (Wright, 2005).

Figure 30. View of the Backyard and Patio of the Pope-Leighey House (Burk, 2013)

Wright's Usonian houses are excellent precedents that exhibit how smaller; more affordable housing options should be designed. Therefore, the researcher visited the

Pope-Leighey House designed in 1938 for the Pope family in Alexandria, Virginia (Figure 30). It particularly maximizes its 1,200 square feet through various design techniques described below. It is composed of a cantilevered driveway with a carport, kitchen, breakfast nook, open plan living area, two bedrooms, a bathroom, sanctuary room, and screened in patio.

The materials used for this house were concrete painted Cherokee Red, brick, wood, and glass. The wood used was red tidewater cypress from the Everglades, which is impervious to water and insect damage. The design emphasizes horizontal lines parallel to nature, creating a connection with its surroundings. Additionally, the brick floor from the exterior continues into the foyer as a way of blurring the lines between the interior and exterior of the house. These design elements reinforce the connection the house has with its context, a landmark feature of Frank Lloyd Wright's designs. The cutouts on the ribbon windows throughout the house, illustrated in Figure 31, create an effect of a floating ceiling on glass, and helps bring in nature and natural light.

Figure 31. Interior Views of the Pope-Leighey House (Burk, 2013)

The interior of the house is designed to create a compression and release effect. This means that low ceilings become high ceilings and small spaces lead to bigger, more open spaces. This creates an effect and makes the inhabitants feel that certain spaces are bigger than they are. This not only makes the public spaces, such as the living room, seem and feel larger, but it also makes the private spaces, such as the bedrooms and kitchen, feel cozier. Additionally, as mentioned above, Wright designed ribbon windows with cutouts that enlarge the spaces and create light effects without using expensive glass.

Although he used walls and insets to define areas within open spaces, another technique he used in this design was not closing off the walls. This meant that some of the interior walls did not completely meet the perpendicular wall it approached or completely close off the space. This technique helped make the space look and feel more open, as well as allowed for light to be borrowed from adjacent spaces.

Corner windows that open up completely were used to provide more natural light, as well as invite the inhabitants to go outside, making a greater connection with their surroundings. Small, built-in, and modular furniture was used to make the space seem larger, as well as create a clutter-free effect. This effect was accomplished as these pieces, particularly those built-in, were integrated into the envelope of the building. This technique visually and physically preserved the openness of the interior space.

Lessons Learned from Site Visits

A total of seven site visits were completed during the summer of 2017 as part of a precedent analysis of micro-dwelling communities. The design elements, facilities offered, and design processes were the focus of the cohousing, tiny house, and micro unit apartment site visits. Additionally, the Usonian Pope-Leighey House, designed by

Frank Lloyd Wright, was studied to better understand the design strategies implemented. Visiting the micro-dwelling communities offered information on current practices and processes; while visiting a Usonian house offered an example of a timeless design of a more affordable housing option for middle class Americans, created by Wright.

Observing different types of micro-dwelling communities allowed identifying what facilities are typically offered and why; as well as the design strategies that are implemented to maximize the space and make the most efficient use of it. The recurring communal facilities that were seen in most of the communities were offices or business centers, a multi-purpose room for events, a communal kitchen and dining area, a fitness center, a laundry room, guest rooms, additional storage, and a community or individual gardens. All the communities used these facilities as common areas that encourage social relations among the residents, and create a sense of community amongst them. All of the communities emphasized the importance of increasing socialization and reducing isolation among the residents.

Table 5. Precedent Analysis: Summary of Facilities and Amenities Offered – Part I

PRECEDENT ANALYSIS - FACILITIES - PART I									
Facilities and Amenities	Purpose or Effect	Durham Coho	Arcadia	Pacifica	Perch and Nest	Farm at Penny Lane	Tiny Houses Greensboro	The Harper	Pope-Leighey House
Common house	The heart of the community, used for both practical and social benefits. They supplement the individual dwellings and provide a place for community activities.		•	•		•			
Multi-purpose room	These rooms are used for meetings, activities, and social events as necessary. They provide a space for social gatherings.		•	•		•			
Lounge		•						•	
Guest rooms	Guest rooms allow for residents to keep their visitors close if they lack space in their dwelling. These are typically part of the common house.	•	•	•		•			
Communal kitchen	Seen as primary communal areas where communication and socialization occur during food preparation times, that then shifts to the dining area.	•	•	•		•		•	
Communal dining room		•	•	•		•		•	
Grilling stations							•	•	
Laundry room	Providing communal laundry rooms may be necessary when smaller dwellings do not have enough space to accommodate a laundry room.	•	•	•	•	•	•	•	•
Terrace	These outdoor spaces allow residents to interact with their neighbors, socialize, and forge relationships. They serve as an extended living space.	•						•	•
Balcony		•	•						
Porch			•		•	•	•		

Facilities or amenities included in the pattern language and/or community model

Table 6. Precedent Analysis: Summary of Facilities and Amenities Offered – Part II

PRECEDENT ANALYSIS - FACILITIES - PART II									
Facilities and Amenities	Purpose or Effect	Durham Coho	Arcadia	Pacifica	Perch and Nest	Farm at Penny Lane	Tiny Houses Greensboro	The Harper	Pope-Leighey House
Fitness center	Fitness centers and gyms are public spaces that micro-dwelling residents are likely to integrate into and appreciate the value of a community more.							•	
Business center	Providing a business center in micro communities benefits residents that may not have a dedicated workspace or materials (ie. printer) in their dwelling.	•						•	
Mailroom	Common in most micro communities, rather than providing individual mailboxes on each property.	•	•	•				•	
Community garden	Typically the green space that is offered in the middle of dwelling clusters. They are seen as a shared outdoor space for interaction.	•	•	•		•	•		
Additional storage	Outdoor storage rooms may be beneficial for residents to store bicycles and shared items, such as garden supplies.		•		•			•	
Bike storage				•				•	
Parking and roads behind dwellings	Locating roads and parking behind dwellings allows for the creation of a shared outdoor space or commons.		•	•		•	•		•

Facilities or amenities included in the pattern language and/or community model

Table 7. Precedent Analysis: Summary of Design Features and Elements Offered – Part I

PRECEDENT ANALYSIS - DESIGN FEATURES - PART I									
Design Features and Elements	Purpose or Effect	Durham Coho	Arcadia	Pacifica	Perch and Nest	Farm at Penny Lane	Tiny Houses Greensboro	The Harper	Pope-Leighey House
High ceilings	Compensates some of the spatial size experience lost due to reduced footprints.	•			•		•	•	•
Compression and release	Low ceilings become high ceilings, creating the effect that a space is larger than it is.								•
Lofts	Typically used as additional storage or a bedspace. Most common design element used to make optimal use of the vertical space provided.		•		•				
Additional storage	Necessary in smaller dwellings, due to their reduced footprint. Normally accomplished through custom or built-in furniture.	•			•	•	•	•	•
Built-in furniture	Commonly become part of the architecture and are seen as smaller pieces that are treated as the envelope of the building. They use the space efficiently and create a clutter-free visual effect.	•			•		•		•
Custom furniture		•			•			•	•
Modular furniture								•	•
Convertible furniture	Programming a single element with more than one function simplifies and reduces clutter, reducing the perceived size of the space.	•			•	•			

Design elements included in the pattern language and/or community model

Table 8. Precedent Analysis: Summary of Design Features and Elements – Part II

PRECEDENT ANALYSIS - DESIGN FEATURES - PART II									
Design Features and Elements	Purpose or Effect	Durham Coho	Arcadia	Pacifica	Perch and Nest	Farm at Penny Lane	Tiny Houses Greensboro	The Harper	Pope-Leighey House
Open plan	Spatially joining the kitchen, living room, and dining room into one great room creates a sense of a larger space.	•	•	•	•	•	•	•	•
Pocket doors	These save space as there is no swing, unlike with hinged doors.	•			•		•		
Panoramic doors	These help blur the line between the interior and exterior with their abaility to open completely without leaving behind posts.	•			•				
Sliding glass doors	Sliding glass doors save space, while also providing views to the exterior.		•	•					•
Large windows	Daylighting is the most effective and sustainable way of lighting a room and making it seem larger. These types of windows bring in copious amounts of natural light.	•		•				•	
Unobstructed corner window									•
Skylights			•		•		•		
Exterior views	Providing views to the exterior heightens the connection between the interior and exterior.	•			•			•	•
Horizontal lines	Horizontal lines parallel to nature allows the dwelling to create a connection with its surroundings.		•	•			•		

Design elements included in the pattern language and/or community model

The design, techniques, elements, and features typically implemented were high ceilings, lofts, built-in or custom furniture, storage, and the purposeful use of natural light. Furthermore, visiting the Pope-Leighey House offered additional and sophisticated design strategies not seen during the other visits, such as creating a compression and release effect and not closing off the walls so as to make the space feel more open.

All of the design elements, facilities, and features summarized in Tables 5, 6, 7, and 8 were key in contributing to the dwellings, giving the impression of being larger and more open than they actually were. This was accomplished through lighting techniques, such as bringing in as much daylight as possible by using large windows, borrowing light from adjacent spaces, and skylights. The built-in and custom furniture accomplished these effects by forming part of the architecture of the dwellings, which does not sacrifice the openness and continuity of the space. Creating a connection with the exterior to blur the lines between the interior and exterior of a dwelling was accomplished by providing views to the exterior, incorporating ribbon windows with cutouts, and using horizontal lines parallel to nature.

Incorporating high ceilings and lofts made efficient use of the vertical space of the dwellings and allowed for more functions to be addressed by the program. Additionally, most all of the dwellings visited avoided using corridors and used open plan living. Ultimately, these site visits provided insight on various design elements and strategies that would be beneficial if implemented in micro-dwelling communities for young adult professionals.

Survey Results

This section discusses the data gathered from the survey results in regards to the participants' demographic characteristics, their social and physiological needs, and

their housing needs and opinions on micro-dwellings. The first two factors were addressed by the first part of the survey, while the latter was addressed by the second part. The findings discussed in this section were used to inform the pattern language, which in turn informed design decisions and programming needs of the micro-dwelling community model that provided the proof for the concept that micro-dwellings can be a viable housing solution for young urban professionals.

Part I

Demographic Characteristics

The survey was distributed to approximately 3,000 individuals aged 18 to 40 years old. Fifty-five (55) individuals completed the survey, out of which thirty-two (32) were aged 20 to 29 years old. Of this sample population, 31 respondents (96.9%) are currently *employed*, while one respondent (3.1%) is *not in the labor force*. Questions #4, #5, #6, and #7 inquired about the participants current and preferred living arrangements, as well as their satisfaction with the same. According to the survey, 16 respondents (50%) stated they *do not have roommates*, while 13 respondents (40.6%) stated they have *one roommate*.

Furthermore, Question #4 asked the participants, “What are your current living arrangements?” in which 37.5% of the respondents are *living with their significant other*, 21.9% are *living alone*, 15.6% are *living with other kin*, and 15.6% are *living at home with their parents*. However, when asked about their preferred living arrangements (Question #6), an outstanding 68.8% responded that they would prefer to *live with their significant other* and 21.9% would prefer to *live alone*. Additionally, none of the respondents would prefer to *live at home with their parents*. The results of questions #4 and #6 are compared in Figure 32. Within this survey sample, the results support the claims found

in previous studies regarding young adults living with their parents being ready to leave the nest (Timmerman, 2015).

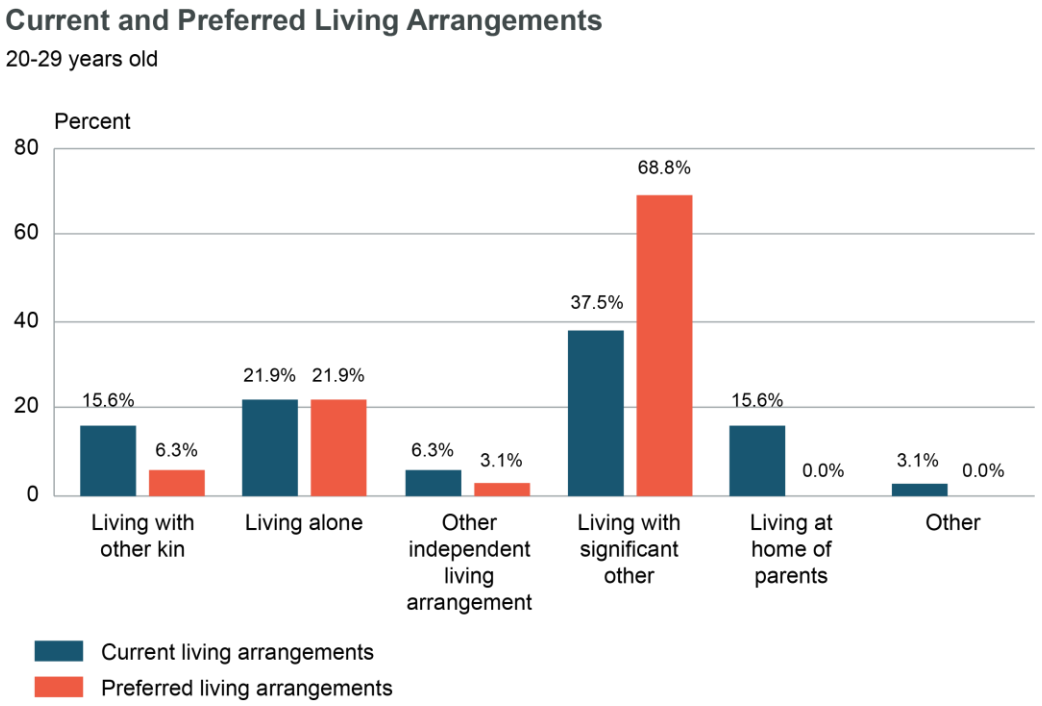


Figure 32. Current and Preferred Living Arrangements

After identifying the participants' current and preferred living arrangements, they were asked to rank their satisfaction with their current living arrangements on a scale of 0 to 5. Values ranging from zero (0) to two (2) were considered *dissatisfied* and three (3) to five (5) were considered *satisfied*. The factors taken into consideration were: overall satisfaction, management satisfaction, value for amount paid, location, community amenities, floor plan, design and layout, and apartment features and finishes.

Table 9. Current Living Arrangement Satisfaction

Current Living Arrangement Satisfaction

Factors	Very Dissatisfied: (0)	Dissatisfied: (1)	Somewhat Dissatisfied: (2)	Very Satisfied: (3)	Satisfied: (4)	Somewhat Satisfied: (5)	Not Applicable	Total (0-2)	Percentage (0-2)	Total (3-5)	Percentage (3-5)
Overall satisfaction	0	0	2	6	14	10	0	2	6.3%	**30**	**93.8%**
Management satisfaction	1	1	2	9	11	7	1	4	12.5%	27	84.4%
Value for amount paid	1	2	2	8	9	8	2	**5**	**15.6%**	25	78.1%
Location	0	2	2	8	12	8	0	4	12.5%	**28**	**87.5%**
Community amenities	2	3	7	6	10	4	0	**12**	**37.5%**	20	62.5%
Floor plan, design and layout	1	1	1	9	12	8	0	3	9.4%	**29**	**90.6%**
Apartment features and finishes	1	2	5	7	8	6	3	**8**	**25.0%**	21	65.6%

Highest percentages of satisfaction

Highest percentages of dissatisfaction

The factors that received the highest percentage of dissatisfaction were *community amenities* (37.5%), *apartment features and finishes* (25%), and *value for amount paid* (15.6%). Meanwhile, the highest-ranking factors within satisfaction were *overall satisfaction* (93.8%), *floor plan, design, and layout* (90.6%), and *location* (87.5%). Furthermore, those who marked zero to two in any category were asked to briefly explain why. The most common themes found were a lack of community amenities, the location, and outdated features and finishes. One of the participants responded, “Location is in Asheboro, NC small town with very little entertainment options and a much older population. Community amenities, again not much a community sense or things to do” (Survey respondent, 2018). Table 9 illustrates the participants’ level of satisfaction with their current living arrangements.

As various sources of literature and past studies have suggested that young adult professionals seek to live in urban settings (Gruen, 2013; Hayden, 2010; Whitlow et al., 2013), Question #2 of the survey addressed these claims. When asked "If you had to move, where would you plan on moving to?", 65.6% of the respondents chose *city or urban area,* 25% chose *suburban area*, and only 9.4% chose *rural area*. Ultimately, the results of the survey, within this study, confirmed young adults' desire to live in urban settings.

Social and Physiological Needs

Table 10. Where the Participants Eat Meals

Space	By Yourself	Percentage (By yourself)	With Others	Percentage (With others)	Both	Percentage (Both)	All	Percentage (All)
Dining room	5	15.6%	10	31.3%	5	15.6%	20	**62.5%**
Kitchen	9	28.1%	4	12.5%	5	15.6%	18	**56.3%**
Living room	8	25.0%	11	**34.4%**	11	**34.4%**	30	**93.8%**
Bedroom	10	**31.3%**	0	0.0%	0	0.0%	10	31.3%
Community kitchen	0	0.0%	0	0.0%	1	3.1%	1	3.1%
Community dining area	0	0.0%	1	3.1%	1	3.1%	2	6.3%
Other	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Highest percentages of spaces used to eat meals

Common spaces to eat meals by yourself, with other, or both

Questions #8, #9, #10, and #11 all inquired about the participants' social and physiological needs, such as food and shelter. These questions were used to gauge the participants' basic needs according to Maslow's Hierarchy of Basic Human Needs. Question #8 asked, "Where do you typically eat meals by yourself, with others, or both?" which addressed the uses given to different spaces in a dwelling, as well as how often

they are used. The options provided were dining room, kitchen, living room, bedroom, community kitchen, community dining area, and other. Table 10 provides a detailed summary of the responses.

Overall, 31.3% of the respondents eat meals *by themselves* in their *bedroom*, 34.4% eat meals *with others* and both by *themselves and with others* in their *living room*. Furthermore, the three most common spaces in which the participants eat meals by themselves, with others, or both are the *living room* (93.8%), *dining room* (62.5%), and *kitchen* (56.3%).

The participants were also asked how often they invite people over to socialize in their house/apartment/dwelling (Question #9). This ranking question used a frequency Likert scale (never, not often, about half the time, most often, and always). Despite characterizing themselves as social individuals, a total of 62.6% of the participants replied *never* or *not often*. When asked to briefly explain why they marked *never* or *not often,* most of the respondents described their dissatisfaction with their current living arrangements. One of the participants explained, “It’s a small space, parking is difficult, there’s nothing to ‘do’ in such a small space except sit down and socialize” (Survey respondent, 2018).

Question #10 asked the participants to mark what activities they do when they invite others over to socialize. The options provided were eating and cooking, drinking and socializing, watching movies and television, working and studying, playing games (board games, video games, etc.), and other. A high 90.6% marked *drinking and socializing*, followed by *eating and cooking* (84.4%). Figure 33, illustrates what young adults typically do when they invite others to socialize.

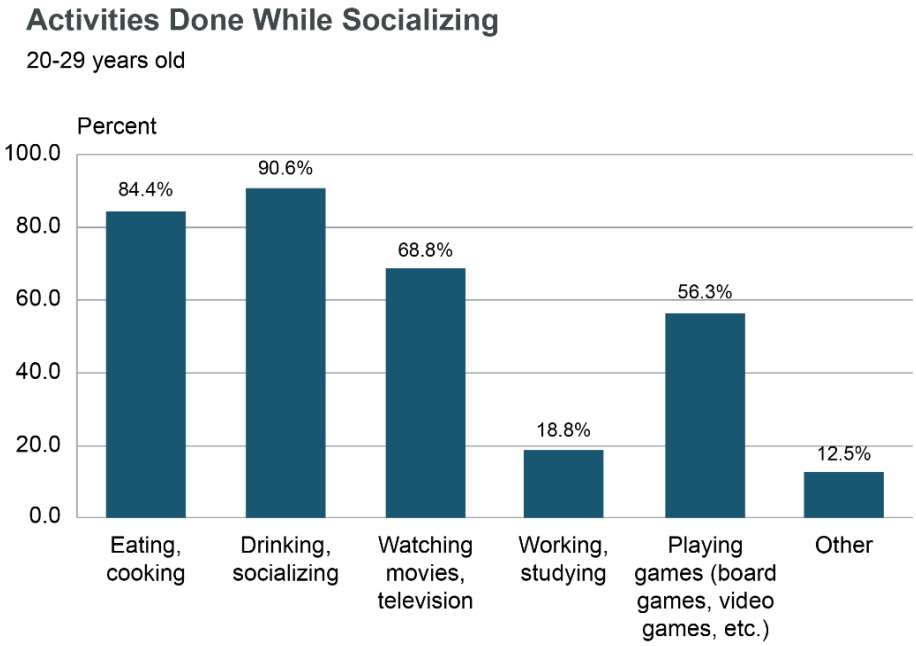


Figure 33. Activities the Participants Do While Socializing

Furthermore, Question #11 asked, “How many people do you normally do these activities with?” in order to understand how many people young adults typically invite over to socialize. To *drink and socialize*, 43.8% responded that they do this activity with *four or more people*. Meanwhile, 50% responded that they *eat and cook* with *one or two people*. To summarize, the results from these four items allowed the researcher to further understand the population’s social and physiological needs. According to the survey results within this study, one of the most popular activities done when they invite people over to socialize is *eat and cook*. Furthermore, the most popular spaces to eat by themselves or with others are the living room, dining room, and kitchen, supporting the importance of these spaces in housing for young adults.

Part II

Interest in Micro-dwellings

The second part of the survey intended to identify the participants' opinions on micro-dwellings, their satisfaction with current amenities and facilities, their desired amenities, and factors that influence their rental decision. This part began with a brief description of micro-dwellings and micro-dwelling communities, including images of tiny houses, accessory dwelling units, micro unit apartments, and pocket neighborhoods. The images offered visual examples of the exteriors and interiors of these micro-dwelling models. These descriptions and images were provided in order to facilitate a comprehensive understanding among the participants of the concepts that were to be discussed.

Proceeding the micro-dwelling descriptions, question #12 asked the participants if they would be interested in owning a micro-dwelling, using a consideration Likert scale (definitely would not, probably would not, unsure, probably would, and definitely would). Eleven (11) out of the thirty-two (32) respondents (40.7%) marked that they *probably would* or *definitely would* be interested in owning a micro-dwelling. However, 44.4% marked that they *definitely would not* or *probably would not* be interested in owning a micro-dwelling.

The participants were then asked what factors would entice them to choose a micro-dwelling over a conventional-size dwelling unit (Question #13). The factors that received the highest percentages were *lower rent* (75%), *desired location* (65.6%), *reduced utility costs* (53.1%), and *more community amenities* (53.1%), as seen in Figure 34. Furthermore, one of the participants specified that they would choose a micro-

dwelling due to their “benefit to society, getting a more communal aspect by living close to others. Pocket neighborhoods are most appealing to me” (Survey respondent, 2018).

