

CRTKL

MICROGRANTS

RESEARCH & INNOVATION JOURNAL



VOLUME 03

MARCH 2023

INTRODUCTION

ABOUT THE PROGRAM

CRTKL's Research and Innovation MicroGrant program has fostered creativity and research since 2020 by supporting small, focused ideas and projects. This year's cohort includes seven diverse research and innovation projects from a pool of 27, selected by an esteemed academic jury from fields in design, innovation, and architecture.

CRTKL is committed to delivering stronger, research-driven, future-focused design solutions—solutions that can quantifiably and positively impact the social, economic, and environmental value. These projects reinforce that commitment. The produced deliverables range from white papers to tool kits and prototypes and have explored design at every level, from creating a third space for virtual community-based healthcare to developing a decision tool to measure social value, to understanding the metaverse's impact on the built environment. While the projects are small in scale, the impacts are meaningful and have shaped real-life projects.



“Curiosity and exploration are necessary ingredients for a design-based culture. Our research leads to innovation not just for our clients but also for the communities in which we live and serve.”

- Craig Lewis, Principal, Global Market Leader | Urbanism + Landscape

INTRODUCTION

ACADEMIC JURY

A select group of design, innovation, and architectural thought leaders serve as a jury to review the projects during the application and award process based on transformational impact and originality. These exceptional individuals came together to offer a collaborative lens on this year's projects.



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“Design at CRTKL includes a process of discovery that is informed by research. To be innovative and transform the industry, we believe that educating ourselves on the latest market insights and the future of our client’s business, allows us to make design decisions that will help accelerate their project to a higher performing solution.”
- Jim Henry, Principal, Global Practice Area Leader, Health & Wellbeing

RESEARCH



MEDITATIVE SPACES FOR HIGH-DENSITY URBAN AREAS: CREATING ENVIRONMENTAL WELLBEING

Evan Bobo



PURPOSE

If you have ever lived or worked in a metropolis, you are aware of the stresses and overstimulation brought on by that specific environment. According to the United Nations Department of Economic and Social Affairs, more than half of the global population lives in these urban areas (United Nations, 2018). For the majority of these people, the pollution, traffic, excessive noise, intense lighting, and overcrowding can cause a sensory overload, leading to stress, anxiety, depression, and a number of other psychological disorders. This study focuses on understanding how natural elements reduce stress and promote meditative states, identifying important features of restorative or contemplative settings, and examining how a meditative sanctuary may fit within a city setting. Within this paper two questions are explored; one, how might a meditative space be created in a high-density urbanized setting and two, what are alternative options to city parks and green spaces?

A framework that can facilitate the design of a meditative space for people who live and work in city environments using the restorative qualities of nature is proposed. For the purpose of discussion, the definition of a meditative space is a setting dedicated to mental relaxation, stress-reduction, and overall improved mental wellbeing achieved through multi-sensory engagement.

METHODS

Three methods in this study were used. A literature review was completed to understand the structures which promote stress reduction and improve mental capacity of individuals in natural settings. The focus of the reviewed research included:

- Benefits of natural landscapes in urban settings
- The impact of sensory stimuli on green space inhabitants, with a specific focus on elements and characteristics which may induce meditative states and reduce stress
- Methods of quantifying the effects of nature and quality of meditative space, and
- Information regarding biophilic design, therapeutic gardens, and restorative urban forests.

Observational field visits were conducted at five existing parks and urban green spaces in New York City, NY. and Chicago, IL., to assess individual and collective meditative elements and qualities. The results served as a collective case study to critically apply the information and conclusions that were drawn from the literature review. Additionally, an international survey was administered where individuals from 12 metropolises evaluated their relationship with the outdoors. This survey asked participants to describe natural environments they frequently visit within their locale.