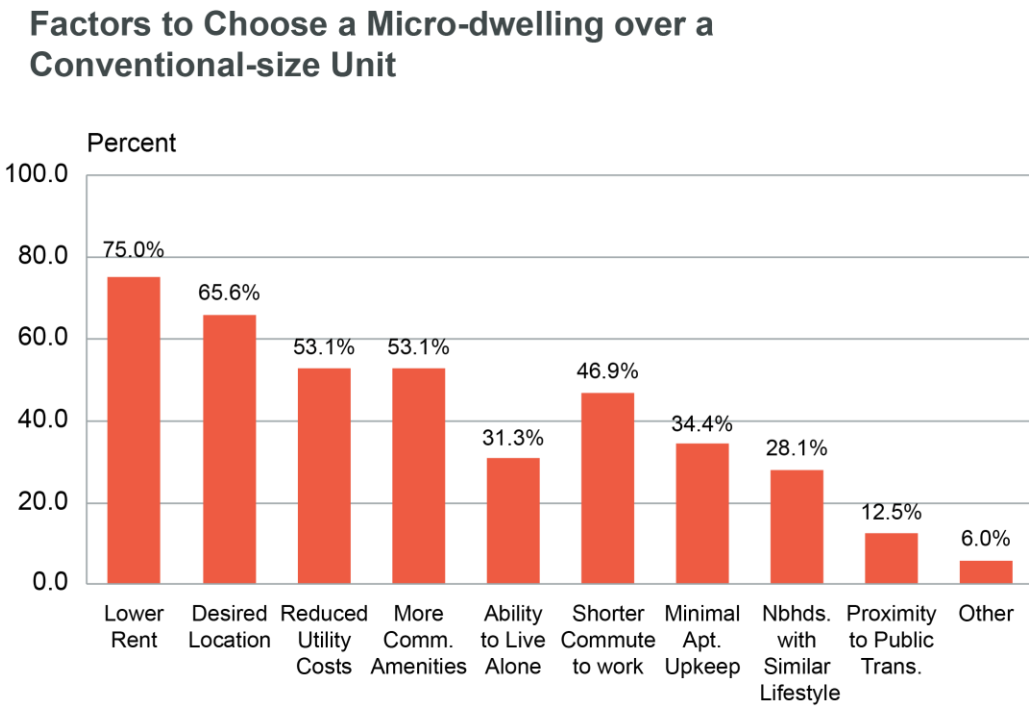


Figure 34. Factors to Choose a Micro-Dwelling over a Conventional-Size Unit

When asked what their priorities are in an initial lease decision (Question #19), 81.3% marked *price*, 78.1% *location*, 65.6% *proximity to work/school*, and 65.6% *floor plan and layout*. The participants also marked *proximity to neighborhood amenities* (56.3%), and *Internet or Wi-Fi access* (56.3%) as priorities. These results highlight young adults’ need for more affordable housing options that provide proximity and accessibility, community and neighborhood amenities, and a floor plan and layout that works. Figure 35 illustrates these results.

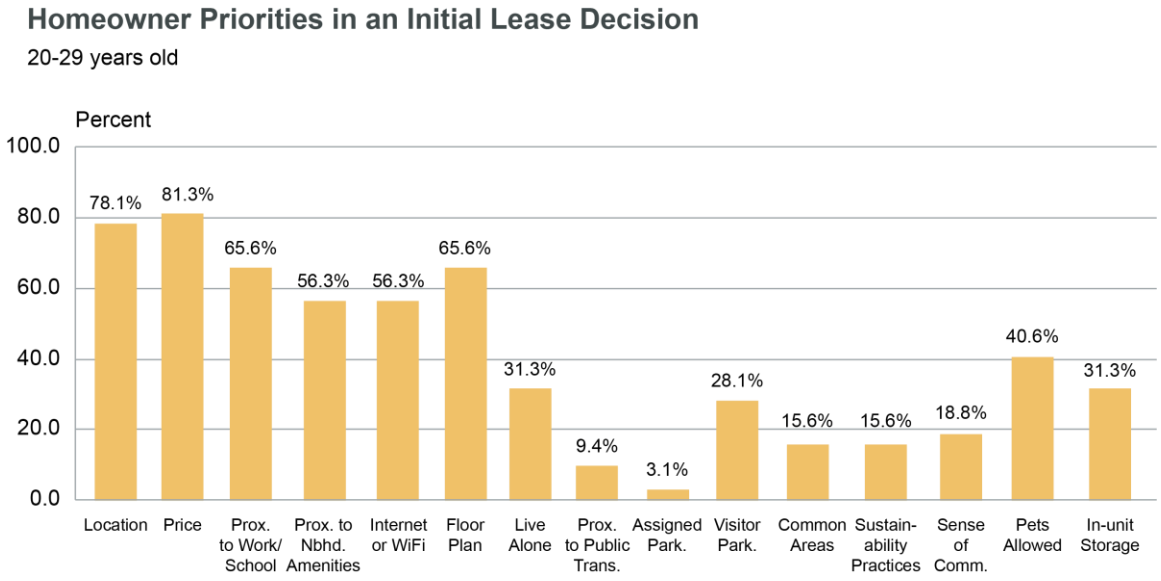


Figure 35. Homeowner Priorities in an Initial Lease Decision

Desired Amenities

The final part of the survey was used to identify community amenities that are typically offered to the target population, their satisfaction with these amenities, and their desired neighborhood, community, and unit amenities. Question #14 asked the participants to mark the community amenities that are offered at their current living arrangements. These included laundry, parking, fitness center, lounge, outdoor space, and business center, among others. *Fitness center* (43.8%) received the highest percentage among the responses, closely followed by *laundry room*, *pool*, and *grill* which all received a 40.6%, and *visitor parking* and *business center* each with 37.5%. When asked about their satisfaction with these amenities (Question #15), these were similarly the highest-ranking amenities: *grill* (37.5%), *visitor parking*, *fitness center*, and *pool* (34.4%), *business center* (28.1%), and *laundry room* (25%).

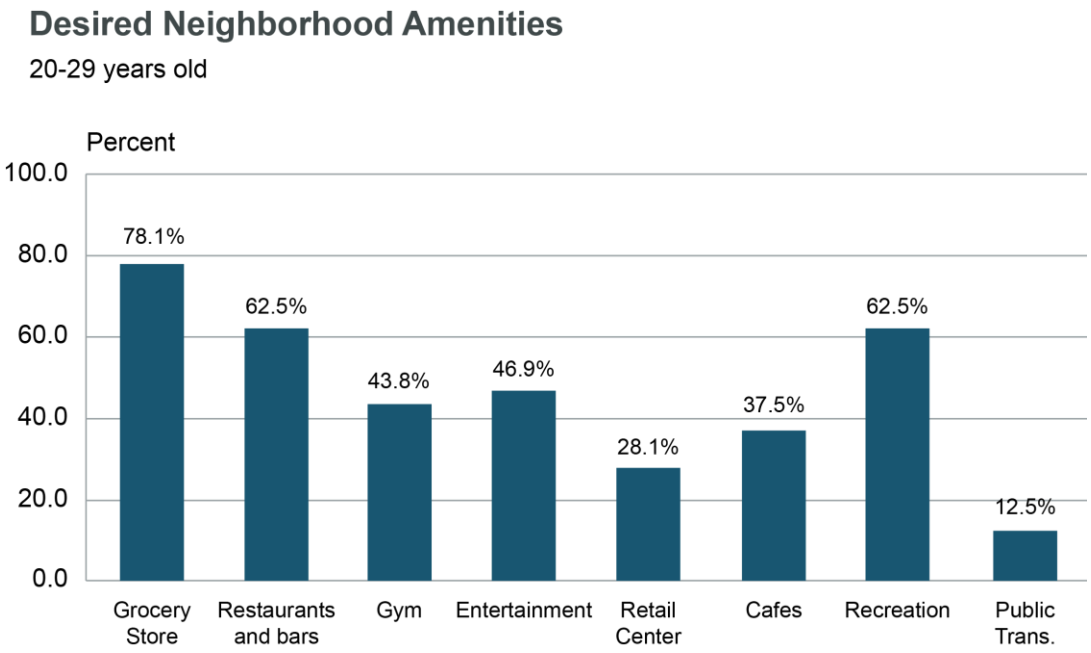


Figure 36. Desired Neighborhood Amenities Among the Survey Respondents

The following three questions (#16, #17, and #18) identified the importance of neighborhood, community, and unit amenities for the target population. These questions used an importance Likert scale ranging from one to five, one being not important, and five being important (not important [1], slightly important [2], neutral [3], moderately important [4], important [5]). Furthermore, for the purpose of this study, scores of one and two were grouped and considered *not important*, while scores of four and five were also grouped and considered *important*. Figure 36 illustrates the desired neighborhood amenities among the survey respondents.

According to the survey results, young adults highly desire *grocery stores* (78.1%), *restaurants and bars* (62.5%), and *recreational areas* (62.5%) among their neighborhood amenities. Among the community amenities, young adults highly desire *roof and outdoor spaces* (56.3%), *visitor parking* (53.1%), *laundry room* (43.8%), and

fitness center (43.8%), as seen in Figure 37. These results highlighted the participants' desire to have an outdoor space for socialization accessible to them. However, when compared with the amenities that are currently provided to them, such as a grill and business center, these were not predominately desired among the participants. In fact, 28.1% found a grill *not important,* while 21.9% found it *important*. Similarly, 43.8% found a business center *not important* and only 21.9% found it *important*.

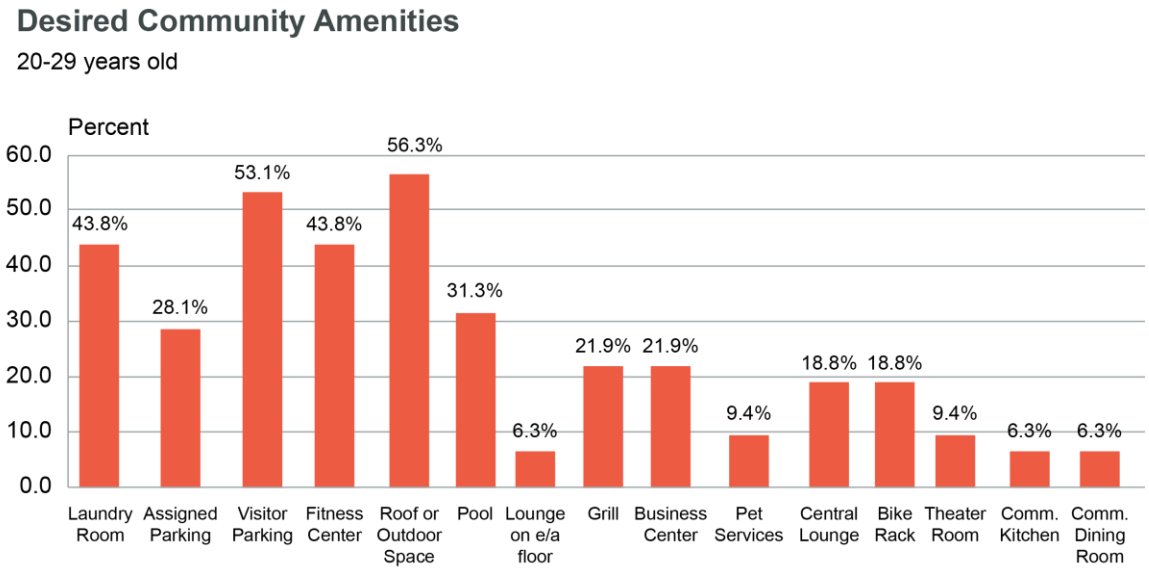


Figure 37. Desired Community Amenities Among the Survey Respondents

Among the unit amenities, the participants showed a high desire for storage, laundry space, and a fully equipped kitchen. Almost seventy-two percent (71.9%) of the participants ranked a *washer and dryer* and *full-size sink* as important, 68.8% ranked *storage space* and *full-size refrigerator* as important, and 65.6% ranked a *four-burner stove* as important. These results coincide with results found in the social and physiological needs section. Living rooms and fully equipped kitchens are highly desired

by young adults. Figure 38 provides a more detailed overview of the unit amenities that are most desired by the participants of this study.

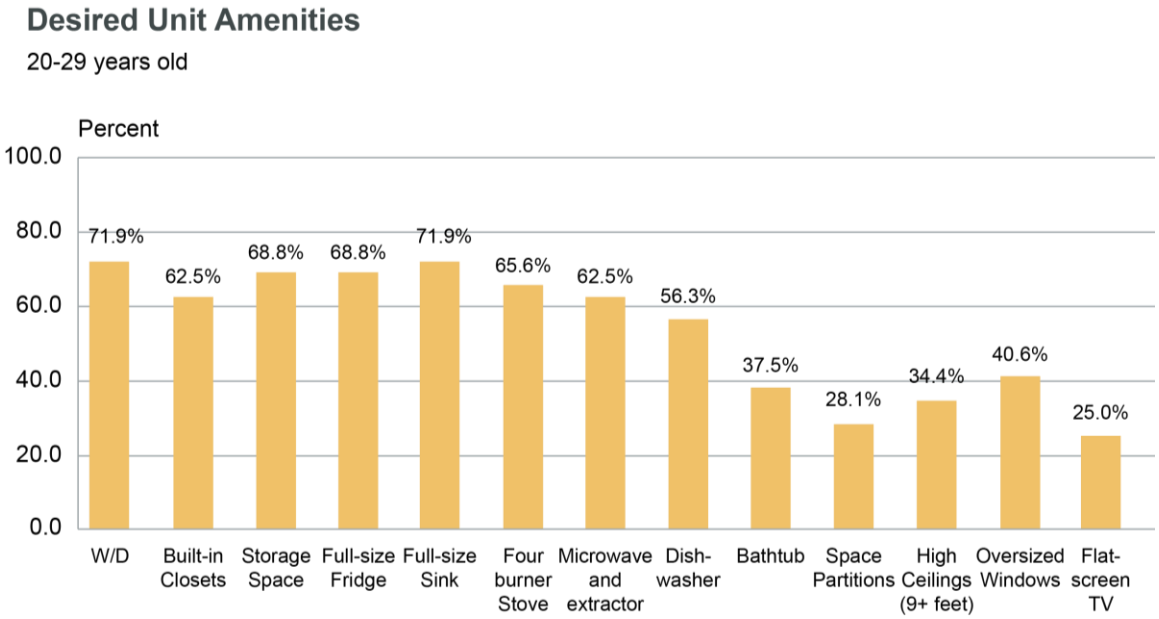


Figure 38. Desired Unit Amenities Among the Survey Respondents

Summary

Studies suggest that young adult professionals want to live in urban settings and that they are amenable to living in smaller dwellings (Hayden, 2010; Whitlow et al., 2013). Millennials have been described as self-reliant, closely connected to family and social organizations, and are seen as individuals with a high desire for forging relationships and creating a sense of community (Gruen, 2013; Timmerman, 2015; Young & Hinsely, 2012). Furthermore, approximately 66% of the participants in this study claimed that if they had to relocate, they would move to a city or urban area.

Differing from the claims found in literature, however, a greater amount of the participants in this survey marked that they *definitely would not* or *probably would not* be

interested in owning a micro-dwelling. Yet, they were willing to live in one in exchange for *lower rent*, *a desirable location*, and *more community and shared amenities*. The latter factor suggests young adults' desire to be provided shared spaces where they can socialize and form a sense of community. Additionally, the participants claimed that they would invite people over to socialize more if they had the appropriate amenities and facilities to do so.

Another claim found in studies is that young adults' housing aspirations include Internet connection, open and flexible spaces, and shared amenities and communal spaces (Gruen, 2013). The survey results in this research showed that millennials are interested in communal amenities, such as *a roof or outdoor space*, *laundry room*, and *fitness center*. They also considered the *floor plan and layout* and *Internet access* priorities in an initial lease decision. Ultimately, most all of the conclusions resulting from this study's survey concurred with the claims found in previous studies.

Design Charrette

During the spring of 2018, the 5th Annual Novem Mason Symposium was hosted by the Center for Community-Engaged Design at UNCG. This symposium was held to discuss topics related to the theme *Design4Health: Towards a Healthy Built Environment for All*. During the symposium, some of the topics touched on were affordable housing, accessory dwelling units, tiny houses, and public interest design. Professionals, faculty, students, and stakeholders came together to partake in different charrettes and presentations that discussed these topics.

One of the charrettes held was an accessory dwelling unit design charrette that sought to develop preliminary site plans and ADU designs for three sites located in Greensboro, NC. These sites were visited beforehand by CC-ED fellows. All of the

information collected was compiled and then used during the charrette as a starting point for the participants (Appendix H). The three sites chosen are further described below.

Sites: Spring Garden St., S Mendenhall St., Kensington Rd.

The first site identified is located on Spring Garden St. and is part of a historic district (Figure 39). Its zoning is R-7 and the type of ADU desired by the owners is a detached unit. The primary dwelling is 2,672 square feet, which suggests that, according to Greensboro's Land Development Ordinance, the ADU can be a maximum of 802 square feet. Among the lot constraints identified was the existence of a mature tree in the backyard, which may affect the placement of the ADU. Additionally, any intervention to this lot will need approval of Preservation Greensboro and the City Historic Preservation Commission. The owners requested a two-story ADU matching the property's historic style; and including storage space for extra furniture, as well as having a small kitchen with abundant storage space.

Figure 39. (a) Front Façade and (b) Space Available for the ADU of the Spring Garden St. House

The second site is located on South Mendenhall St. and is also part of a historic district (Figure 40). Like the previous site, its zoning is R-7 and the type of ADU desired

by the owners is a detached ADU. The primary dwelling is 2,654 square feet, which means that the ADU can be a maximum of 796 square feet. A constraint that was taken into account is that the lot slopes downhill towards the North. Due to this, the owners suggest that the best site for the ADU is the southern side of the lot past the end of the driveway and past an existing tree's canopy on high ground. Some of the owner's desires were that the ADU be a two-story cottage with a loft, covered porch, and extra storage space.

Figure 40. (a) Front Façade and (b) Space Available for the ADU of the South Mendenhall St. House

The third site is located on Kensington Road and is the only lot that is not part of a historic district (Figure 41). The zoning for this lot is R-5 and the owners would like a detached ADU or a detached garage conversion. The primary dwelling is 1,865 square feet, which means that the ADU can be a maximum of 560 square feet. This garage is currently being used as a shed and it is not structurally sound. The owners are looking for extra storage with a separate entrance for their use. However, the ADU is to be built for them to rent to college students or young professionals. They would like for the ADU's design to be coordinated with the outdoor space and for its access to face the

street or rear yard, asking for a one-story structure, but open to it being a two-story structure, if necessary.

Figure 41. Space Available on the Kensington Rd. Lot for the ADU

Land Development Ordinance

In order for the charrette participants to develop site plan designs, they referred to the Land Development Ordinance (Appendix I) provided by the City of Greensboro, as all three sites were local. To summarize the information provided, one ADU, excluding recreational vehicles, is permitted in a lot under a set of requirements. Either the primary or accessory dwelling must be occupied by the owner of the lot, an additional parking space must be provided; and most importantly, the ADU must be a minimum of 400 square feet and no larger than 30% of the floor area of the primary dwelling. A portion of the ordinance addressed is copied below.

> **30-8-11.2 Accessory Dwelling Units**
> …**(B)** The owner of the property must occupy either the primary or the accessory dwelling.
> **(C)** Only one accessory dwelling is allowed.
> …**(E)** The heated floor area of the accessory dwelling must be at least 400 square feet in area, but it may not exceed 30% of the floor area of the primary dwelling.

> …**(G)** One additional off-street parking space must be provided.
> **(H)** Use of a travel trailer or recreational vehicle (RV) as an accessory dwelling is prohibited within a residential district or on property devoted to residential use (Greensboro City Council, 2017, p.71-72).

Charrette Process and Outcomes

The facilitators of the charrette included Kol Peterson, author of *Backdoor Revolution: The Definitive Guide to ADU Development*; Dan Curry, board chair of the Greensboro Housing Coalition; professors from UNC Charlotte, UNC Greensboro, and Virginia Commonwealth University (VCU); and UNCG Interior Architecture and VCU students, including the researcher. This cohort led the participants throughout the two-day symposium and helped facilitate the charrette.

The first day of the symposium began with an introduction to accessory dwelling units. Kol Peterson spoke briefly about his experience with ADUs, and what the participants should take into account when designing the site plan and the unit itself. The group was divided into three subgroups of about six participants to take on each of the sites. During this first day, the participants reviewed the data provided to them about the site and owner's requirements and set on the task of developing schematic site plan options. Some groups also had the opportunity to start working on the interior layout and exterior elevations of the ADUs. The site plans utilized for the schematic drawings are shown in Figure 42.

During the second day of the symposium, the participants focused on the interior layout of the ADUs. They worked on schematic floor plans, interior and exterior elevations, and perspectives. Two of the three site owners were present, and the participants had the opportunity to present them their work and receive feedback. The

outcome of this charrette was a series of sketches that were compiled into poster documents (Appendix J). These were also synthesized into a site plan and floor plan per dwelling.