FINDINGS

Literature Review

Several published research articles demonstrate how human exposure to nature reduces stress and increases mental wellbeing and positive emotional states (Ulrich, 1981), (Ulrich, 1991), (Cooper Marcus, 1997), (Keniger, Gaston, et al., 2013). Humans have a strong psychological connection to nature and natural environments (Söderlund & Newman, 2015). However, we are so consumed with our busy daily lives – primarily experienced indoors, far away from nature (Harshfield, Manville, et al., 2019). This may be especially true for those in high-density urban areas like New York City, London, and Beijing – where space for stress reduction and recuperation have not been prioritized (Ulrich, 1991). Opportunities for getting away to natural destinations is not feasible for many; there is a great restriction of access to these types of areas. Urban green spaces (UGSs) are located in and around most larger cities, but their purposes are mainly recreational, social, ecological, or aesthetic-based, not solely to provide an environment conducive to mental relaxation and stress-reduction.

Guiding Principles

Based on the reviewed research, seven guiding principles are proposed as core components to understand and consider when establishing a meditative environment, including 1) Emulating

the Spirit of Nature, 2) Diminishing Negative Sound Sources, 3) Liberty, 4) Being Away, 5) Accessibility, 6) Security and Comfort, and 7) Seclusion.

Emulate the Spirit of Nature: Variability & Compatibility

Meditative environments must Emulate the Spirit of Nature. In this concept, multimodal stimuli act as parts of a whole unified scene, adhering to an order, complexity, and spatial hierarchy as encountered in nature (Browning, Ryan, et al., 2014). This may also be referred to as “extent,” as explained by Stephan Kaplan – to create an authentic, perhaps believable natural landscape, it must be rich and coherent (Kaplan, 1995). In other words, an environment with a great number of stimuli lacking coherency may be just a collection of unrelated, seemingly random elements. In a study of urban park atmospheres, the diversity and complexity of nature-related sounds proved to have significant meditative attributes, especially when combining visual and auditory stimuli (Deng, Luo, et al., 2020). This is just one instance highlighting the power of activating multiple sensory systems for mental benefits. Under the same umbrella, principles variability and compatibility are referenced.

Variability in this context is represented by fluctuations in airflow, lighting, and seasonally-changing vegetation – all of which exhibit natural processes. The

constant yet fluctuating motion of non-rhythmic natural stimuli (leaves blowing in a breeze, water flowing and rippling, birds singing and insects buzzing) can reduce stress and promote healing (Browning, Ryan, et al. 2014). Variations and changes of ground-plane materials (stones, grass, mulch, dirt, sand, etc.) may promote greater awareness of surroundings, which engages individuals’ senses and focus (Nowosielska, 2021). Biophilic patterns such as thermal & airflow variability (subtle changes in airflow and surface temperature which mimic natural environments) and light/shade variability (ever-changing movement of lightness and darkness to mimic the sun in the sky irregularly obscured by clouds and trees, which displays the natural circadian processes occurring in nature, and conveys movement, intrigue and calm) create meaningful direct connections with natural stimuli and processes, which relaxes muscles and lowers blood pressure and stress hormone levels (Browning, Ryan, et al., 2014).

Compatibility, characterized by how individual elements within the greater scope of an environment harmonize, speaks to the spatial order, composition and balance found within nature, as well as the harmony that may be found between natural and man-made elements. When evaluating the contemplativeness of a natural landscape, the overall visual scheme

or design must be clear, balanced, and well-composed while not overwhelming or confusing (Navickas, Olszewska-Guizzo, et al., 2016). Physical and visual relations must complement each other, and there must be an explicit spatial order (Olszewska-Guizzo, 2018). A space meant for meditative engagement must also be programmatically and functionally compatible with what one would expect in a natural setting (Kaplan, 1995).