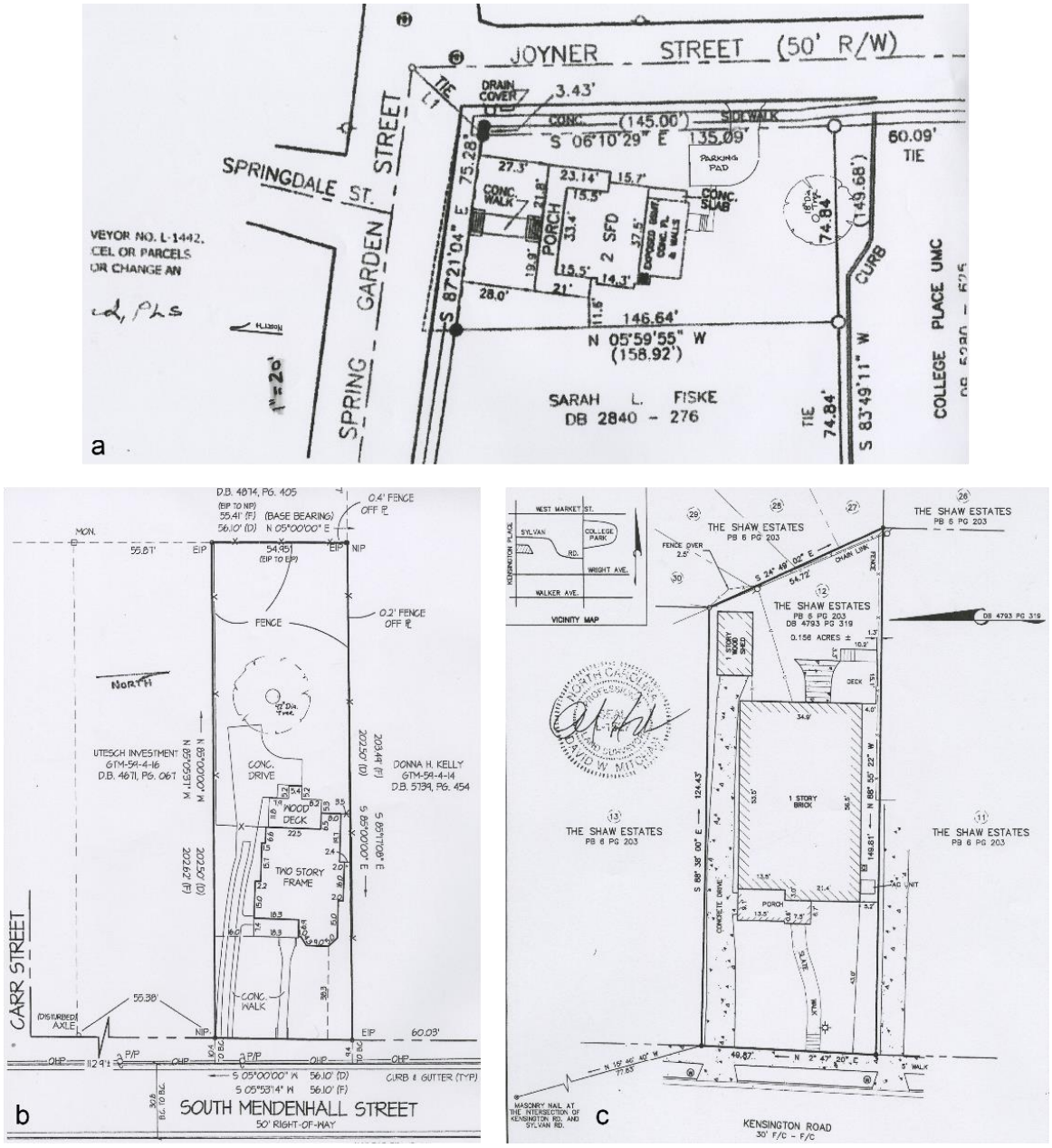


Figure 42. Original (a) Spring Garden St., (b) South Mendenhall St., and (c) Kensington Rd. Site Plans

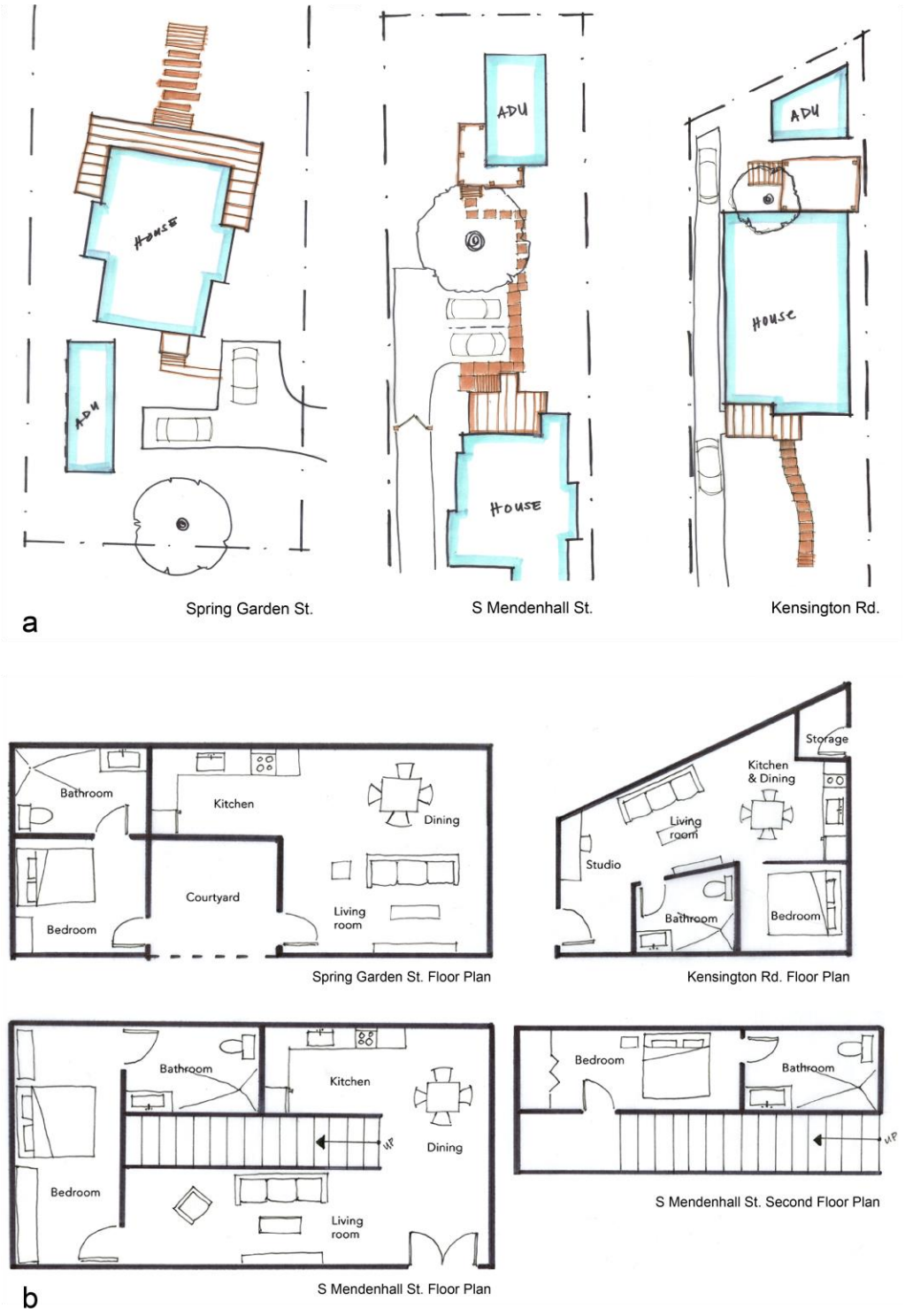


Figure 43. (a) Synthesized Site Plan and (b) Floor Plan Sketches for all Three Sites

This charrette offered the researcher new knowledge and a different perspective on the design of accessory dwelling units. This knowledge was acquired through the city's requirements, Kol Peterson's advice for designing ADUs, and the researcher's involvement in compiling and synthesizing the participants' sketches.

All of the synthesized site plans had detached ADUs located behind the primary dwelling, being partially hidden from the street, as can be seen in Figure 43. The site plans incorporated an additional parking space and the floor plans offered the following basic amenities: living room, dining area, kitchen, bedroom, and bathroom. However, as the owners' use for the ADUs differed, so did the interior layouts and the additional spaces offered. Some floor plans included a studio workspace and storage room, while others included a courtyard. Figure 43 illustrates the synthesized floor plans the researcher developed. Ultimately, the design charrette helped inform the pattern language alongside the survey and site visits.

Pattern Language

The pattern language resulting from the preceding study phases is illustrated in Table 12. Separate examination of the patterns identified in the characterization study and the patterns identified from the survey, and their comparison, led to identifying the commonalities and congruencies that suggested design strategies and features for inclusion in the pattern system. This pattern language selection process can be seen illustrated in Tables 11 and 12.

Table 11 illustrates the original patterns identified from the literature review, site visits, charrette, and survey. The patterns that were found in common between the survey and the literature, site visits, and charrette were color coded. All of the patterns that were related were highlighted with a color, while the patterns that weren't related,

but formed part of the pattern language, were highlighted in gray. These colors correlate to Table 12, which shows the patterns found in common, the different patterns, and the final pattern language.

The patterns were grouped into three categories depending on their use or type of problem addressed: general requirements, architecture, and unit design.

General requirements address the site, location, and size of the units: (1) city or urban area, (2) proximity and connectivity, (3) communal amenities, and (4) square footage. Architecture refers to what strategies should be taken into account when designing the units: (5) increase height, (6) rooms as circulation, (7) sight lines and views, and (8) natural lighting. The last section, unit design, refers to the spaces and furniture provided: (9) kitchen and laundry room, (10) porch or balcony, (11) built-in furniture, and (12) convertible furniture.

Table 11. Pattern Language Selection Process – Part I

PATTERN LANGUAGE PROCESS - PART I		
ORIGINAL PATTERNS		
Literature, Site Visits, Charrette	Source(s)	Survey
Less than 500 square feet	(Small Housing BC, 2015)	1-2 living in the unit
Site lines and views	(Richmond, 2012; Charrette - Peterson)	City or urban area
		Fully equipped kitchen
Shrink footprint	(Richmond, 2012)	Laundry room
Increase height	(Site Visits - Perch and Nest, Pope-Leighey House)	Recreational areas
Split levels	(Richmond, 2012)	Built-in furniture
Rooms as circulation	(Charrette - Peterson)	Storage space
Voids	(Richmond, 2012)	Proximity to work
Natural light	(Site Visits - Pope-Leighey House; Charrette - Peterson; Van Den Wymelenberg, 2014)	Communal amenities
Multi-use convertible furniture	(Richmond, 2012; Willet, 2016, Site Visits - Durham Coho)	Well designed floor plan
Custom or built-in Furniture	(Site Visits - Durham Coho, Pope-Leighey House; Richmond, 2012)	Outdoor spaces
Urban setting	(Timmerman, 2015; RCLCO, 2013)	Visitor parking
Lofts	(Priesnitz, 2014; Site Visits - Perch and Nest)	Space for socialization
Garden	(Site Visits - Pope-Leighey House, Durham Coho; Priesnitz, 2014)	Fitness center
Guest room	(Site Visits - Cohousing)	Full-size refrigerator
Communal dining area	(Site Visits - Cohousing)	Full-size kitchen sink
Communal kitchen	(Site Visits - Cohousing)	Four-burner stove
Connectivity	(Kilman, 2016; RCLCO, 2007)	Neighborhood amenities
Proximity to neighorhood amenities	(Goodman, 2015; Kilman, 2016)	
Sense of community	(Timmerman, 2015; Elgin, 1993; Site Visits - Durham Coho)	
Outdoor spaces such as porches	(Presnitz, 2014; Site Visits - Perch and Nest)	
Stacking functions	(Charrette - Peterson; Richmond, 2012)	
Compression and release	(Wright, 2005; Site Visits - Pope-Leighey House)	

Table 12. Pattern Language Selection Process – Part II

PATTERN LANGUAGE PROCESS - PART II			
COMMON PATTERNS	DIFFERENT PATTERNS		FINAL PATTERN LANGUAGE
	Patterns	Source(s)	
Urban setting	Natural light	Charrette, literature	City or Urban Area
Outdoor spaces	Increase height	Literature, site visits	Proximity and Connectivity
Proximity and connectivity	Lofts	Site visits	Communal Amenities
Built-in furniture and storage	Square footage	Literature	Square Footage
Rooms as circulation	Convertible furniture	Literature, site visits	Tiny houses (less than 500 sqaure feet) can save 26,000 pounds of CO2 being released into the atmosphere every year (Tiny House Build, 2014).
Sense of community	Laundry	Survey	
	Compression and release	Site visits	Increase Height
	Fully-equipped kitchen	Survey	Increasing height allows for void spaces that can serve as couryards, light wells, and double height spaces. "Having headspace puts you in a better headspace" (Peterson, 2017, p.4).
	Shrink foot print	Literature	
	1-2 living in the unit	Survey	Rooms as Circulation
	Interior views	Charrette, literature	Sight Lines and Views
	Exterior views	Literature, site visits	One of the most effective strategies when making small spaces appear larger is providing the occupant with an internal or external view that is greater than that of the space occupied (Richmond, 2012).
			Natural Lighting
			Without exposure to normal 24-hour day and night cycles, consistent lack of daylight could have a significant cumulative effect on an individual's health (Van Den Wymelenberg, 2014).
			Kitchen and Laundry
			Participants ranked washer and dryer, full-size sink, full-size refrigerator, and four-burner stove the highest among desired unit amenities. "Micro units need to supply smaller, but full-size appliances" (Whitlow et al., 2013, p. 28).
			Porch or Balcony
			Built-in Furniture and Storage
			Convertible Furniture
			Programming a single element or space wih more than one function is a way of simplifying and reducing clutter, effectively reducing the perceived size of the space (Richmond, 2012)

General Requirements

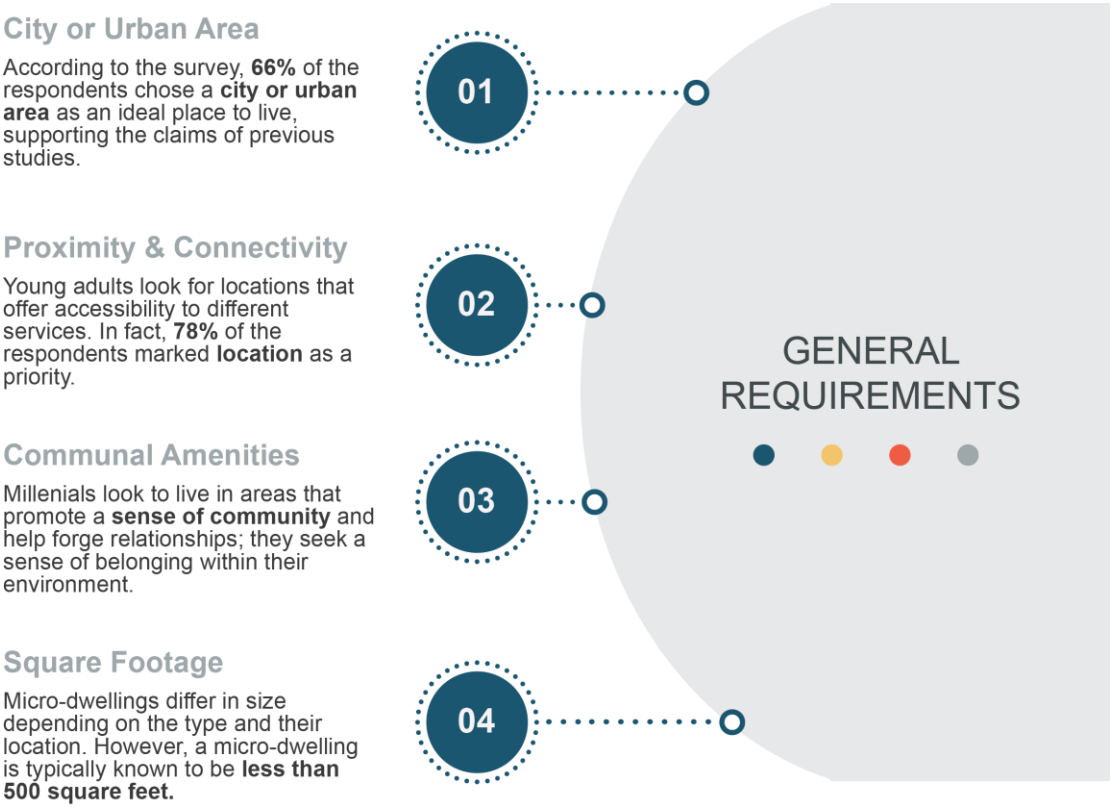


Figure 44. Pattern Language: General Requirements

City or Urban Area

Results from this study indicate that young adult professionals want to live in urban settings and their migration patterns support this. According to Timmerman (2015), millennials show a great desire to live in cities rather than in suburban or rural areas. Robert Charles Lesser and Co. (RCLCO, 2013), state that almost half of the millennial generation works within the city, resulting in this population moving to these environments. Furthermore, Figure 45 shows that from 2010 to 2013, the amount of

young adults that consider themselves a city person increased by 6%, while those who consider themselves suburbanites decreased by the same amount.

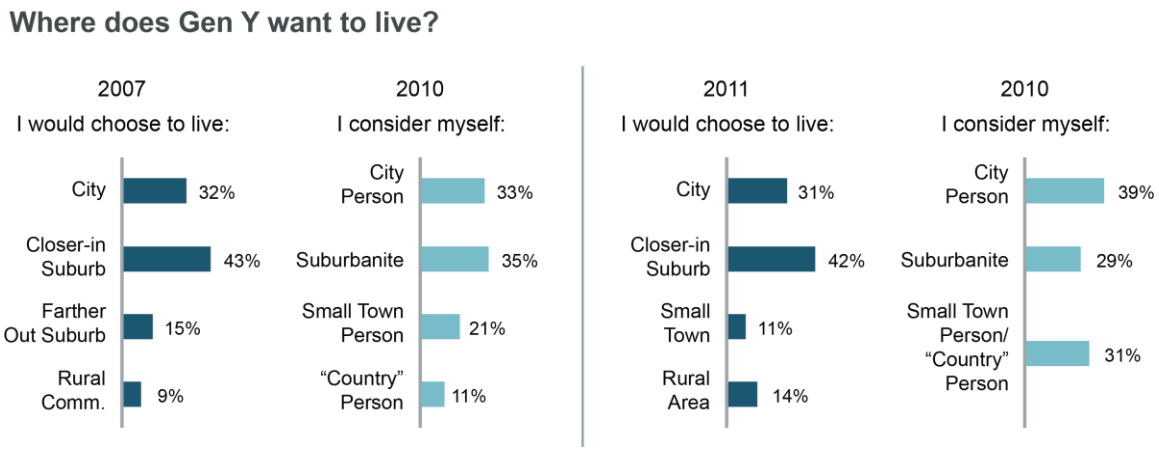


Figure 45. Where Does Gen Y Want to Live? (RCLCO, 2013)

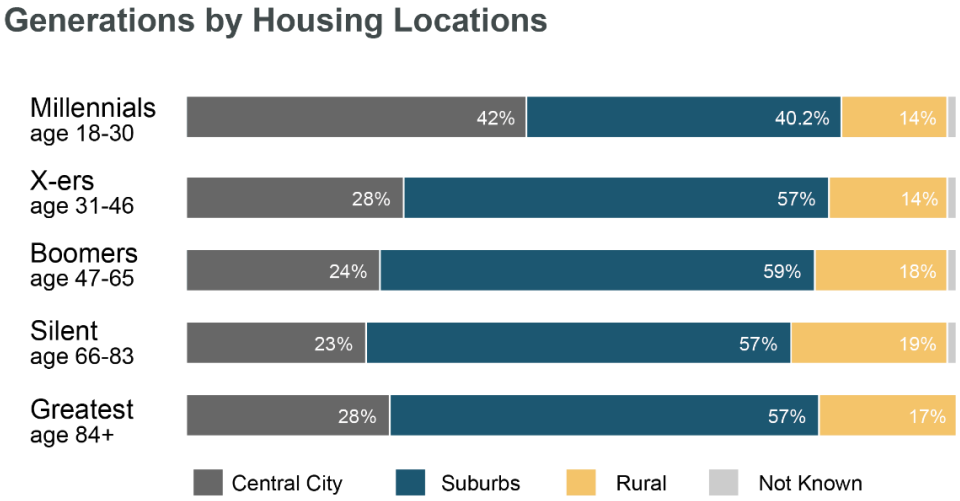


Figure 46. Generations and Their Housing Location (PRC, 2010)

As shown in Figure 46, millennials' interest in living in urban settings has increased in comparison to other generations. In fact, 42% of millennials prefer to live in urban settings compared to 28% of Gen X-ers. The survey conducted in this study

supports these claims, as 65.6% of the respondents said they would prefer to live in an urban setting if they were to move. When asked about their satisfaction with their current living arrangements, one of the recurring problems mentioned was the location. Their reasoning was that many live in a rural or suburban area, or they live in a small town, all of which offer little amenities. When asked to explain why they weren't satisfied with their living arrangements, one of the respondents simply stated, "rural" (Survey respondent, 2018).

Proximity and Connectivity

Proximity and connectivity in their neighborhood are highly desired by young adults. This is one of the main reasons as to why they prefer to live in cities and urban areas. Communities located in urban settings, normally benefit from the service providers in their surroundings. Therefore, they look for locations that are home to many restaurants, grocery stores, and recreational areas, as they offer accessibility to these services. For example, when visiting Durham Coho, the residents mentioned being in walking distance of the Farmers' Market, library, theater, and many restaurants, as community assets.

RCLCO (2013) conducted a survey asking young adults how important the community features presented to them were (Figure 47). An overwhelming 71% found walkability important or a vital role in their home or community selection process.

This was echoed by this study's survey respondents, many of whom are not satisfied with their current living arrangements as they do not offer neighborhood amenities or are far from their workplace. When asked why they weren't satisfied with their current living arrangements, one of the survey respondents said, "Gibsonville is very small and lacks amenities – large parks, grocery stores, etc." (Survey respondent,

2018). Furthermore, 60.9% of the participants find proximity to their work, school and neighborhood amenities a priority. According to the survey, the neighborhood amenities most desired are recreational areas, restaurants and bars, and grocery stores.

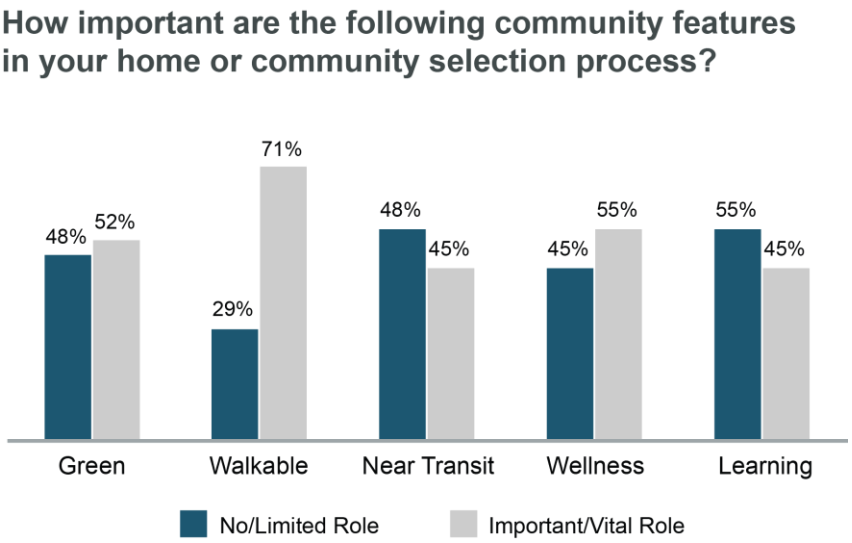


Figure 47. Importance of Community Features (RCLCO, 2013)

Communal Amenities

One of the most important characteristics of millennials is their desire to be part of a community. Young adults look to live in areas that promote a sense of community and help forge social relationships; they seek a sense of belonging within their environment and surroundings. Therefore, offering communal spaces, such as common houses, that allow for socialization is essential for a community designed for the millennial cohort. Common houses are frequently the way communal facilities are organized, as these are the heart of the community. They serve both practical and social benefits and offer the residents a way of coming together and socializing (McCamant & Durrett, 1988).

Young adults seek a sense of belonging within their environment and surroundings, and this can also be accomplished through community amenities. According to the survey conducted, more than half of the respondents stated that they would choose a micro-dwelling over a conventional unit, if more communal spaces were offered. Many respondents expressed their dissatisfaction with their current living arrangements, due to a lack of communal spaces. One of the respondents stated, “Location is in Asheboro, NC. It is a small town with little entertainment options… communal amenities, again not much a community sense or things to do” (Survey respondent, 2018).

Similarly, when asked what would make them choose a micro-dwelling over a conventional unit, a respondent said, “Benefit to society, getting a more communal aspect of living close to others. Pocket neighborhoods are the most appealing to me” (Survey respondent, 2018). Later, the survey participants were asked what amenities they would prefer to have in the community. Interestingly, they showed a preference for outdoor spaces, visitor parking, laundry facilities, and a fitness center over a theater room, communal kitchen and dining rooms, and lounges on each floor.

Additionally, while conducting the site visits, it was noted that all of the communities visited offered communal spaces for the residents. These were seen in the form of a common house, lounges, communal kitchen and dining areas, porches, and even community gardens. These observations from the site visits and the information from the literature confirm the importance of providing communal or shared spaces in a community serving the socializing needs of young adults.

Square Footage

As mentioned before, micro-dwellings refer to residential units that are smaller than traditionally sized units. The most common type of micro-dwelling is a tiny house, which typically ranges from 150 square feet to 430 square feet. However, the maximum square footage of a micro-dwelling can range depending on its location. This is commonly seen with micro unit apartments. For example, in New York, micro unit apartments are considered to be approximately 300 square feet, but in Dallas they can be approximately 500 square feet (Whitlow et al., 2013).

This can also be seen among accessory dwelling units, as their square footage is governed by city requirements. During the design charrette, it was stated that in Greensboro, North Carolina ADUs must be a minimum of 400 square feet. There is no definitive answer for what is the maximum size of a micro-dwelling. However, for the purpose of this study, micro-dwellings are considered to be 500 square feet or less. This encompasses tiny houses, micro unit apartments, and accessory dwelling units, even though the latter can range up to 800 square feet.

The size of micro-dwellings is important as, aside from their novelty and popularity, these dwellings have an impact on the environment, due to their reduced square footage. Furthermore, proving their sustainability, these dwellings comply with most all prerequisites, and could comply with 16 out of 36 Leadership in Energy and Environmental Design (LEED) v4 for Homes credits, given the nature of their design, which amounts to 80 possible points out of 100. More so, they could comply with more credits depending on their design.

The most evident way they contribute to sustainability is their reduced footprint. Compact housing has a direct impact on the materials and resources used, as well as

their energy use. These dwellings reduce their carbon footprint exponentially through smaller and fewer appliances and having less space to heat and cool, which results in reduced fuel and electricity use, both during the construction process and the building's lifecycle (Green Building Education Services [GBES], n.d.). Many communities, such as Pacifica Cohousing, also use solar panels to reduce their carbon footprint.

If properly designed, micro-dwellings can also have an impact on water consumption. Many tiny houses and communities, such as Perch and Nest and Pacifica Cohousing, have incorporated the use of composting toilets; though other technologies such as low-flow faucets and greywater recapture are also possible. Ultimately, micro-dwellings and their compact size have an impact on the triple bottom line: economy, environment, and social responsibility.

Architecture

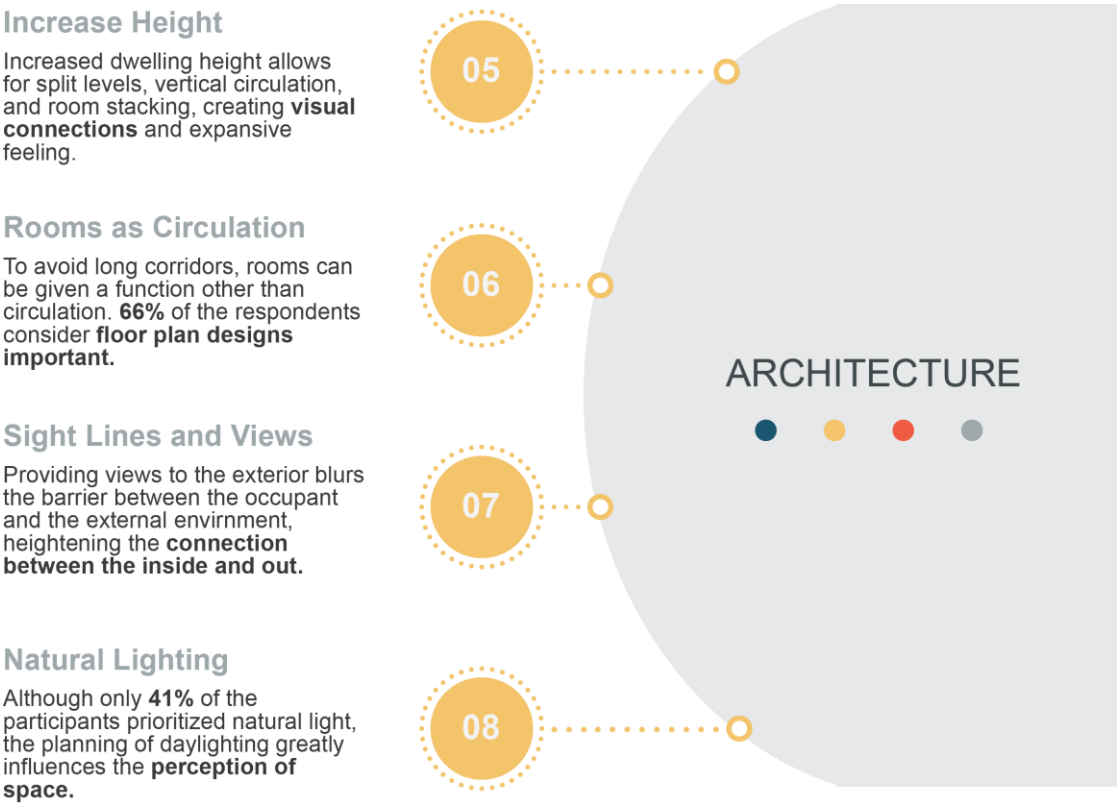


Figure 48. Pattern Language: Architecture

Increase Height

As the footprint of the dwellings decrease, it is imperative to increase their height, as this allows for the space to appear larger than it is. Increasing the height of the dwelling allows for split-levels, vertical circulation, and room stacking. By having vertical circulation, stairwells become an element that helps disperse light, while also acting as a void space. This creates a designated space for circulation and prevents the use of corridors, which generally take up space. Richmond (2012) states, “split level design

allows for visual connections between spaces and levels; and light to be ‘shared’ between multiple spaces, yet still offers distinction between different areas.” (p. 86).

Stacking rooms and functions is also important in micro-dwellings and can be achieved by increasing the height of the building. Stacking rooms allows for adding more spaces to a building, while reducing the amount of partitions used, as floor planes function to divide the rooms. Increasing the height also allows for void spaces that can serve as courtyards, light wells, and double height spaces. “Having headspace puts you in a better headspace” (Peterson, 2017, p.4). Peterson emphasized the effect tall ceilings can have on a space during the design charrette, as it makes the space feel larger and adds visual interest. He suggested the need to incorporate ceilings of at least 8 feet and up to 10 feet high.

Rooms as Circulation

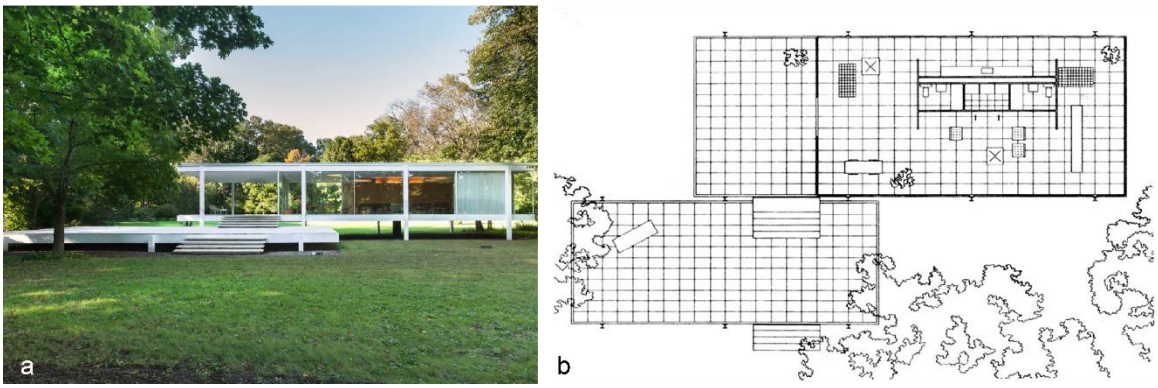


Figure 49. (a) Farnsworth House Façade and (b) Floor Plan by Mies van der Rohe (Manuel, 2013)

When surveyed, 65.6% of the respondents stated that the floor plan and layout of the dwelling is a priority to them in an initial lease decision. Therefore, it is important to maximize the space as much as possible by avoiding corridors. Long corridors typically

only serve one purpose and occupy more space than necessary. In order to avoid this, rooms can be given a secondary function as circulation. An iconic example of this design strategy is Mies van der Rohe's Farnsworth House, which only encloses the bathroom and maintains the rest of the floor plan completely open to various functions, as seen in Figure 49.

Stacking functions in a room is an effective way of using a space efficiently. One strategy that accomplishes this is open plan living. During the design charrette, Kol Peterson suggested spatially joining the kitchen, living room, and dining room into one great room to create the sense of a larger space. This was referred to as the great room and was viewed as the central part of the dwelling. This strategy was seen consistently during the site visits as all of the dwellings and communities used this technique. As mentioned before, stacking functionality in small dwellings is important; for example, offices and living rooms can double as a guest room. This can be easily accomplished through convertible and movable furniture, which will be discussed later.

Sight Lines and Views

One of the most effective strategies when making small spaces appear larger is using interior and exterior sight lines and views. Providing the occupant with an internal view that is greater than that of the space occupied creates a significant effect. Similarly, providing views to the exterior, blurs the barrier between the occupant and the external environment, heightening the connection between the inside and outside to the point of appearing to be the same space (Richmond, 2012). This was emphasized in the Pope-Leighey house as many design features, such as unobstructed corner windows, were incorporated to create a connection to nature.

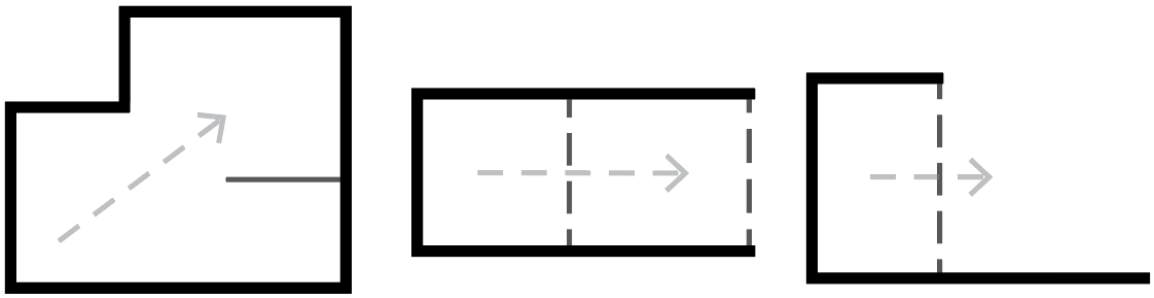


Figure 50. Interior and Exterior Sightlines and Views Diagram

Creating long sight lines from one corner of a space to the other and through windows is an effective way of making a small space feel larger. For this, deciding where windows will be placed needs to be done strategically (Peterson, 2017). Window placement is also important for views from the inside to the outside. When designing small spaces, views should be offered in key locations throughout the dwelling, as they help establish a visual connection with the surrounding environment. When placed intentionally and strategically, they facilitate a connection with the outdoors, blurring the line between interior and exterior, suggesting an expansive feeling.

Natural Lighting

Windows not only offer a connection with the surrounding environment, but also allow natural light to enter the space. High windows, in particular, cast light across small spaces in a way that gives them a greater sense of volume. The Harper, a micro unit apartment located in Washington, D.C. and part of the site visits, used floor-to-ceiling windows in the units to accomplish this. Skylights and clerestory windows are other types of windows that accomplish this effect.

Although the survey respondents do not prioritize natural lighting in their units, this is an important and effective strategy for making small spaces seem larger. As

Richmond (2012) states, natural light is essential in densely packed urban areas. The placement and planning of daylighting greatly influences the perception of space. A way to accomplish this is by borrowing natural light from an adjacent space to light a room that would otherwise be under lit. Wright used this technique in the Pope-Leighey House by not completely closing off some of the walls throughout the house and thus allowing light to spill from a lit room to another

Daylighting is the most effective and sustainable way of lighting a room and making it seem larger. However, there are other lighting strategies that create a visual effect in small spaces. For example, “diffuse light softens the edges and lines of the interior space, which subsequently increases the perceived size of the space” (Richmond, 2012, p.90).

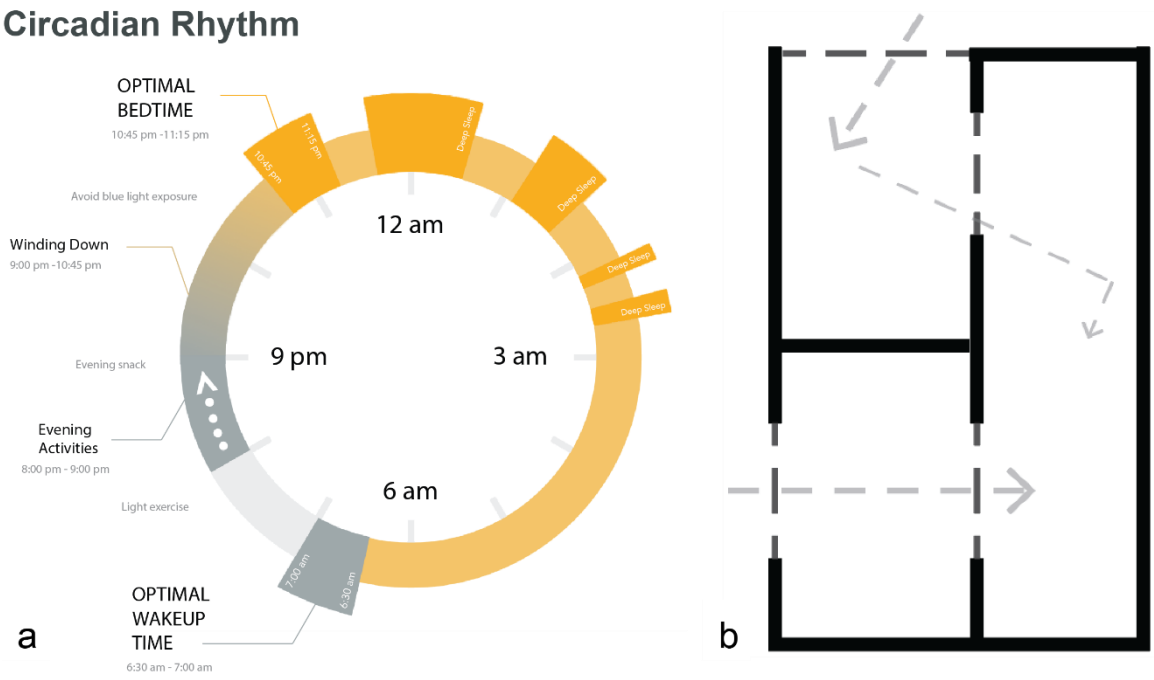


Figure 51. (a) Circadian Rhythm (Oura, 2017); (b) Natural Light Diagram

Incorporating natural light in small spaces also has environmental and individual health benefits. Increasing daylight in the space not only helps offset a portion of the electrical lighting load, but it also helps regulate human circadian rhythms (GBES, n.d.), illustrated in Figure 51. “The biological processes that regulate our sleep-wake cycle make up our circadian system” (Van Den Wymelenberg, 2014). This means that without exposure to normal 24-hour day and night cycles, consistent lack of daylight could have a significant cumulative effect on an individual’s health.

Unit Design

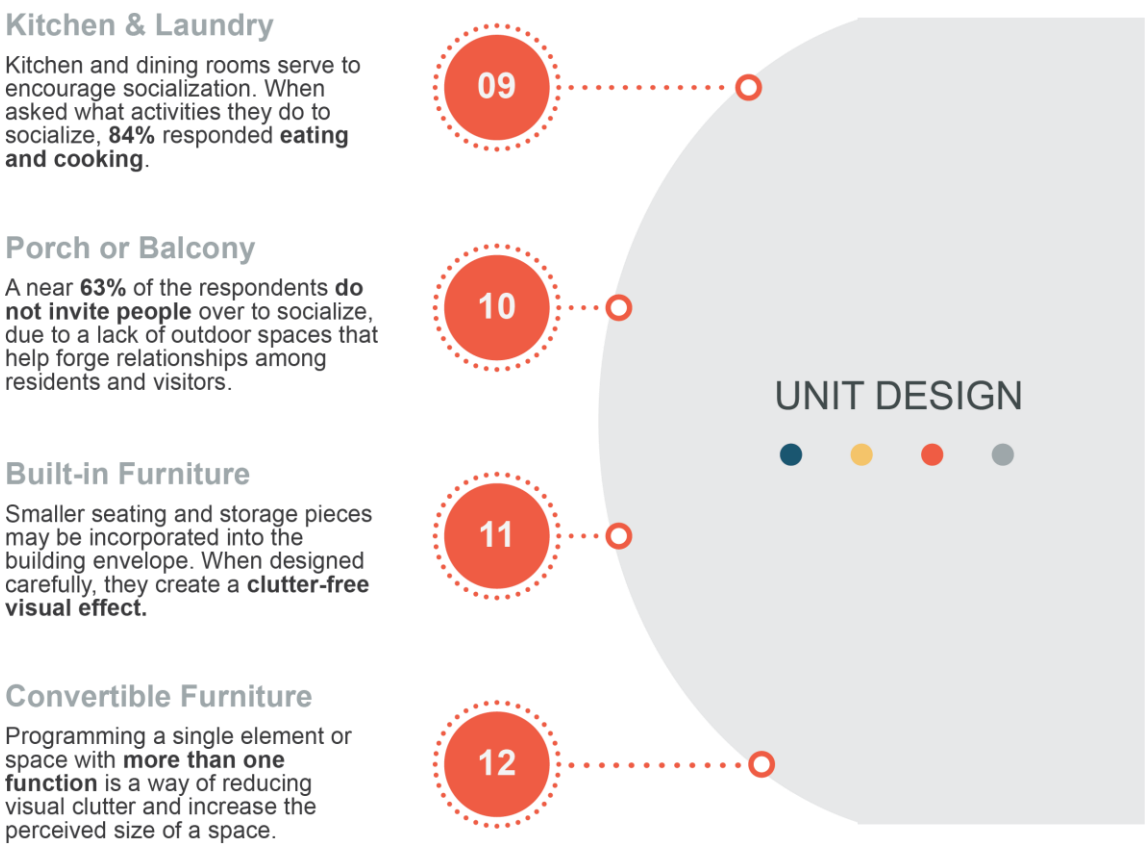


Figure 52. Pattern Language: Unit Design

Kitchen and Laundry

An interesting finding from the survey results was young adults' interest in having a fully equipped kitchen and laundry room. When referring to a fully equipped kitchen, this means that the kitchen has a minimum of a full-size refrigerator and sink and a stove top or oven range. When asked what socialization activities they partake in, more than 80% of the respondents chose eating and cooking. Later, when asked where they typically do these activities, more than half chose the dining room and kitchen area. This suggests that kitchen and dining areas can serve to encourage socialization and that they are important to young adults, which provides some justification for their preferences.

The participants rated having a fully equipped kitchen and laundry room in their unit the highest. Providing a fully equipped kitchen with full-size appliances is important as, according to Whitlow et al. (2013), "micro units need to supply smaller, but still full-size appliances (i.e. a full-height 24-inch refrigerator) because residents do not like small, under countertop refrigerator units like those found in hotel suites" (p.28). Kitchens are seen as primary communal areas where communication and socialization occur during food preparation times and then shift to the living and dining rooms (Kopec, 2006). Seven of the eight dwellings and communities visited, provided fully equipped kitchens.

Porch or Balcony

As mentioned previously, young adults desire living spaces where they can socialize and forge relationships. A space that can achieve this is a porch or balcony. Providing young adults an outdoor space where they can interact with their neighbors is important. These spaces support creating a sense of community among the residents,

as they become a comfortable space where residents can entertain their friends and family. As described before, Third Street Cottages in Langely, Washington is an example of how porches can help create a sense of community, as they are used to extend living spaces (Priesnitz, 2014). Confirming this notion, all of the sites visited offered outdoor gathering spaces in the form of an outdoor terrace, balcony, or porch.

According to the survey, 56.3% of the respondents were interested in having a roof or outdoor space as part of their community amenities. Moreover, 90.6% of the respondents chose drinking and socializing as a common activity they do to interact and fraternize with others. However, 62.6% of the participants do not invite people over to socialize. Most of their reasons for this were that their apartment felt small. In fact, one of the respondents said that they would go to their friends' houses to socialize because "they have real houses" (Survey respondent, 2018). When asked why they may not be satisfied with their current living arrangements, another respondent stated that they live in a 9-story building in downtown Greensboro and that there are zero amenities. "Due to my proximity, I treat Center City [park] and LeBauer Park as my 'balcony'" (Survey respondent, 2018). Therefore, offering porches and balconies as an extended living space make the dwelling more comfortable and appealing to live in.

Built-in Furniture

One of the design strategies that surfaces as essential in a micro-dwelling is provision of custom, built-in furniture and storage. As the footprint shrinks, one of the biggest challenges faced is providing sufficient storage. Built-in furniture becomes part of the architecture, taking the form of smaller pieces integrated into the envelope of the building. When designed carefully, these pieces use the space efficiently, and create a clutter-free visual effect. They help simplify interior functions, while also preserving the

continuity and openness of an interior space (Richmond, 2012). Young adults seem to be interested in having large amounts of storage through built-in furniture as 62.5% of the respondents indicated an interest in having a built-in closet as part of their unit amenities.