Diminish Negative Sound Sources

Negative sound sources must be diminished to achieve maximum restorative potential. Traffic, mechanical, and anthropologic sounds are less preferred compared to natural sounds, and may imply necessary design interventions (Shao, Hao, et al., 2022). Examples of negative sound sources are traffic sounds (skateboards, bicycle ring, heavy vehicles, car horn, motor vehicles, airplane, rail, highway, metro); mechanical sounds (radio, construction, loudspeaker, weeding, alarm); and anthropologic sounds (exercising, walking, boating, talking, parent-child activities, bells, pedaling, laughing/discussion, music, singing) (Shao, Hao, et al., 2022). In a study of visual and auditory stimuli in UGSs, human activities and voices were negative indicators of restorative value (Deng, Luo, et al., 2020). In fact, a dominance of mechanical and human sounds on a site — when the two exceed certain

ranges — are often associated with negative human perceptions (Green & Murphy, 2019). In a multitude of decibel ranges, traffic sounds were found to have negative effects on the overall soundscape comfort (Shao, Hao, et. al., 2022). Acoustical comfort is a factor which greatly impacts occupant experience in the built environment. Exposure to noise sources such as traffic and transportation have been shown to hinder the health and wellbeing of people in a number of different ways (International WELL Building Institute, 2022). Multiple studies have given evidence of individuals suffering from sleep disturbance, hypertension, and even heightened risk of heart attack due to road traffic and air traffic noise, as well as exterior noise from industrial sources (International WELL Building Institute, 2022). Creating sound barriers to increase the level of sound isolation may prevent noise annoyance and hypertension perceived by survey participants (International WELL Building Institute, 2022).

Liberty

The environment must allow personal and individual liberty – a sense of control and freedom – to further strengthen the restorative impact. Stress stemming from lack of control has been proven to have negative effects on immune system functioning and other physiological measures (Cooper Marcus, 2005). Research suggests

regaining control and thus reducing stress is one of the major motivations for garden inhabitation (Cooper Marcus, 2005). According to a study of restorative urban forests, to meet the basic needs of individuals intent on stress reduction, the inhabitable space must be free for exploration of nature, for meditation and introspection (Guardini, 2022). Autonomy inspired by wild nature allows a person to strengthen their intrinsic values and beliefs and make their own choices in life; lack of instruction will promote individuality and sense of freedom (Bentley Brymer, Toledo, et. al., 2020).

Being Away

Being away, as described by Kaplan, facilitates mental restoration; creating physical and psychological distance from daily routines and demands allows personal relief and offers one the ability to rest their mind (Kaplan, 1995). Creating refuge, or a quality of a place where individuals have the capability to let go, feel completely immersed, and “enter another world,” may provide feelings of safety and support the restoration process (Guardini, 2022). Similar to healing gardens and therapeutic gardens, places designed to remove people from overstimulating or chaotic environments and offer relief, a meditative sanctuary may allow people to use their senses to find tranquility and healing (Göker & Kahveci, 2020).

Accessibility

Accessibility must be considered when establishing a meditative environment. Openness to the community, close proximity, ease of travel, and opportunity for people of all ages, abilities, and backgrounds to interact with a meditative space is important. Cooper Marcus emphasizes the necessity of nearby, accessible places with natural landscape, which has the power to enhance one’s ability to recover from stress (Cooper Marcus, 2005). A study focused on green space deficiency in urban communities revealed adverse physical and mental health effects, while the provision of green space can promote movement and mental wellbeing (Aguinaga, 2018). Practical and pleasurable landscapes must be provided for those of any age, race, background, or ability, to the greatest extent possible (Hazen, 2013), (Srinivasan & Sachs, 2021).