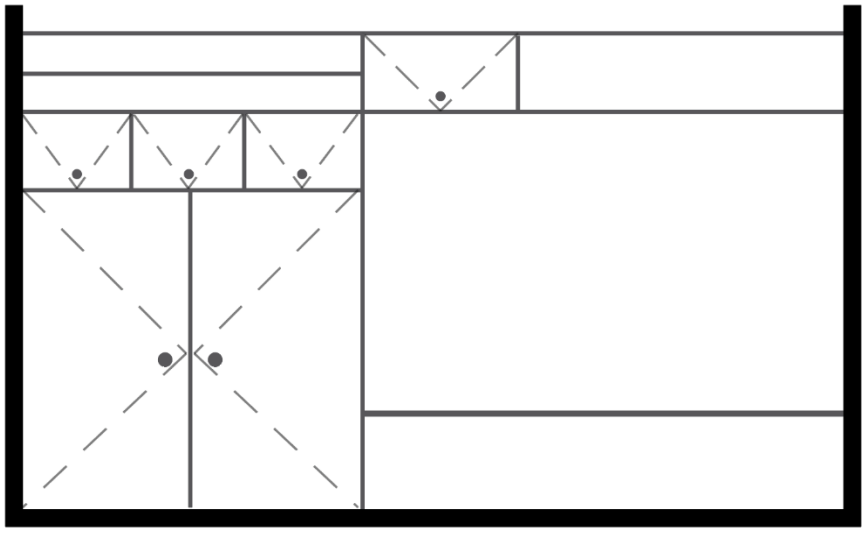


Figure 53. Built-in and Custom Furniture Diagram Illustrating Cabinets, Shelving, and Seating Areas Built into a Wall

Furthermore, Whitlow et al. (2013) state, “convertible, built-in furniture promotes livability and versatility, and it helps show residents how to live in small spaces” (p.26). Custom and built-in furniture does not let any unused space go to waste. For example, stairs can be used as drawers and spaces located under lower sections (less than approximately five feet) can be used for storage with built-in shelves or drawers (Peterson, 2018). This feature was observed during the visit to Perch and Nest, particularly in the showcase home, Roost 36. It was also seen in Frank Lloyd Wright’s Pope-Leighey house. Other strategies to incorporate storage and custom furniture are through built-in seating with storage below and built-in bench seating in window nooks.

All of these examples help remove the need for residents to bring their own large furniture storage solutions with them to their dwelling.

Convertible Furniture

Similarly to built-in furniture, convertible furniture and spaces are key design elements for micro-dwellings. Programming a single element or space with more than one function is a way of simplifying and reducing clutter, effectively reducing the perceived size of the space. Common furniture pieces used to accomplish this are sofa beds or Murphy beds that can turn any space into a bedroom. During the site visits, it was noted that The Farm at Penny Lane and Perch and Nest both include sofa beds in their dwellings, while one of the units visited at Durham Coho had a Murphy bed.

Rooms can transform and adapt to emulate the lives of the inhabitants (Richmond, 2012). This can benefit young adults that are starting a family and desire to continue living in a micro-dwelling. These transformations can be accomplished through movable partitions and convertible furniture, as seen in Figure 54. Depending on the activity, the space and furniture can adapt to the necessary changes.

Figure 54. Convertible Furniture and Spaces Diagram Illustrating How Sliding Partitions and Pullout Furniture Transform a Space

A great example of how a dwelling can transform to accommodate different activities is the Domestic Transformer by Gary Chang. This is a 344-square-foot micro

home in an apartment building that holds 24 different rooms in one transformable house. The architect used sliding walls, that double as storage; and transformable furniture, leaving approximately 180 square feet of unused space and making the apartment feel larger (Willet, 2016). This micro home has a living room, fully equipped kitchen, bathroom, walk-in closet, dining area for five people, laundry room, bedroom and even a game room, among others (Figure 55).

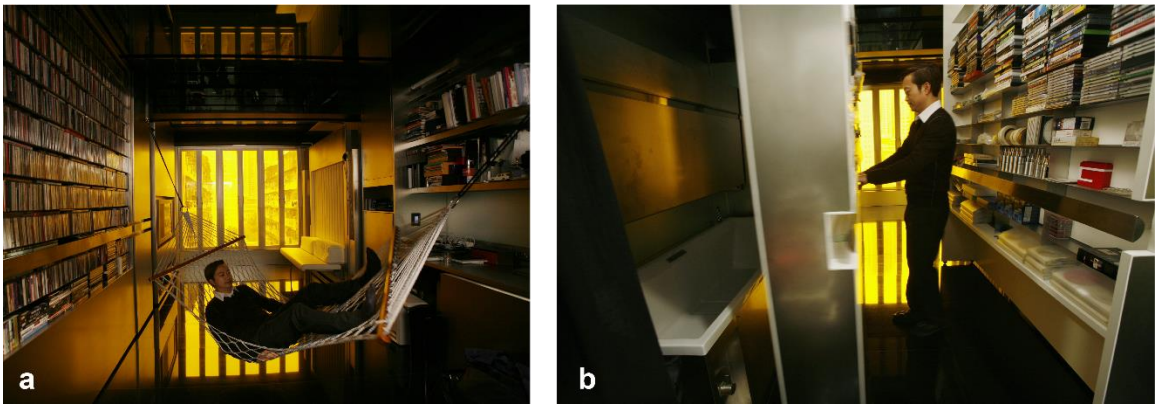


Figure 55. (a) View of the Apartment in Living Room Mode and (b) in the Process of Transforming with Sliding Walls (Willett, 2016)

Application

After identifying the design guidelines that make up the pattern language, these were applied to a case. The hypothesis, micro-dwellings might be a viable housing option for young adult professionals, was tested through the studio exploration and modeling of a micro-dwelling community model. This section describes how the patterns were applied to the design of this model to satisfy the housing needs and aspirations of the target population.

Site Plan

Two sites were identified in mid-town Greensboro, North Carolina to develop the micro-dwelling community model, which consisted of micro unit apartments, individual dwelling units, and stacked units. The two sites selected were the current locations of Seminole Court and Whilden Place Apartments, currently housing 32 apartments in three multi-story buildings on two adjacent lots. Although these sites are located in a neighborhood, they border the urban area along Battleground Avenue, which satisfies the first design guideline identified in the pattern language (Figure 56). This location is an up and coming area in Greensboro that provides the neighboring community easy access to communal and neighborhood amenities.

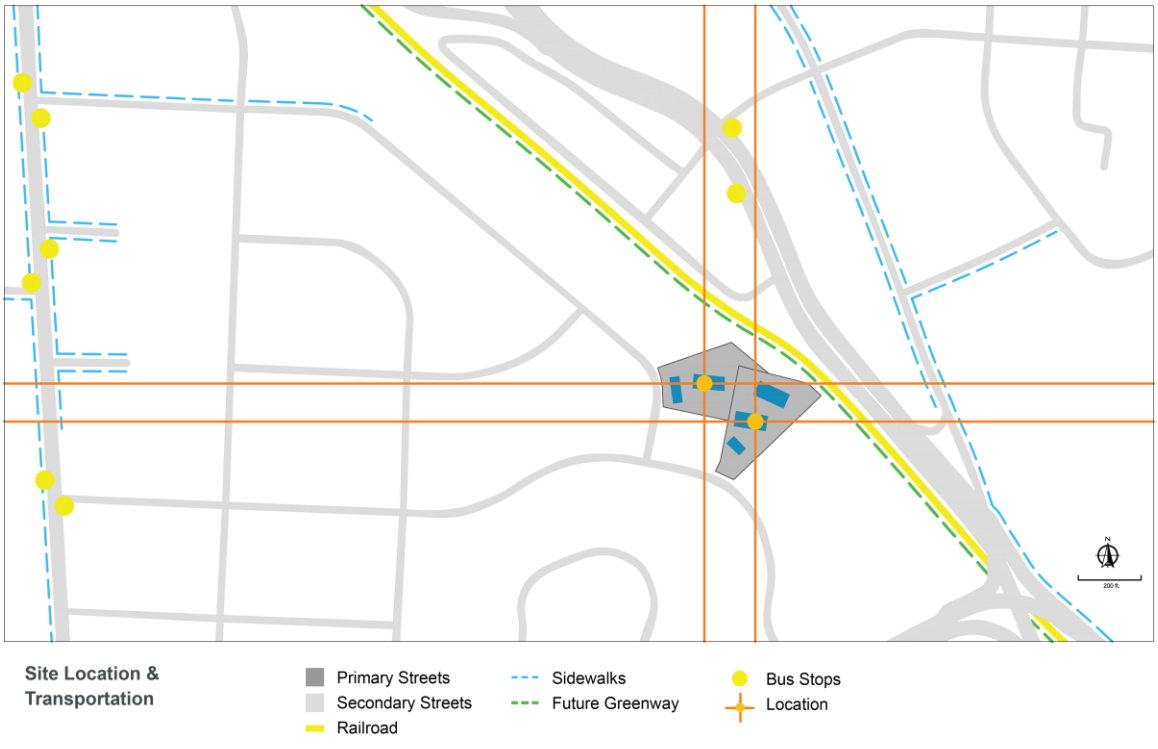


Figure 56. Site Location and Transportation

Mid-town Greensboro continues to grow and expand, offering more spaces for residents of the community to interact and socialize. Although the sites are located in a highly residential area, many amenities, such as shops, restaurants, and service providers are accessible to them. The sites are also in close proximity to hospitals, universities, shopping malls, and the future extension of the City Greenway. The furthest, Friendly Center shopping mall, is only at a 1.5-mile radius from the sites, approximately a six-minute drive. Aside from the future greenway extension, the sites are also in close proximity to many recreational areas, such as Lake Daniel and Latham Park. Furthermore, educational establishments like Greensboro College and the University of North Carolina at Greensboro are less than a five-minute drive away. Figure 57 provides a more detailed look at the uses in the context of the sites.

Figure 57. Site Context Uses

The location of the community complies with two of the design guidelines identified in the pattern language: city or urban area and proximity and connectivity. Furthermore, the design of the site plan addressed two more patterns: communal amenities and square footage. The site plan proposed in this model consists of residential units in the form of a micro unit apartment building, individual units, and stacked units; as well as communal areas. The latter includes a common house accommodating communal kitchen and dining areas, a laundry room, a multi-purpose room for events, a fitness center, and additional storage. Additionally, a community garden and central courtyards are also provided to the residents.

The communal kitchen and dining room are provided as communal areas where residents can communicate and socialize during food preparation times and while eating meals together if desired, as in the cohousing model. A multi-purpose room, often serving as dining room, is essential for meetings, activities, and events as necessary, and are the primary space used for social gatherings (McCamant & Durrett, 1988). The laundry room was provided as a necessary area for residents living in the smaller dwellings that do not have enough space to accommodate a washer and dryer, also a typical cohousing feature. Fitness centers and gyms are public spaces that residents are likely to integrate into and appreciate the value of their community more through their interactions with other residents. Furthermore, providing additional storage for the community is beneficial for storing items, such as bicycles and garden supplies, given the reduced square footage of the dwelling units.

Figure 58. Micro-dwelling Community Site Plan

Figure 58 illustrates the site plan developed for the model, which consists of tiny houses that are located on both lots, and micro unit apartments that are located at Seminole Court Apartments Lot. The common house and garden are located on the Whilden Place Lot, but are accessible to all the residents. In total, the proposed community comprises 29 tiny house units with a collective 7,340 square feet and 10 micro units with a collective 1,600 square feet. Furthermore, the 39 micro-dwellings amount to 8,940 square feet and the common spaces add up to a 45% of the total residential unit square footage, 4,230 square feet.

The site plan includes twenty-five (25) 160 square feet units, eight (8) 400 square feet units, and six (6) 290 square feet units. These all have their own porch or balcony that serves as an extended living and socialization space. The micro unit apartments consist of ten (10) 160 square feet units stacked upon each other. These, much like the individual and stacked units, all have their own balcony or porch space. On the ground floor, there is a common space with communal amenities, such as a laundry room.

The common house, functioning as the heart of the community, was located in a central area along with the community garden, in order to be accessible to all the residents. The residential units were located throughout the site in clusters of neighboring houses. The stacked units were located facing each other, creating small courtyards for the residents. Similarly, the individual units and micro unit apartment building were located facing each other, also creating a shared outdoor space for the residents. This layout of house clusters was possible by locating the primary road and parking lots behind the dwellings. Without driveways disrupting pedestrian movement between the structures, this community design persuades the residents to interact with each other more and forge relationships with their neighbors.

Dwelling Units

As mentioned above, the community model incorporated four different units. The first one uses a shipping container footprint of 160 square feet. The second is the only one that incorporates a loft and measures a total of 290 square feet which included a 100 square foot loft. The third unit was designed to comply with the American's with Disabilities Act (ADA) and measures 400 square feet. The final unit maintains the same footprint as the ADA unit, but was designed for a small family. The range of the units addresses the population in a more holistic way, attending to single young adults, couples, small families, and disabled young adults.

The first unit (Figure 59), which used a shipping container footprint, was designed to show how these containers can be repurposed and used to house individuals. The shipping container footprint used was the 8' x 20' x 8' 6", which is one of the standard sizes of these containers. With the intention of showing how spaces as small as 160 square feet can be designed efficiently, the design did not interfere with or alter the height of the space. This unit would be ideal for a single young adult or a couple. The unit includes a full bathroom, a fully equipped kitchen, and a living space that doubles as a dining area and that can also be used as a bedroom. However, it does not include a laundry space.

The design of this unit emphasizes the use of custom and built-in furniture to offer as much storage as possible, while also providing a comfortable living space. This was accomplished by the design of a custom storage unit that frames the sofa bed in the living area. Another pattern incorporated was convertible furniture. This is seen through the sofa bed that easily transformed the living area into a bedroom, and a fold out table that allows the residents to have a designated dining area and/or workspace.

Furthermore, to make more efficient use of the space, a pocket door was used for the bathroom to save space.

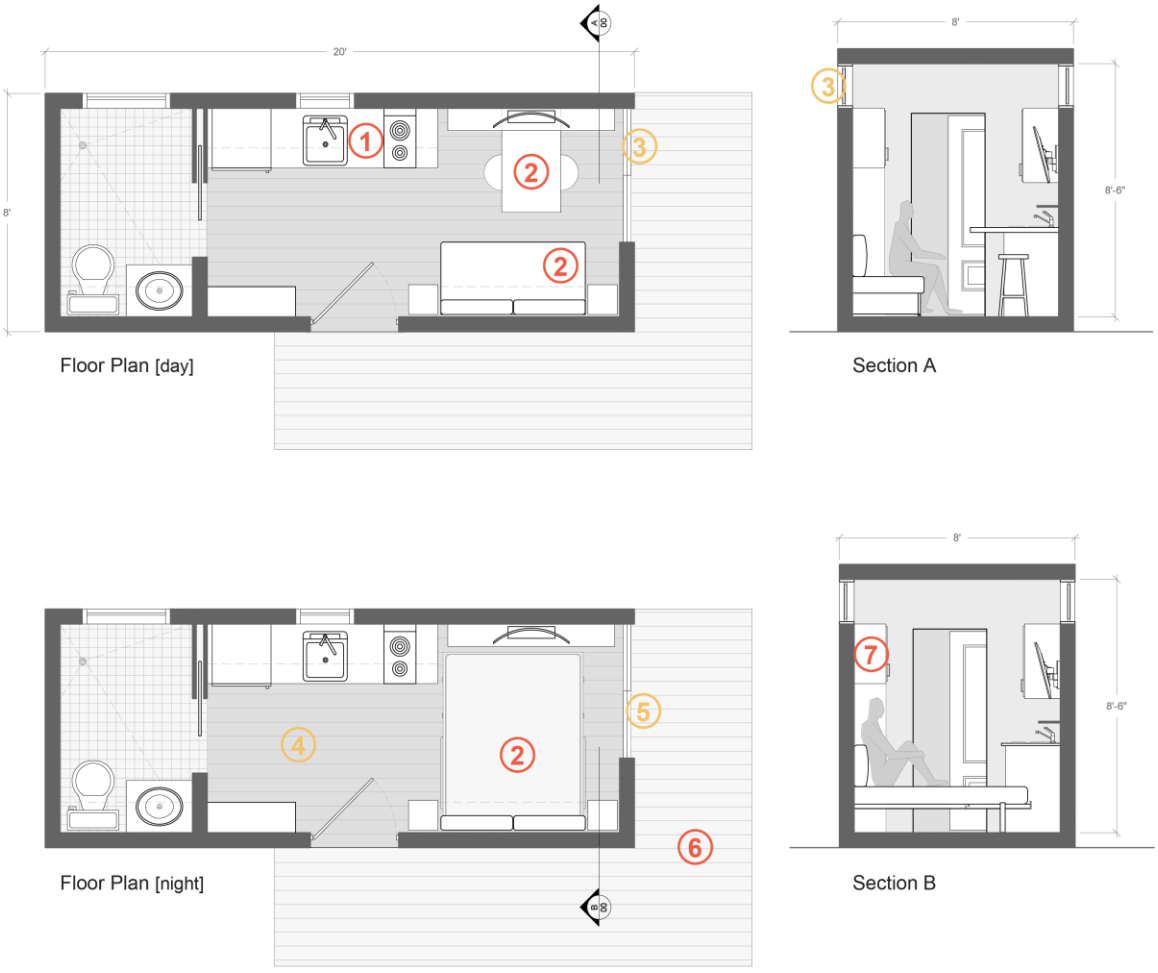


Figure 59. Pattern Language as Applied to Unit #1

This design also incorporates different design strategies to make the space seem spacious. One of these strategies is the use of rooms as circulation. Given the limited space in this unit, there are no corridors, it has a completely open plan allowing the residents to circulate through the rooms. Additionally, the use of natural light and sight lines and views contribute to this effect. This was accomplished through use of clerestory windows and sliding glass doors.

This unit design was used for the micro unit apartment, as well as the stacked units, where they were stacked on each other and on the 400 square foot units. Each unit was provided a porch or balcony. This extended outdoor living space helped make the unit seem larger through sliding glass doors that helped blur the barrier between the interior and exterior of the unit.

The second unit designed has a footprint of 290 square feet and a 100 square foot loft (Figure 60). It incorporates all of the patterns identified and can be seen as a showcase unit. This unit makes use of its interior vertical space, 17 feet, by creating split levels with the use of a lofted bedroom. This is an efficient way of stacking rooms while reducing the need and use of partitions. This also allows for visual connections between the bedroom and living area, as well as sharing light between multiple spaces. However, this design strategy maintains a distinction between different areas.

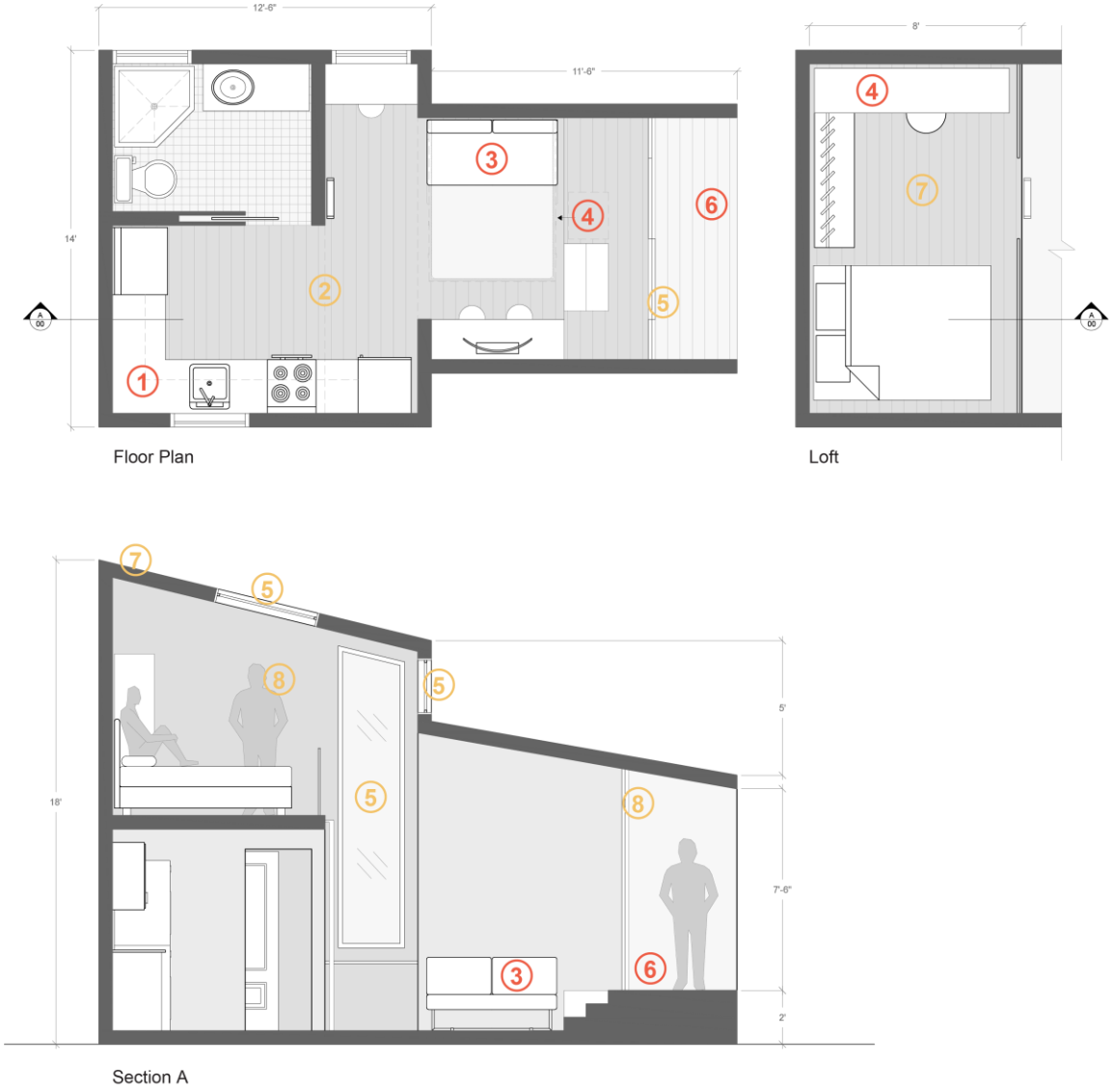
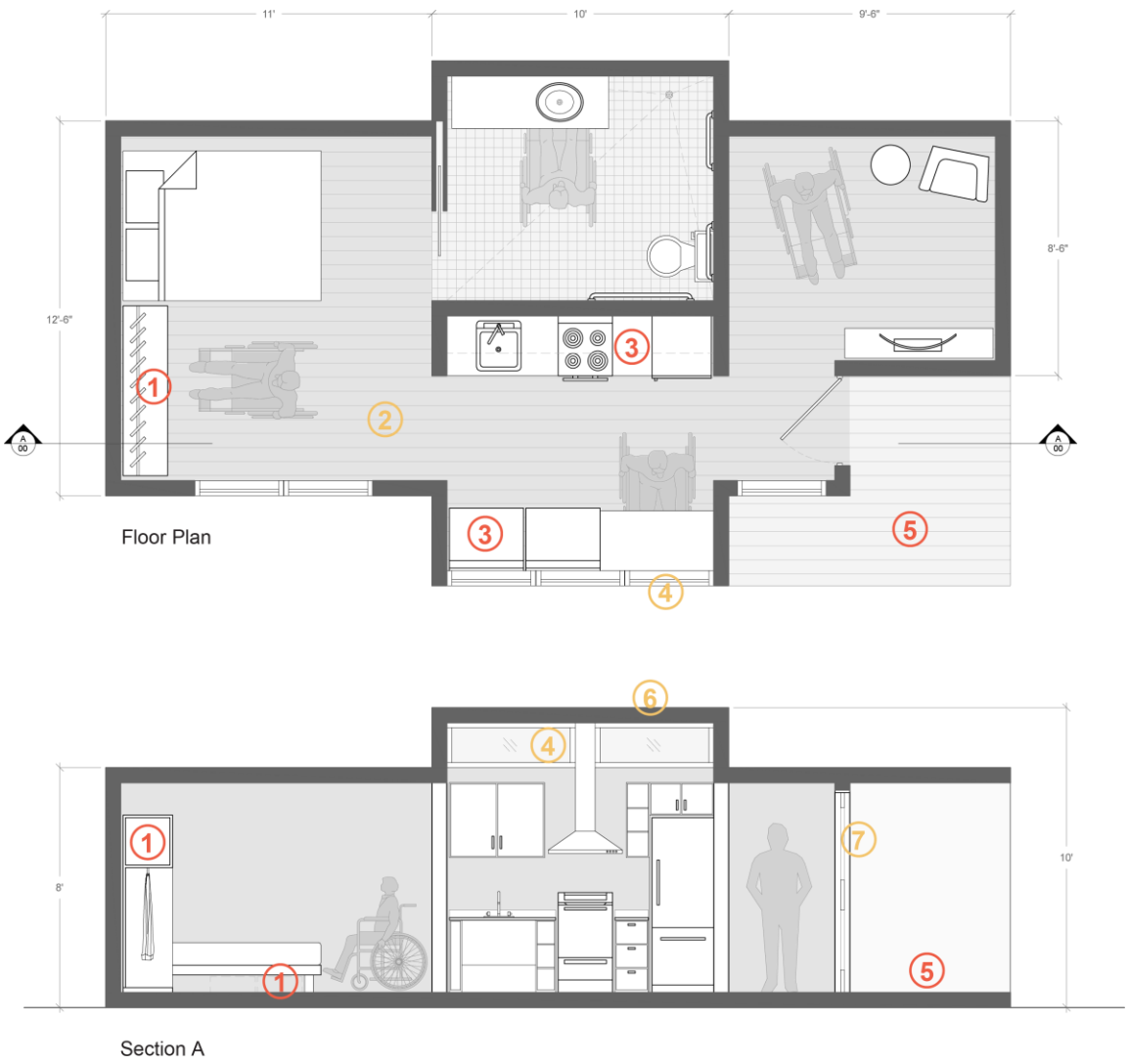


Figure 60. Pattern Language as Applied to Unit #2

Similar to the first unit, this design includes sliding glass doors that lead to an outdoor living space. These doors allow for abundant natural light to enter the space, as well as help blur the barrier between the interior and exterior of the space. The design also incorporates large windows, clerestory windows, and a skylight to help accomplish this. The natural light, sight lines, and views to the exterior that these windows provided helped make the space seem large. As mentioned above, this unit used custom, built-in, and convertible furniture to make more efficient use of the space, such as the use of a sofa bed that converts the living room into a second bedroom for guests. Aside from the custom storage under the elevated platform, the loft also has a custom furniture piece that includes a closet space and an attached desk.

Just like with the shipping container unit, this design uses pocket doors to save space and does not include any corridors to create an open floor plan that uses the rooms as circulation. This unit is targeted to single young adults, couples, and may even work for a small family. Ultimately, this unit design is the most holistic one and the most representative of how a micro-dwelling should be designed to satisfy young adult professionals' housing needs and aspirations.

The third and fourth units both have the same footprint, measuring a total of 400 square feet (Figures 61 and 62). This design has three main volumes; one that is used as the bedroom, a middle one for the bathroom, kitchen, and laundry area, and another volume that houses the living room and a porch. The difference between the two units is that one complies with ADA guidelines and the other caters to a small family or a couple that might want to transition to a larger family home, but desires to remain in the community and a micro-dwelling.

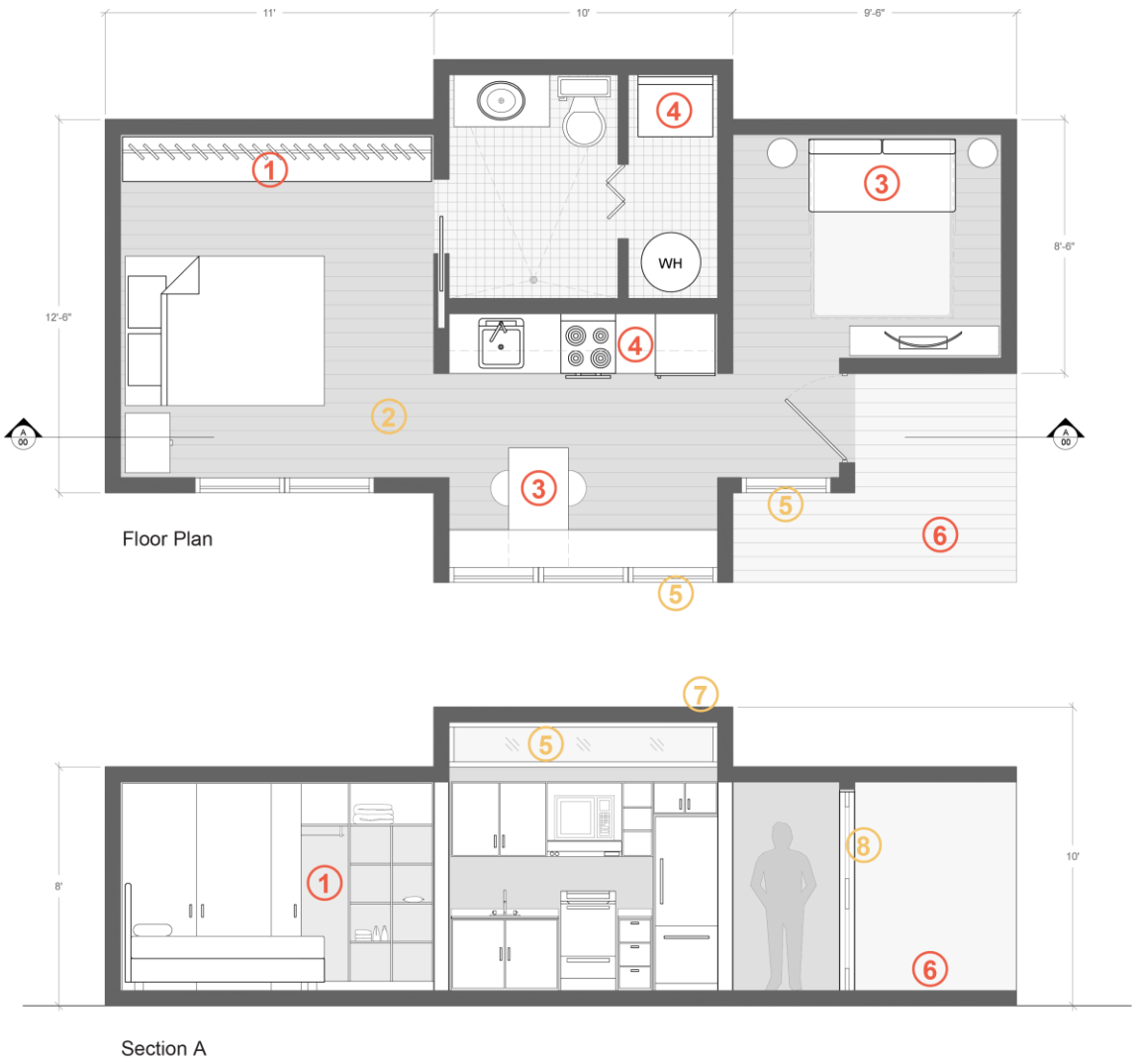


Unit #3

400 sq. ft. [ADA]

1. Built-in and custom furniture
2. Rooms as circulation
3. Fully equipped kitchen and laundry
   - Refrigerator
   - Kitchen sink
   - Four-burner stove
   - Hood extractor
   - Washer and dryer
4. Natural light
   - Clerestory windows
   - Large windows
5. Porch
6. Increase height
7. Exterior sight lines and views

Figure 61. Pattern Language as Applied to Unit #3



Unit #4

400 sq. ft. [family]

1. Built-in and custom furniture
2. Rooms as circulation
3. Convertible furniture
   - Pull-out table
   - Sofabed
4. Fully equipped kitchen and laundry
   - Refrigerator
   - Kitchen sink
   - Four-burner stove
   - Microwave w/ extractor
   - Stackable washer and dryer
5. Natural light
   - Clerestory windows
   - Large windows
6. Porch
7. Increase height
8. Exterior sight lines and views

Figure 62. Pattern Language as Applied to Unit #4

Just like the previous units, these two units avoid long corridors and use rooms as circulation, as well as use pocket doors to save space. A porch is also provided as an extended outdoor living space for socializing. These units also make use of the height of the space by creating a compression-and-release effect where passage from a tight space to a wider or taller space fosters a feeling of expansiveness. The left and right volumes have an interior height of 7 feet, while the middle volume has an interior height of 9 feet. These differences in height where low ceilings become high ceilings creates the effect that the space is larger than it is.

The units also have large windows and clerestory windows that not only bring natural light into the space, but also allow for light to be borrowed from adjacent rooms. For example, the kitchen has large windows, and there are also clerestory windows located on the partition that separates the bathroom and the kitchen. This is a way of bringing natural light into the bathroom through an adjacent space.

While the third unit (ADA) is fully accessible and provides a living room, fully equipped kitchen and laundry space, bedroom, and bathroom; the fourth unit provides a living room that can double as an additional bedroom, fully equipped kitchen, bedroom, and a bathroom with a laundry room. Furthermore, the fourth unit used custom, built-in, and convertible furniture to make more efficient use of the space, making it more comfortable for more than two people to live in. This was accomplished through a custom furniture piece in the bedroom that is meant to be used as a closet and additional storage space. The convertible pieces used were a sofa bed in the living room and a fold out table in the kitchen. This table folds out of a custom furniture piece and can be used as a dining table and/or a workspace.

Summary

This micro-dwelling community model served to test the design guidelines identified for the pattern language as applied to a case, with the purpose to provide a proof of concept that micro-dwellings are a viable housing option for young adults. This design incorporated all the patterns identified in the preceding study phase and demonstrated how micro-dwellings can be designed to satisfy the housing needs and aspirations of the target population.

The selected sites, as well as the design of the site plan applied the patterns that formed part of the general requirements: city or urban area, proximity and connectivity, communal amenities, and square footage. The site of this model is in an urban setting where many neighborhood amenities are in close proximity, such as restaurants, shops, service providers, and recreational areas. Furthermore, the site plan included communal amenities that are highly desired by young adults: a community garden, courtyards, and common house with facilities such as a fitness center and laundry room. Additionally, the units range from 160 to 400 square feet, keeping under the 500 square foot limit.

All of the units incorporated at least half of the patterns that were meant to address the design of the unit. The first unit applied the following patterns: rooms as circulation, exterior sight lines and views, natural light, kitchen, porch, built-in furniture, and convertible furniture. The third and fourth units, incorporated the following patterns: increased height, rooms as circulation, exterior sight lines and views, natural light, kitchen and laundry, porch, built-in furniture, and convertible furniture. Finally, the second unit incorporated all eight patterns identified for the architecture and design of the units. This unit can be considered the showcase unit as it is the most holistic one and most representative of a micro-dwelling design for young adult professionals.

CHAPTER V

CONCLUSION

In the next few decades, millennials will become the largest generation yet, having an assured impact on the economy and the housing and rental market. Although previous literature has proven that millennials' housing needs and aspirations differ from those of past generations; this has not been tested as applied to a housing model. However, shelter, in the form of housing, is the most basic human need for survival. If this need is not satisfied, along with food, drink, sleep, and oxygen; the individual will be overcome by their physiological needs, and all other needs will be pushed to the back or become nonexistent (Maslow, 1954).

Furthermore, Maslow's (1954) Hierarchy of Basic Human Needs defines love, affection, acceptance, and belonging as a subsequent need, thus alluding to the need for community. This can be seen as essential for satisfying the target populations' housing aspirations. When young adults identify with their surroundings, they tend to feel integrated to their community, which provides emotional safety, personal connection, and interpersonal relationships (Timmerman, 2015). This makes the case for the need to address the housing and social needs of young adult professionals. This study aimed to do just that by studying the possible fit between these needs and the micro-dwelling housing model.

Discussion

The results and findings of this research are intended to contribute to the design and development of micro-dwellings as a housing type that satisfies young adults'

needs. These findings as applied to a pattern language would be most beneficial to developers, contractors, architects, and designers as a way of facilitating the design process through a set of design guidelines. With the intention of providing housing alternatives to the target population and help them break into the housing and rental market, this research studied micro-dwellings as they are suggested to be desired by millennials. Therefore, the research question addressed was: *What is the possible fit between the housing aspirations of young adults, and the micro-dwelling housing model?*

Studies have shown that there is a growing interest in micro-dwellings, due to their presumed affordability and sustainability. Kilman (2016) states that micro-dwellings have captured people's attention because they do not only impact the environment, but also influence the owner's lifestyle. This innovative movement continues to grow, having an impact of the environment, economy, and social responsibility, while also capturing the attention of many people such as young adults. Furthermore, Hayden (2010) suggests that millennials want to live in urban settings and are amenable to living in smaller spaces.

The review of literature and past studies established that there are clear indications of young adults' need for housing, as well as their interest in micro-dwellings to address those needs. To gauge the possible fit between the housing aspirations of young adults and the micro-dwelling housing model; the following factors must be addressed: what young adults value most in housing, the viable housing options available in the rental market, and the optimal design of these housing options. These are further discussed below and through their exacting answers, the main research question was satisfied.

What do Young Adults Value Most in Housing?

Past research has identified what amenities, features, and factors millennials value most in housing. Gruen (2013), with the Urban Land Institute, stated that millennials are interested in uncongested central locations, areas close to shops, restaurants, and service providers, units with laundry facilities, buildings with a well-designed exterior, and a smart interior layout. Additionally, Gruen (2013) listed features that appeal to young adults: 250 to 450 square foot range per unit, suggesting their interest in smaller living spaces; Internet connection, open and flexible spaces, and shared amenities and communal spaces. These features or elements can be summarized in millennials' interest in living in urban settings that allow them to access public spaces easily and being interested in units where they can work comfortably from their home. These statements are supported by other sources, such as Hayden (2010), RCLCO (2013), Timmerman (2015), Whitlow et al. (2013), and Young and Hinsely (2012).

The results from the survey conducted for this study supported, for the most part, these claims. A high 65.6% of the participants would choose to move to an urban location if given the opportunity. Furthermore, they considered price (81.3%), location (78.1%), proximity to work/school (65.6%), floor plan and layout (65.6%), Internet or Wi-Fi access (56.3%), and neighborhood amenities (56.3%) most important amongst their priorities in an initial lease decision. These results align with Gruen's claims regarding the location and community they desire.

However, within the sample of this study, the claims that young adults find 250 to 450 square foot units appealing as currently available in the market, were rejected. Almost 45% of the participants would not be interested in owning a micro-dwelling.

Nevertheless, they would choose a micro-dwelling over a conventional-size unit in exchange for lower rent, a desirable location, reduced utility costs, and more communal amenities. This further supports young adults inherent need for a sense of community and forming a sense of belonging within their environment.

This need for having spaces to socialize was also seen in the participants' lack of inviting people over (62.6%), within this study, due to not having enough space in their dwelling. Despite micro-dwellings being known for having a reduced footprint, spaces for socializing can be seen in the form of a kitchen, dining area, and living room. When asked what they typically do to socialize, the participants responded with eating and cooking (84.4%) or drinking and socializing (90.6%). More so, the most popular spaces chosen to eat and cook were the living room, kitchen, and dining room. Furthermore, porches and balconies are important for micro-dwellings as they provide an extended living space for socialization. This is a way of addressing young adults' need for community while working with reduced square footage.

The results of this study, within its sample, confirm past studies' claims that millennials value community, proximity, connectivity, accessibility, and a well-designed unit most in housing. Additionally, these results also offered more specific features that young adults value in housing. At a neighborhood level, millennials value having access to grocery stores, recreational areas, and restaurants and bars most. At a community level, millennials are most interested in being provided roof or outdoor spaces, visitor parking, fitness center, and laundry facilities. Finally, they value having a laundry room, a fully equipped kitchen, and storage space most in their unit.

Which, Among the Different Micro-Dwelling Housing Types Available in the Rental Market, Might Be Viable Housing Options for Young Adults?

Three different types of micro-dwellings were studied and analyzed throughout the research: tiny houses, accessory dwelling units (ADUs), and micro unit apartments. According to the review of literature, the Tiny House Movement is a novelty that has captured people's attention, including millennials, due to their presumed affordability. These dwellings, typically less than 430 square feet are popular among people who are interested in downsizing for environmental reasons (Kilman, 2016). People that are interested in tiny houses are concerned with reducing their footprint and consumption, ultimately living a simpler life. Tiny houses are typically found in rural settings where people hope to embrace their environment and natural surroundings. However, these can sometimes be found in or near urban settings, as for example at Boneyard Studios.

Obstacles tiny houses face are the zoning laws and building codes in the United States, which do not permit tiny houses. Although revisions to the IRC have added a new Appendix Q* for tiny houses, the same still faces many legal obstacles, making these unattainable for young adults. Nevertheless, many organizations, such as Tiny Houses Greensboro and the Farm at Penny Lane have begun working with their local governments to develop tiny house communities to help house homeless individuals and individuals with mental illnesses.

Ultimately, tiny houses as part of a rental community align with most of young adults' housing needs and aspirations and are considered viable for the millennial generation. It is important to note, however, that tiny houses, when not part of a rental community development, may not be considered a viable housing option, due to the legal obstacles they face. Purchasing and owning a tiny house is not as accessible as

often portrayed, due to zoning laws that do not allow a single tiny house on a lot and the lack of mortgage financing. This is not the case for rental tiny house communities though, as cities are becoming more amenable to allowing these developments, as seen with Tiny Houses Greensboro and Quixote Village.

Accessory dwelling units, smaller homes located behind or attached to the primary dwelling, can typically be found in suburban neighborhoods as rental units (Vail, 2016). These units normally house the owner's family members as a way of retaining them close while also offering them a degree of independence and privacy. Although these units were prohibited in the 1950s and 1960s, due to a high demand of lower-density development, they made a reappearance in the late 1970's to the 1990's. Municipalities began to adopt accessory dwelling unit programs in order to increase the affordable housing supply and make efficient use of the existing housing stock (Sage Computing Inc., 2008).

The government of the town or city are the main forces supporting the adoption of ADUs and this can be seen through the rising acceptance of ADUs across the United States. This rising acceptance has encouraged many homeowners to become interested in building an ADU to rent to family members or college students. For example, during the design charrette it was noted that one of the owners was interested in renting their unit to a young professional. However, one major factor that prevents ADUs from being an appropriate fit for young adults is their lack of a community. Creating a sense of community and belonging among young adults is one of the things they value most in housing. Yet, ADUs tend to be isolated, lacking the communal spaces that this population seeks. Therefore, accessory dwelling units are not considered a viable housing option for young adults.

Micro unit apartments are the only micro-dwelling type studied that aligns with millennials interest in living in an urban setting and having communal spaces for interaction, as these are built in denser areas with multistory construction. Micro unit apartments are typically small studio apartments that include a fully functioning, and accessibility compliant, kitchen and bathroom (Whitlow et al., 2013). They are starting to gain attention, much like tiny houses, due to their presumed affordability. In some cases, these units have been developed as a way of accommodating the city's growing small household population, through affordable housing under Section 8 (nARCHITECTS, 2016).

Whitlow et al. (2013) conducted a consumer research and case studies on micro unit apartment developments and found that a segment of renters is interested in smaller units. In fact, the target demographic for these apartments is young professional singles, young couples and roommates, and older move-down singles (Whitlow et al., 2013). They are seen as a new type of residential community that is designed to provide small, but affordable housing in urban areas. These units, such as The Harper, are designed with amenities, such as a roof terrace, laundry room, communal kitchen and dining areas, and flexible furniture systems which are highly desired by young adults, as established previously.

To summarize, two of the micro-dwelling types studied are considered to be viable housing options for young adult professionals. Although accessory dwelling units are accepted by local governments, and in many cases, are designed to be rented to young adults, these lack one of the most important things millennials value most in housing, a community. Their lack of communal spaces prevents them from being a viable housing option for this population. However, tiny houses, when part of a rental

community development, align with the need for a community and the desire to downsize and reduce consumption, living a simpler life. In addition, micro unit apartments offer communal amenities and proximity to services in an urban setting, making them viable housing options for the target population.

What is the Optimal Design of Micro-Dwellings as Housing for Young Adults?

The literature review, site visits, design charrette, and survey informed the pattern language, developed as a set of twelve guidelines, that described the optimal design of micro-dwellings for young adults. This pattern language was categorized into three large groups, with four patterns each, according to their use or type of problem addressed: general requirements, architecture, and unit design. The first addressed the site, location, and size of the units, the second addressed architectural strategies for designing micro-dwellings, and the third addressed the spaces and type of furniture that should be provided.

Micro-dwellings for young adult professionals, particularly a community development, should be located in a city or urban area. This will provide the residents accessibility to public services and easy access to amenities such as restaurants and shops. Being in an urban location will also offer the residents proximity and connectivity within their neighborhood. This is necessary for them to integrate themselves into their community, through social gathering spaces such as recreational areas and restaurants and bars.

Although there is not a definitive maximum square footage for micro-dwellings, the pattern language stipulated 500 square feet as the maximum size of micro-dwellings for young adults. Therefore, given the reduced footprint of micro-dwellings, providing

shared spaces in the community is essential. Offering communal amenities is a priority as young adults have expressed their interest in socializing and forming a sense of community. This is possible through shared spaces, such as outdoor recreational areas, laundry facilities, and fitness centers.

The reduced square footage of micro-dwellings requires that these be designed differently from conventional-size units in order to make more efficient use of the space. This should be accomplished through increasing the height of the space, using rooms as circulation, providing interior and exterior sight lines and views, and allowing abundant amounts of natural light to enter the space. Increasing the height of the space allows for split levels, vertical circulation, and room stacking, which creates visual connections and an expansive feeling. Similarly, using rooms as circulation maximizes the space and eliminates the need for corridors.

Providing views to the exterior is an excellent way of blurring the barrier between the interior and exterior. Additionally, providing the resident with interior views that are greater than that of the space occupied creates a significant effect on the perceived size of the space. Moreover, natural lighting is extremely beneficial for young adults living in micro-dwellings, as it helps regulate human circadian rhythms. Natural lighting is also an effective strategy for making small spaces seem larger.

Young adults have expressed their desire for having a fully-equipped kitchen and laundry room, a space for socialization, and furniture that makes efficient use of the space and provides additional storage. Therefore, when designing micro-dwellings for this population, it is important to provide these spaces and furniture pieces. A full-equipped kitchen and laundry is described as including a full-size refrigerator, kitchen sink, stove top or oven range, and a washer and dryer. On the other hand, porches or

balconies serve as an extended living space where the residents can socialize and forge relationships.

Custom and built-in furniture and convertible furniture address millennials' desire for additional storage in their dwelling unit. Custom and built-in furniture typically form part of the architecture, creating a clutter-free effect while also providing alternative storage solutions. Convertible furniture, programs a single element or space with more than one function. This is essential for young adults as they are going through a transitional period of their life and these pieces transform and adapt to emulate the lives of the residents. These furniture pieces also eliminate the need for large furniture storage solutions and do not sacrifice the openness and continuity of the space.

What is the Possible Fit Between the Housing Aspirations of Young Adults, and the Micro-Dwelling Housing Model?

The proposition that micro-dwellings might be a viable housing option for young adult professionals was partially proven within this study. The research found that two out of the three micro-dwellings studied are viable housing options for the target population. Furthermore, the results of the survey within this study uncovered that most millennials are not interested in owning a micro-dwelling. However, they would choose it over a conventional-size unit in exchange for lower rent, a desirable location, and more communal and shared spaces. Therefore, although the micro-dwellings that are currently in the rental market do not seem to appeal to the target population, these can be designed to satisfy their housing needs and aspirations.

As described above, micro-dwellings for young adults should be 500 square feet or less, located in an urban setting, and have communal and neighborhood amenities accessible to them. The community model developed demonstrated this through the

sites selected and the site plan design. Additionally, providing communal amenities in the design, such as a community garden and common house, demonstrated how a micro-dwelling community can help satisfy social needs.

The reduced square footage of micro-dwellings calls for design strategies such as increasing the height, providing sight lines and views, using rooms as circulation, and using natural light in order to make the resident feel comfortable within the space. The four dwelling units developed in this study applied at least half of the patterns that were meant to address the architecture and design of the unit. This demonstrated that it is possible to make efficient use of the space and make the unit feel more spacious rather than constricting.

These units must also include a kitchen, laundry space, porch or balcony, and abundant storage space. Despite their reduced square footage, incorporating the design elements described above in the design allowed for these units to have a fully-equipped kitchen, laundry room, and abundant storage space. Although many of the survey participants in this study stated that they did not invite people over to socialize often due to their dwelling seeming too small, providing a porch or balcony solved this issue in the design. Ultimately, the community model developed for this study showed how micro-dwellings can become an alternative housing option for young adult professionals. This was possible through the implementation of the pattern language that was designed to address the target population's housing needs and aspirations.

Limitations and Delimitations

Limitations and delimitations arose throughout the research, such as the scope of the study, the qualitative nature of the study, the sample size and characteristics, and the time and resource constraints of the research. Limitations are those influences that

cannot be controlled, while delimitations are choices made by the researcher that set boundaries for the study (PhDStudent, 2018). The qualitative nature of the study was a limitation, as the study was exploratory and aimed at suggesting possible explanations. This, along with the constraints of the limited size and regional character of the sample population, calls for future, more in-depth studies. This will be necessary, in order to both survey a larger pool of subjects that is more representative of the target population, and conduct an inferential statistics analysis of the factors identified in the study.

A convenience sample was identified for this study, which posed a limitation to the representation of the population being studied. The samples identified in Greensboro, North Carolina were not fully representative of the population, which was due to being chosen as they were easily accessible to the researcher. Additionally, the survey did not specify what the 5- or 6-point Likert scales meant, making this a limitation of the study.

The survey conducted did not receive the response rate expected and required an additional distribution of the survey to a second convenience sample. The additional distribution created a constraint and delay in the timeline and resource obtainment of the research project, as it delayed the data collection and analysis of the results by approximately three months. Resource constraints affected the sample size of the survey, as well as its response rate. Out of the 3,000 individuals contacted, only 55 individuals participated. This resulted in 1.8% response rate, and a 98.2% nonresponse bias, which affected the generalizability and validity of the survey results.

The population addressed was a delimitation as the researcher chose to work specifically with young adult professionals, aged 20 to 29 years old, which excluded other age groups and generations. Therefore, the findings of this research do not apply

to other generations, nor can it be generalized to the sampling frame, affecting the generalizability of the study. Additionally, millennials were studied only in the aspect of their social needs and how the built environment can satisfy those needs. This study addressed the satisfaction of needs from the perspective of design, exploring only this one dimension of a larger issue.

Another delimitation was the scope of the study, as not all micro-dwelling and community models were examined, excluding a large number of options. Only more conventional living spaces, like tiny houses, accessory dwelling units, and micro unit apartments were studied. Other types of micro-dwellings, such as tents and yurts, were excluded. Additionally, the site visits conducted only covered tiny house communities and one micro unit apartment. The lack of accessory dwelling units and micro unit apartments available for visits resulted in a limited amount of information gathered through personal observation of the researcher. The researcher's participation in the design charrette was also a delimitation as it may have led to potential researcher bias and influence within this phase of the study.

Future Research

As stated before, this research only studied one dimension of the social and housing needs of young adults, from the perspective of design. This one dimension forms part of a larger issue that should be studied from different perspectives, such as housing policies. Additionally, it only addressed three different types of micro-dwellings. Therefore, for future research, it would be ideal to study and analyze other types of micro-dwellings that were not discussed in this study. This would provide a more holistic overview of micro-dwellings and how these other types of dwellings could be a possible fit for young adults.

Surveying a larger pool of subjects and conducting inferential statistics analysis of the results would be ideal for future research as well. This would allow for the results and findings from the data collected to be expressed in a quantifiable form. Additionally, correlation could be used to identify the degree and strength of the relationship between two variables. Studying the relationship between the participants' satisfaction with their current amenities and their desired amenities would contribute to further understanding what young adults look for in housing. This would also help with understanding why and how current housing models do not comply with the population's needs.

Additionally, understanding the relationship between the socialization activities young adults typically partake in and their desired unit amenities could be beneficial to research further. This could help determine what spaces in the dwelling are most used with what activities, with their relative importance being a factor translatable to dwelling layout and room square footage.

For future research, it would be ideal to present the micro-dwelling community model to millennials, to receive feedback and possible validation of the patterns identified and their application to a case. Presenting the model to a sample of the target population would be ideal to complete the test and corroborate the validity of the model. This could also be accomplished with the input of different micro-dwelling developers, designers, and advocates. This would allow for the researcher to incorporate feedback; developing a more reliable model that has been approved or disapproved by the population in question as well as micro-dwelling advocates.

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APPENDIX A

APPENDIX V PROPOSAL: TINY HOUSES (IRC)

APPENDIX V
TINY HOUSES

(The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.)

SECTION AV101
GENERAL

AV101.1 Scope. This appendix shall be applicable to *tiny houses* used as single *dwelling units*. *Tiny houses* shall comply with the *International Residential Code* except as otherwise stated in this appendix.

SECTION AV102
DEFINITIONS

AV102.1 General. The following words and terms shall, for the purposes of this appendix, have the meanings shown herein. Refer to Chapter 2 of the *International Residential Code* for general definitions.

EGRESS ROOF ACCESS WINDOW. A skylight or roof window designed and installed to satisfy the *emergency escape and rescue opening* requirements in Section R310.2.

LANDING PLATFORM. A landing measuring two treads deep and two risers tall, provided as the top step of a stairway accessing a *loft*.

LOFT. Any floor level located above the main floor and open to it on at least one side, with a *ceiling height* less than 6 feet 8 inches (2032 mm), complying with the area, access, and guard requirements of Section AV104, and used as a living or sleeping space.

TINY HOUSE. A *dwelling* which is 400 or less square feet (37 m^2) in floor area excluding *lofts*.

SECTION AV103
CEILING HEIGHT

AV103.1 Minimum ceiling height. *Habitable space* and hallways in *tiny houses* shall have a *ceiling height* not less than 6 feet 8 inches (2032 mm). Bathrooms, toilet rooms, and kitchens shall have a *ceiling height* not less than 6 feet 4 inches (1930 mm). No obstructions shall extend below these minimum ceiling heights including beams, girders, ducts, lighting, or other obstructions.

Exception: *Ceiling heights* in *lofts* are permitted to be less than 6 foot 8 inches (2032 mm).

SECTION AV104
LOFTS

AV104.1 Minimum loft areas. *Lofts* used as a sleeping or living space shall meet the minimum area and dimension requirements of Sections AV104.1.1 through AV104.1.3.

AV104.1.1 Minimum area. *Lofts* shall have a floor area of not less than 35 square feet (3.25 m^2)

AV104.1.2 Minimum dimensions. *Lofts* shall be not less than 5 feet (1524 mm) in any horizontal dimension.

AV104.1.3 Height effect on loft area. Portions of a *loft* with a sloping ceiling measuring less than 3 feet (914 mm) from the finished floor to the finished ceiling shall not be considered as contributing to the minimum required area for the loft.

Exception: Under gable roofs with a minimum slope of 6:12, portions of a *loft* with a sloping ceiling measuring less than 16 inches (406 mm) from the finished floor to the finished ceiling shall not be considered as contributing to the minimum required area for the loft.

AV104.2 Loft access. The access to and primary egress from *lofts* shall be of any type described in Sections AV104.2.1 through AV104.2.4

AV104.2.1 Stairways. Stairways accessing *lofts* shall comply with this code or with Sections AV104.2.1.1 through AV104.2.1.5

AV104.2.1.1 Width. Stairways accessing a *loft* shall not be less than 17 inches (432 mm) in clear width at all points at or above the permitted handrail height. The minimum width below the handrail shall not be less than 20 inches (508 mm).

AV104.2.1.2 Headroom. The headroom in stairways accessing a *loft* shall not be less than 6 feet 2 inches (1880 mm) measured vertically from the sloped line connecting the tread nosings in the middle of the tread width.

Exception: The headroom for *landing platform*s shall not be less than 4 feet 6 inches (1372 mm).

AV.104.2.1.3 Treads and Risers. Risers for stairs accessing a *loft* shall be a minimum of 7 inches (178 mm) and a maximum of 12 inches (305 mm). Tread depth and riser height shall be calculated with the following formulas:

Tread depth = 20 inches (508 mm) minus 4/3 riser height
OR
Riser height = 15 inches (381 mm) minus ¾ tread depth

Exception: *Landing platforms* shall measure two treads deep and two risers tall.

AV104.2.1.4 Handrails. Handrails shall comply with Section R311.7.8.

AV104.2.1.5 Stairway guards. *Guards* at open sides of stairways shall comply with Section R312.1.

AV104.2.2 Ladders. Ladders accessing *lofts* shall comply with Sections AV104.2.2.1 and AV104.2.2.2

AV104.2.2.1 Size and capacity. Ladders accessing *lofts* shall have 12 inches (305 mm) minimum rung width and 10 inches (254 mm) to 14 inch (356 mm) spacing between rungs.

Ladders shall be capable of supporting a 200 pound (75 kg) load on any rung. Rung spacing shall be uniform within 3/8-inch (9.5 mm).

AV104.2.2.2 Incline. Ladders shall be installed at 70 to 80 degrees from horizontal.

AV104.2.3 Alternating tread devices. *Alternating tread devices* accessing *lofts* shall comply with Sections R311.7.11.1 and R311.7.11.2. The clear width at and below the handrails shall be not less than 20 inches (508 mm).

AV104.2.4 Ships ladders. *Ships ladders* accessing *lofts* shall comply with Sections R311.7.12.1 and R311.7.12.2. The clear width at and below the handrails shall be not less than 20 inches (508 mm).

AV104.3 Loft guards. Loft *guards* shall be located along the open side(s) of *lofts* located more than 30 inches (762 mm) above the main floor. Loft *guards* shall be not less than 36 inches (914 mm) in height or one-half the clear height to the ceiling, whichever is less.

SECTION AV105
EMERGENCY ESCAPE AND RESCUE OPENINGS

AV105.1 General. *Tiny houses* shall meet the requirements of Section R310 for *emergency escape and rescue openings*.

Exception: *Egress roof access windows* in *lofts* used as sleeping rooms shall be deemed to meet the requirements of Section R310 where installed with the bottom of their opening no more than 44 inches (1118 mm) above the loft floor.

APPENDIX B

SURVEY

PART I

1. Please identify your age range:
   - □ 20-29
   - □ 30-40
   - □ Other

2. If you had to move, where would you plan on moving to?
   - □ City/Urban area
   - □ Suburban area
   - □ Rural area
   - □ N/A

3. What is your labor status?
   - □ Employed
   - □ Unemployed
   - □ Not in the labor force

4. What are your current living arrangements?
   - □ Living with other kin
   - □ Living alone
   - □ Other independent living arrangement
   - □ Living with significant other (married, committed, etc.)
   - □ Living at home of parent(s)
   - □ Other _____

5. If you have roommates, how many roommates do you live with?
   - □ N/A
   - □ 1
   - □ 2
   - □ 3
   - □ 4+

6. What living arrangements would you prefer?
   - □ Living with other kin
   - □ Living alone
   - □ Other independent living arrangement
   - □ Living with significant other (married, committed, etc.)
   - □ Living at home of parent(s)
   - □ Other _____

7. Current living arrangement satisfaction:

Overall satisfaction	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Management satisfaction	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Value for amount paid	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Location	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Community amenities	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Floor plan, design, and layout	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Apartment features and finishes	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Other _____	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A

[if you marked 0-2 for any category]
Could you briefly explain why?

_____
_____
_____
_____

8. Where do you typically eat meals by yourself, with others, or both?

Dining room	□ By yourself	□ With others	□ Both
Kitchen	□ By yourself	□ With others	□ Both
Living room	□ By yourself	□ With others	□ Both
Bedroom	□ By yourself	□ With others	□ Both
Community kitchen	□ By yourself	□ With others	□ Both
Community dining area	□ By yourself	□ With others	□ Both
Other _____	□ By yourself	□ With others	□ Both

9. How often do you invite people to socialize in your house/apartment/dwelling?

□ Never
□ Not often
□ About half the time
□ Most often
□ Always

[if never]
Could you give a brief explanation as to why you do not invite others over to socialize?

_____
_____
_____
_____

10. [Mark all that apply] When you invite others over to socialize, activities include:

□ Eating, cooking
□ Drinking, socializing
□ Watching movies, television
□ Working, studying
□ Playing games (board games, video games, etc.)
□ Other _____

11. How many people do you normally do these activities with?

Eat/cook	□ 0	□ 1	□ 2	□ 3	□ 4+
Drink/socialize	□ 0	□ 1	□ 2	□ 3	□ 4+
Watch movies/television	□ 0	□ 1	□ 2	□ 3	□ 4+
Work/study	□ 0	□ 1	□ 2	□ 3	□ 4+
Play games/video games	□ 0	□ 1	□ 2	□ 3	□ 4+
Other _____	□ 0	□ 1	□ 2	□ 3	□ 4+

Part II

Micro housing or micro dwelling refers to residential units that are smaller than traditionally sized units. (i.e. tiny house movement, accessory dwelling units, micro unit apartments)

Tiny houses include mobile or stationary homes that are typically of less than 430 sq. ft.

An accessory dwelling unit (ADU) is a smaller home or apartment that is located behind the principal dwelling, and is on the same property lot.

Micro unit apartments refer to a small studio apartment, typically less than 350 square feet, with a fully functioning, and accessibility compliant, kitchen and bathroom.

Micro-villages are intentional tiny home communities that represent the merging of the tiny house movement, with the tent city movement.

Pocket neighborhoods refer to clustered groups of neighboring houses, or apartments, gathered around a shared open space.

---

12. Would you be interested in owning a micro dwelling?
    - □ Definitely would not
    - □ Probably would not
    - □ Unsure
    - □ Probably would
    - □ Definitely would

13. [Mark all that apply] I would choose a micro unit over a conventional-size dwelling unit in exchange for:

- □ Lower rent compared with conventional studios
- □ Desired location/neighborhood
- □ Reduced utility costs
- □ Ability to live alone (i.e. without roommates)
- □ Shorter commute to work
- □ Minimal apartment upkeep, cleaning, etc.
- □ Neighbors with a similar lifestyle
- □ More community amenities/shared spaces
- □ Proximity to public transportation
- □ Other (i.e. ideological reasons) _____

14. [Mark all that apply] What community amenities are offered at your current living arrangements?

- □ Laundry room
- □ Assigned parking
- □ Visitor parking
- □ Fitness center
- □ Roof/outdoor space
- □ Pool
- □ Lounge area on each floor
- □ Grill
- □ Business center
- □ Pet services
- □ Central lounge
- □ Bike rack
- □ Theater room
- □ Communal kitchen
- □ Communal dining area
- □ Other _____

15. Satisfaction with current amenities and facilities:

Laundry room	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Assigned parking	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Visitor parking	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Fitness center	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Roof/outdoor space	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Pool	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Lounge area on each floor	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Grill	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Business center	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Pet services	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Central lounge	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A

Bike rack	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Theater room	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Communal kitchen	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Communal dining area	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A
Other _____	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5	□ N/A

[if you marked 0-2 for any category]
Could you briefly explain why?

_____
_____
_____
_____

Importance of Amenities in Homeownership

16. Neighborhood amenities

Grocery store	□ 1	□ 2	□ 3	□ 4	□ 5
Restaurants/bars	□ 1	□ 2	□ 3	□ 4	□ 5
Gym	□ 1	□ 2	□ 3	□ 4	□ 5
Entertainment	□ 1	□ 2	□ 3	□ 4	□ 5
Retail centers	□ 1	□ 2	□ 3	□ 4	□ 5
Cafés	□ 1	□ 2	□ 3	□ 4	□ 5
Recreation	□ 1	□ 2	□ 3	□ 4	□ 5
Public transit	□ 1	□ 2	□ 3	□ 4	□ 5
Other _____	□ 1	□ 2	□ 3	□ 4	□ 5

17. Community amenities

Laundry room	□ 1	□ 2	□ 3	□ 4	□ 5
Assigned parking	□ 1	□ 2	□ 3	□ 4	□ 5
Visitor parking	□ 1	□ 2	□ 3	□ 4	□ 5
Fitness center	□ 1	□ 2	□ 3	□ 4	□ 5
Roof/outdoor space	□ 1	□ 2	□ 3	□ 4	□ 5
Pool	□ 1	□ 2	□ 3	□ 4	□ 5
Lounge area on each floor	□ 1	□ 2	□ 3	□ 4	□ 5
Grill	□ 1	□ 2	□ 3	□ 4	□ 5
Business center	□ 1	□ 2	□ 3	□ 4	□ 5
Pet services	□ 1	□ 2	□ 3	□ 4	□ 5
Central lounge	□ 1	□ 2	□ 3	□ 4	□ 5
Bike rack	□ 1	□ 2	□ 3	□ 4	□ 5
Theater room	□ 1	□ 2	□ 3	□ 4	□ 5

Communal kitchen	□ 1	□ 2	□ 3	□ 4	□ 5
Communal dining area	□ 1	□ 2	□ 3	□ 4	□ 5
Other _____	□ 1	□ 2	□ 3	□ 4	□ 5

18. Unit amenities

Washer and dryer	□ 1	□ 2	□ 3	□ 4	□ 5
Built-in closet/drawers	□ 1	□ 2	□ 3	□ 4	□ 5
Storage space	□ 1	□ 2	□ 3	□ 4	□ 5
Full-size refrigerator	□ 1	□ 2	□ 3	□ 4	□ 5
Full-size kitchen sink	□ 1	□ 2	□ 3	□ 4	□ 5
Four-burner stove	□ 1	□ 2	□ 3	□ 4	□ 5
Microwave/extractor	□ 1	□ 2	□ 3	□ 4	□ 5
Dishwasher	□ 1	□ 2	□ 3	□ 4	□ 5
Bathtub	□ 1	□ 2	□ 3	□ 4	□ 5
Space partitions	□ 1	□ 2	□ 3	□ 4	□ 5
High ceilings (9 feet+)	□ 1	□ 2	□ 3	□ 4	□ 5
Oversized windows	□ 1	□ 2	□ 3	□ 4	□ 5
Flat-screen television	□ 1	□ 2	□ 3	□ 4	□ 5
Other _____	□ 1	□ 2	□ 3	□ 4	□ 5

19. [Mark all that apply] Homeowner priorities in initial lease decision:

- □ Location
- □ Price
- □ Proximity to work/school
- □ Proximity to neighborhood amenities
- □ Ability to live alone
- □ Proximity to public transportation
- □ Internet/Wi-Fi services
- □ Floor plan/layout
- □ Assigned parking
- □ Common areas/amenities
- □ Sustainability practices
- □ Sense of community
- □ Pets allowed
- □ In-unit storage
- □ Visitor parking
- □ Other _____

APPENDIX C

IRB APPROVAL

THE UNIVERSITY of NORTH CAROLINA
GREENSBORO

OFFICE OF RESEARCH INTEGRITY
2718 Beverly Cooper Moore and Irene Mitchell Moore
Humanities and Research Administration Bldg.
PO Box 26170
Greensboro, NC 27402-6170
336.256.0253
Web site: www.uncg.edu/orc
Federalwide Assurance (FWA) #216

To: Jessica Ocasio
Interior Architecture
Interior Architecture

From: UNCG IRB

Date: 8/31/2017

RE: Notice of IRB Exemption
Exemption Category: 2. Survey, interview, public observation
Study #: 17-0303
Study Title: Micro-dwellings as Housing for Young Adults

This submission has been reviewed by the IRB and was determined to be exempt from further review according to the regulatory category cited above under 45 CFR 46.101(b).

Study Description:

The "Micro-dwellings as Housing for Young Adults" research project, aims to explore how micro-dwellings might offer a viable housing option for young adults, defined as 20 to 29-year-olds. Following the Housing Crisis in 2007, this population still does not have the means to join the housing market and are in need of more affordable housing options. Conducting a two-part survey will help the investigator understand what young adults look for in housing, and if micro-dwellings are an appropriate fit for them.

Investigator's Responsibilities

Please be aware that any changes to your protocol must be reviewed by the IRB prior to being implemented. Please utilize the most recent and approved version of your consent form/information sheet when enrolling participants. The IRB will maintain records for this study for three years from the date of the original determination of exempt status.

Signed letters, along with stamped copies of consent forms and other recruitment materials will be scanned to you in a separate email. **Stamped consent forms must be used unless the IRB has given you approval to waive this requirement.** Please notify the ORI office immediately if you have an issue with the stamped consents forms.

Please be aware that valid human subjects training and signed statements of confidentiality for all members of research team need to be kept on file with the lead investigator. Please note that you will also need to remain in compliance with the university "Access To and Retention of Research Data" Policy which can be found at http://policy.uncg.edu/university-policies/research_data/.

CC:
Maruja Torres, Interior Architecture

APPENDIX D

CONSENT FORM

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO
CONSENT TO ACT AS A HUMAN PARTICIPANT

Project Title: Micro-dwellings as Housing for Young Adults

Principal Investigator and Faculty Advisor: Jessica M. Ocasio (principal investigator) and Maruja Torres-Antonini PhD (faculty advisor)

What are some general things you should know about research studies?
You are being asked to take part in a research study and your participation in the study is voluntary. Therefore, you may choose not to join, or you may withdraw your consent to be in the study, for any reason, without penalty at any time during the study.

Research studies are designed to obtain new knowledge and this new information may help people in the future. There may not be any direct benefit to you for being in the research study and there also may be risks to being in research studies. If you choose not to be in the study or leave the study before it is done, it will not affect your relationship with the researchers or the University of North Carolina at Greensboro. Details about this study are discussed in this consent form. It is important that you understand this information so that you can make an informed choice about being in this research study.

You will be given a copy of this consent form. If you have any questions about this study at any time, you should ask the researcher named in this consent form. The contact information is below.

Jessica M. Ocasio: (787) 529-7199 | jmocasio@uncg.edu

What is the study about?
The "Micro-dwellings as Housing for Young Adults" research project, conducted by Jessica M. Ocasio for her MFA thesis, aims to understand the housing needs of young adult professionals. These housing needs are to be identified, in order to determine what type of micro-dwelling is the most viable housing option for this target population. Your participation in this study is voluntary.

Why are you asking me?
For this research project, young adult professionals or millennials, aged between 20 – 40 years old, are being asked to participate, in order to determine what they value most in housing. You must be 20 – 40 years old to participate.

What will you ask me to do if I agree to be in the study?
You will be asked to participate in an online survey that consists of two parts.

Is there any audio/video recording?
There will be no audio or video recording during the surveys.

What are the risks to me?
The Institutional Review Board at the University of North Carolina at Greensboro has determined that participation in this study poses minimal risk to participants. If you have questions, want more information or have suggestions, please contact Jessica M. Ocasio at (787) 529-7199 or jmocasio@uncg.edu. You may also contact my advisor Dr. Maruja Torres-Antonini at (336) 334-5320 or m_torres@uncg.edu.

Approved IRB
8/31/17

If you have any concerns about your rights, how you are being treated, concerns or complaints about this project or benefits or risks associated with being in this study please contact the Office of Research Integrity at UNCG toll-free at (855) 251-2351.

Are there any benefits to society as a result of me taking part in this research?
This research may be a significant contribution to generalizable knowledge, as studies suggest that young adult professionals are in need of more affordable housing options that align with their idea of a home. Therefore, understanding the housing needs of young adult professionals is essential to this research project.

Are there any benefits to me for taking part in this research study?
There are no direct benefits to participants in this study.

Will I get paid for being in the study? Will it cost me anything?
You will not get paid for being in this study nor will it cost you anything.

How will you keep my information confidential?
All information obtained in this study is strictly confidential unless disclosure is required by law. The surveys will be kept in a password-protected computer and the participants will not be identified by name at anytime, including when data is disseminated. Results from the study will only be reported as aggregated data. Absolute confidentiality of data provided through the Internet cannot be guaranteed due to the limited protections of Internet access. Please be sure to close your browser when finished so no one will be able to see what you have been doing.

What if I want to leave the study?
You have the right to refuse to participate or to withdraw at any time, without penalty. If you do withdraw, it will not affect you in any way. If you choose to withdraw, you may request that any of your data, which has been collected be destroyed unless it is in a de-identifiable state. The investigators also have the right to stop your participation at any time. This could be because you have failed to follow instructions, or because the entire study has been stopped.

What about new information/changes in the study?
If significant new information relating to the study becomes available, which may relate to your willingness to continue to participate, this information will be provided to you.

Voluntary Consent by Participant:
By accepting this consent form/completing this survey, you are agreeing that you read, or it has been read to you, and you fully understand the contents of this document and are openly willing consent to take part in this study. All of your questions concerning this study have been answered. You are agreeing that you are 18 years of age or older and are agreeing to participate in this study described to you by Jessica M. Ocasio.

Approved IRB
8/31/17

APPENDIX E

EMAIL RECRUITMENT

UNIVERSITY OF NORTH CAROLINA AT GREENSBORO
EMAIL OR LISTSERV RECRUITMENT

Good morning/afternoon,

My name is Jessica M. Ocasio and I am a graduate student in the Department of Interior Architecture at the University of North Carolina at Greensboro. As part of my Master of Fine Arts thesis, I am conducting a research titled "Micro-dwellings as Housing for Young Adults". This research project aims to explore how micro-dwellings might offer a viable housing option for young adult professionals.

Following the Housing Crisis in 2007, this population does not have the means to join the housing market and are in need of more affordable housing options. Therefore, I will be conducting a two-part survey to help me understand what young adults look for in housing, and if micro-dwellings are an appropriate fit for this population. Micro-dwellings refer to residential units that are smaller than traditionally sized units. The types of micro-dwellings to be studied throughout this research project are tiny houses, accessory dwelling units, and micro unit apartments.

I would like to ask for you to complete the survey linked below in this email. It may be completed at any time, beginning the day you receive this email until **[insert date the survey will close]**; and will take approximately 20 minutes of your time. Your participation is entirely voluntary and you may choose to not participate in this study. If you choose to complete the survey however, you may skip any question you do not want to answer.

Attached is a copy of the consent form. If you choose to complete the survey, please be sure to read through it beforehand. If you have any questions regarding the research, please contact me at jmocasio@uncg.edu or (787) 529-7199. Thank you very much!

Best,
Jessica M. Ocasio
Principal Investigator

[Link to survey]

[Consent form attachment]

Approved IRB
8/31/17

APPENDIX F

IRB MODIFICATION APPROVAL

THE UNIVERSITY of NORTH CAROLINA GREENSBORO

OFFICE OF RESEARCH INTEGRITY
2718 Beverly Cooper Moore and Irene Mitchell Moore Humanities and Research Administration Bldg.
PO Box 26170
Greensboro, NC 27402-6170
336.256.0253
Web site: www.uncg.edu/orc
Federalwide Assurance (FWA) #216

To: Jessica Ocasio
Interior Architecture
Interior Architecture

From: UNCG IRB

Date: 11/28/2017

RE: Notice of IRB Exemption (modification)
Exemption Category: 2.Survey, interview, public observation
Study #: 17-0303
Study Title: Micro-dwellings as Housing for Young Adults

This submission has been reviewed by the IRB and was determined to be exempt from further review according to the regulatory category cited above under 45 CFR 46.101(b).

Study Description:

The "Micro-dwellings as Housing for Young Adults" research project, aims to explore how micro-dwellings might offer a viable housing option for young adults, defined as 20 to 29-year-olds. Following the Housing Crisis in 2007, this population still does not have the means to join the housing market and are in need of more affordable housing options. Conducting a two-part survey will help the investigator understand what young adults look for in housing, and if micro-dwellings are an appropriate fit for them.

Modification Information:

- Update the sites that will administer the survey
- Update the description of how the participants will be recruited
- Update the number of subjects to be studied
- Add site approval letters for the additional sites that will administer the survey

Investigator's Responsibilities

Please be aware that any changes to your protocol must be reviewed by the IRB prior to being implemented. Please utilize the most recent and approved version of your consent form/information sheet when enrolling participants. The IRB will maintain records for this study for three years from the date of the original determination of exempt status.

Signed letters, along with stamped copies of consent forms and other recruitment materials will be scanned to you in a separate email. **Stamped consent forms must be used unless the IRB has given you approval to waive this requirement.** Please notify the ORI office immediately if you have an issue with the stamped consents forms.

Please be aware that valid human subjects training and signed statements of confidentiality for all members of research team need to be kept on file with the lead investigator. Please note that you will also need to remain in compliance with the university "Access To and Retention of Research Data" Policy which can be found at http://policy.uncg.edu/university-policies/research_data/

CC:
Maruja Torres, Interior Architecture

APPENDIX G

DESIGN CHARRETTE AGENDA

5th Annual Novem Mason Symposium
Accessory Dwelling Units Design Charrette

Tuesday, March 13 9:00am - Noon

8:30 – 9:00 **Studio Setup**

9:00 – 9:10 **Arrival & Welcome** (Dan and/or Travis)

9:10 – 9:20 **ADU Introduction & Charrette Orientation** (Dan/Elizabeth/Jessica)

9:20 – 10:15 **Design Session #1 (concurrent work teams – I for each ADU site)**
Review site data & owner-provided project information & objectives
Develop alternative ADU siting and footprint sketches
Develop alternative building massing sketches

10:15 – 10:35 **Pin Up Session #1**

10:35 – 11:30 **Design Session #2**
Develop alternative interior space use diagrams
Begin development of exterior design themes

11:30 – 12:00 **Pin Up Session #2 (incl. review of VCU team draft products)**

Wednesday, March 13 9:00am – Noon

9:00 – 10:00 **Design Session #3**
Develop alternative schematic floor plan layouts
Develop exterior schematic elevations
Prepare proposed site plan

10:00 – 10:30 **Pin Up Session #3**

10:30 – 11:30 **Design Session #4**
Prepare and render final exterior elevations
Prepare and render final interior floor plans
Prepare and render final site plan

11:30 – 12:00 **Pin Up Session #4 (incl. review of VCU team products)**

APPENDIX H

DESIGN CHARRETTE SITES

Accessory Dwelling Unit Site Visit Checklist

Owner Name	Susan and Richard Stone
Address	919 Spring Garden St
Historic District (Y/N)	Y
Phone	
Email	
Type of ADU Desired (Internal, Attached, Detached, Garage Apt.)	Detached
Zoning	R-7
Survey Available (Y/N)	
Primary House SF/Max. ADU SF (30% of house)	2,672 sf/801 sf
Lot SF/Max. accessory bldg. coverage (50% or 600 SF)	10,454 sf/600 sf
# of Existing Parking Spaces	3
Zoning	
Other Lot Constraints	Tree canopy in backyard; needs a small footprint ADU; will need approval of Preservation Greensboro (historic covenants) and City Historic Preservation Commission (historic district); question about bathroom doors opening into kitchen - can this be waived in an ADU?
Owner's Design Parameters	Use as a guest house; Owner suggested we look at outbuilding on Walker Avenue for design theme; probably need 2-story bldg.; historic feel; wood siding; wood ceilings; tall windows; wide mouldings; storage space for xtra furniture; small kitchen with lots of storage space; no need for porch due to tight space;

Accessory Dwelling Unit Site Visit Checklist

Owner Name	Arlen and Jamie Nicolls
Address	216 S Mendenhall Street
Historic District (Y/N)	Y
Phone	
Email	
Type of ADU Desired (Internal, Attached, Detached, Garage Apt.)	Detached
Zoning	R-7
Survey Available (Y/N)	
Primary House SF/Max. ADU SF (30% of house)	2,654 sf/796 sf
Lot SF/Max. accessory bldg. coverage (50% or 600 SF)	6,126 sf/600 sf
# of Existing Parking Spaces	
Zoning	
Other Lot Constraints	lot slopes downhill toward the north; best site for ADU is southern side of lot past end of driveway and past tree canopy on high ground
Owner's Design Parameters	2 story Queen Ann cottage; symmetrical features; possible loft; covered porch; gingerbread detailing; use for family visits; need some extra storage space; fireplace/insert would be nice w/ antique mantel; deep claw-foot tub/shower; lots of light; window boxes; stained glass in gables; farmhouse sink; window above sink; crown mouldings

Accessory Dwelling Unit Site Visit Checklist

Owner Name	Marlene and Charles Sanford
Address	207 Kensington Road
Historic District (Y/N)	N
Phone	
Email	
Type of ADU Desired (Internal, Attached, Detached, Garage Apt.)	Detached garage conversion
Zoning	R-5
Survey Available (Y/N)	
Primary House SF/Max. ADU SF (30% of house)	1,865 sf/801 sf
Lot SF/Max. accessory bldg. coverage (50% or 600 SF)	6,534 sf/600 sf
# of Existing Parking Spaces	
Zoning	R-5
Other Lot Constraints	House built in 1935; Existing garage not structurally sound - probably needs rebuilding; ex. garage appears to be about 7' from rear line and 3' from side line; may be smallest lot in area; dimension of ex. garage 10'6" x 18'4";14' to top of garage roof ridge
Owner's Design Parameters	Need some storage space for garden tools w/ separate access; coordinate design with outdoor space; access facing street or rear yard; probably 1 story but maybe 2; need bedroom, bath, kitchenette, loft;

Accessory Dwelling Unit Requirements

Zoning District	All sf and mf zoning districts
Ownership	Owner must live in the primary house or ADU
Lot Req.	Must be a conforming lot
ADU SF	Min. of 400 SF and <= 30% of primary house SF
Parking	One additional space required
ADU lot coverage	< = 50% lot coverage for all accessory bldgs. or 600 sf, whichever is greater
Setbacks	ADU must be behind front bldg. line of primary house; 10' setback from alleys and 3' setback from side and rear lines; 10' setback from side and rear lines if ADU over 15' height
Separation from primary structure	<600sf ADU = 5' from primary >600sf ADU = 10' from primary
Utilities	Required to branch from primary house
Design	Property must maintain SF appearance from the street

APPENDIX I

GREENSBORO LAND DEVELOPMENT ORDINANCE

LAND DEVELOPMENT ORDINANCE

Article 8. District Use Requirements

30-8-11 Accessory Uses and Structures

30-8-11.2 Accessory Dwelling Units

A. Unless otherwise expressly stated, all accessory dwelling units must meet the requirements that apply to principal uses in the subject zoning district. The primary dwelling must be located on a lot that meets the minimum area requirements of the zoning district.

B. The owner of the property must occupy either the primary or the accessory dwelling.

C. Only one accessory dwelling is allowed.

D. The accessory dwelling may be located within the primary dwelling; however, if it is detached, it must meet the location and dimensional requirements of the principal structure.

E. The heated floor area of the accessory dwelling must be at least 400 square feet in area, but it may not exceed 30% of the floor area of the primary dwelling.

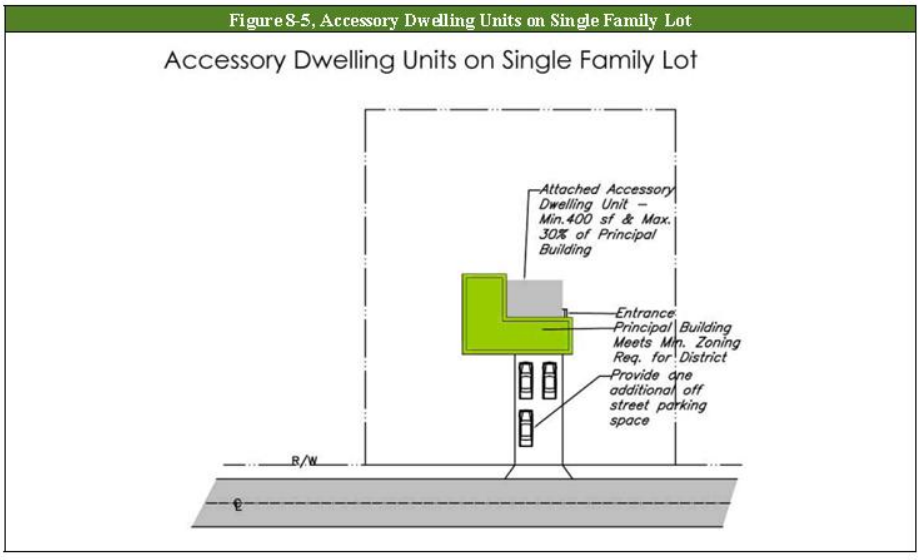
> ***Commentary:*** *Examples of accessory dwelling square footage are: a 1,333 square foot primary dwelling is needed for a 400 square foot accessory dwelling. (30% of 1,333 = 400 square feet); a 2,000 square foot primary dwelling is needed for a 600 square foot accessory dwelling.*

F. If the accessory dwelling is proposed for location on a single-family property, the property must retain a single-family appearance from the street.

G. One additional off-street parking space must be provided.

H. Use of a travel trailer or recreational vehicle (RV) as an accessory dwelling is prohibited within a residential district or on property devoted to residential use.

Figure 8-5, Accessory Dwelling Units on Single Family Lot



APPENDIX J

DESIGN CHARRETTE POSTERS

ADU CHARETTE: 5th ANNUAL NOVEM MASON SYMPOSIUM

University of North Carolina at Greensboro - Department of Interior Architecture - Center for Community-Engaged Design

Travis Hicks - Director of CC-ED, Professor of Interior Architecture, UNC Greensboro

Sites: Spring Garden St., Mendenhall St., Kensington Rd.

FACILITATORS:

Kol Peterson - author of *Backdoor Revolution: The Definitive Guide to ADU Development*
Dan Curry - Board Chair, Greensboro Housing Coalition
Thomas Forget - Associate Professor of Architecture, UNC Charlotte
Adele Ball - VCU + mOb Studio
Maruja Torres-Antonini - Professor of Interior Architecture, UNC Greensboro
Tommy Lambeth - Professor of Interior Architecture, UNC Greensboro
Jessica Ocasio - CC-ED Fellow, UNC Greensboro
Elizabeth Graves - CC-ED Fellow, UNC Greensboro

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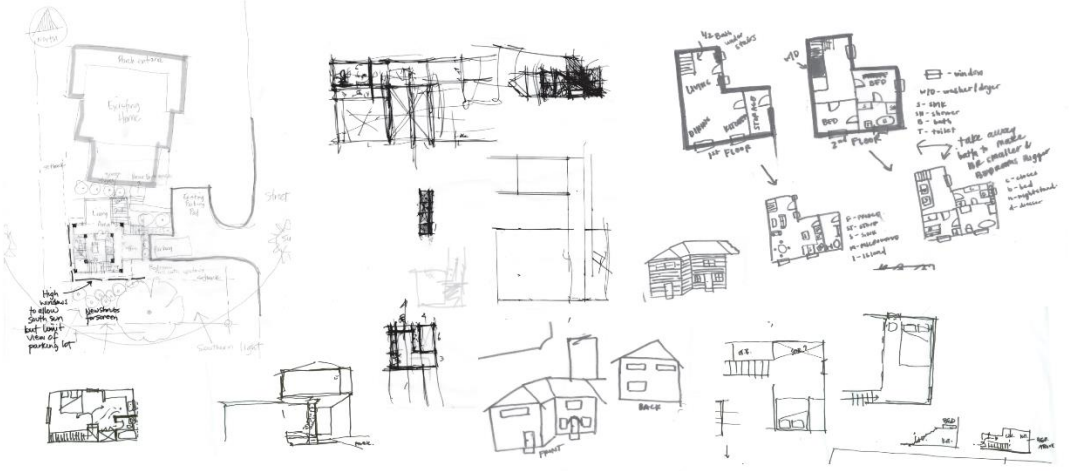
CC-ED Center for Community-Engaged Design

SPRING GARDEN ST: DETACHED OR ATTACHED ADU

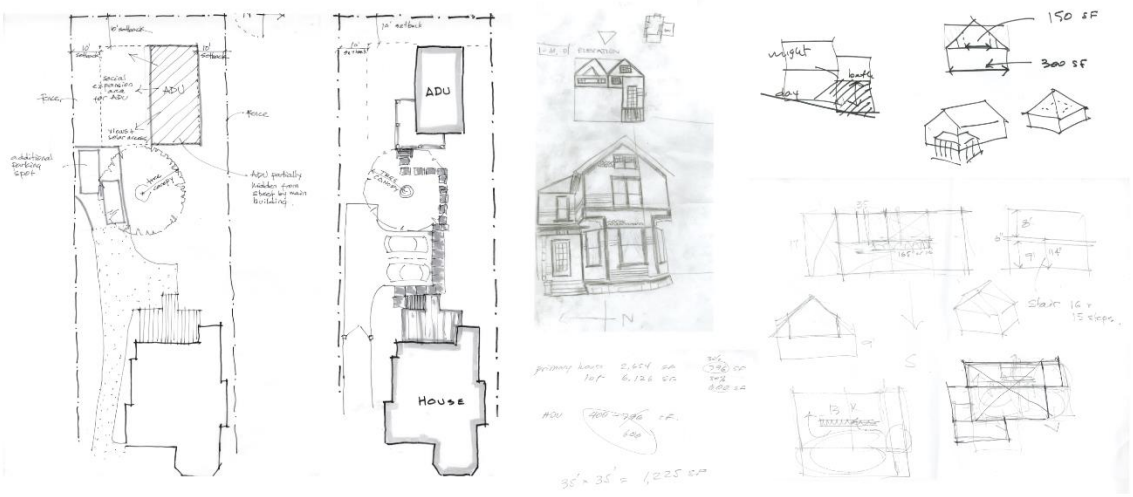


OWNER'S DESIGN PARAMETERS:

Use as a guest house; Owner suggested we look at outbuilding on Walker Avenue for design theme; probably need a 2-story building; historic feel; wood siding; wood ceilings; tall windows; wide mouldings; storage space for extra furniture; small kitchen with large amounts of storage space; no need for a porch due to tight space

CC-ED Center for Community-Engaged Design

SOUTH MENDENHALL ST: DETACHED ADU



OWNER'S DESIGN PARAMETERS:

Two story Queen Ann cottage; symmetrical features; possible loft; covered porch; gingerbread detailing; will be used for family visits; need some extra storage space; fireplace/insert would be nice with antique mantel; deep claw-foot tub/shower; a lot of light; window boxes; stained glass in gables; farmhouse sink; window above sink; crown mouldings

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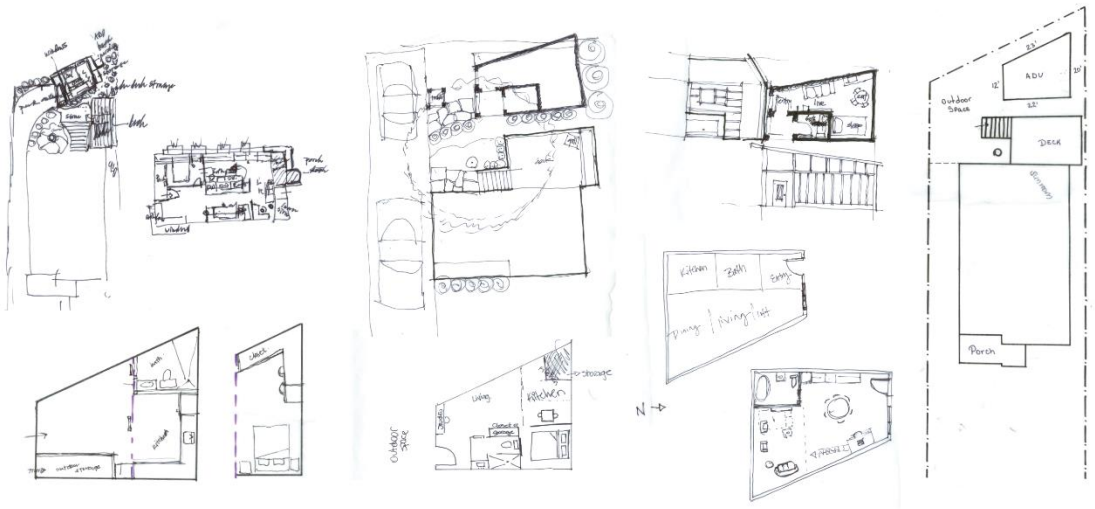
KENSINGTON RD: DETACHED ADU, GARAGE CONVERSION



OWNER'S DESIGN PARAMETERS:

Need extra storage space for garden tools with a separate access; coordinate the design with the outdoor space; access should be facing the street or the rear yard; probably a one-story structure, but could be two; needs a bedroom, bathroom, and kitchenette; possible loft; renovate current shed or create a new structure

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