Safety and Comfort

Meditative environments must be safe and comfortable; this refers to psychological comfort, thermal comfort, olfactory comfort, cleanliness, and overall physical comfort. This principle is rooted in establishing a space that feels open and freeing and provides a setting to “see without being seen” (Flanders Cushing & Miller, 2020). This is known as the theory of Prospect/Refuge, which comes from Kaplan’s Attention Restoration Theory (Kaplan,

1995). This concept is based on the idea that having a view outward enables feelings of safety and control and a concealed, protected place to reside, and offers the necessary feeling of comfort and safety (Kaplan, 1995). The exclusion of excessively strong scents (i.e., unfavorable fragrant plants and flowers) and removal of unpleasant odors is essential to preserve olfactory comfort. Unpleasant odors impair the affective state of healthy subjects and reverse the effect of pleasant fragrances on mood, alertness, and calmness; meanwhile, natural odors improve affective states in humans in a natural, outdoor setting (Weber & Heuberger, 2008). The avoidance of hazardous chemicals, offerings of shade or protective construction, and healthy plants offer personal comfort and refuge to garden inhabitants (Hazen, 2013).

Seclusion

People tend to experience tranquility and relaxation when they are alone or in a small group, highlighting the core principle of seclusion (Hammit, 1994). A fundamental feature of meditative and restorative gardens is the offering of privacy, private use spaces, and tranquility (Göker & Kahveci, 2020). Opportunities for privacy and solitude emerged as significant qualities of place chosen by study participants when feeling stressed (Cooper Marcus, 1997). A place that allows for silence and not many people around was

reported as an essential element by participants during immersive forest bathing sessions (Guardini, 2022).

Design Elements

Based on the reviewed research which led to developing guiding principles, eight design elements emerged as the primary components which constitute a meditative environment. These include: 1) Diversity of Vegetation, 2) Presence of Water, 3) Meditative Soundscape, 4) Color, Light and Shading, 5) Tactile Materials, 6) Enclosure, 7) Seclusion and Accessible Paths, and 8) Seating Options.

Diversity of Vegetation

A primary design element essential for the existence of a meditative space is the Diversity of Vegetation. According to findings from a study by Ulrich, brain activity recordings revealed that alpha-wave production (which show a relaxed mental state) were significantly higher while subjects viewed trees and other vegetation as opposed to urban scenes (Ulrich, 1986). Trees, specifically, are the most important element of nature contributing to a majority of participants' subjective wellbeing and connectedness to nature (Maurer, Zaval, et. al., 2021). Nearby access to natural landscape or a garden can enhance people's ability to deal with stress and thus potentially improve health outcomes (Cooper Marcus, 2005). According Olszewska-Guizzo's CLASS method,

a high diversity of lush plant species which seem native and seasonally change equates to a landscape with a high level of contemplativeness (Olszewska-Guizzo, 2018). In a study on urban forests, a diversity of vegetation (which activate a range of senses – smell and sight – by confronting various colors and odors) may influence behavior and foster a perceived mental restoration (Guardini, 2022).

Presence of Water

Seeing, hearing, or touching water is calming; the Presence of Water has been shown to reduce stress, increase feelings of tranquility, and lower heart rate and blood pressure (Browning, Ryan, et. al., 2014). Ulrich's study asserts strong evidence that individuals felt more wakefully relaxed while viewing vegetation and water settings compared to urban settings (Ulrich, 1986). Similarly, when analyzing human responses via functional magnetic resonance imaging (fMRI) technology, there was a significant difference between the restorative value of urban and natural environments, with water-based landscapes having the most value, and urban environments having the least (Tang, Tsai, et. al., 2017). In an auditory-visual experiment, results indicated that easy accessibility to waterscape typical promotes the restorative quality of meditative landscapes (Zhao, Xu, et. al., 2018).

Meditative Soundscape

A “meditative” soundscape, research suggests sounds reminiscent of natural environments (e.g., birds singing, water splashing, wind blowing) have the greatest ability to create a tranquil atmosphere, and thus, enhancing healing (United Nations, 2018, Tse, Chau, et. al., 2012, Göker & Kahveci, 2020). Previous works suggest that natural sounds are better for improving the mental stress recovery compared to man-made sounds (Tse, Chau, et. al., 2012). Pairing natural visual factors (natural water, shrubs, and flowers) with auditory factors (flowing water sounds, wind-induced vegetative sounds, and birdsong) creates a positive perceived restorative value; furthermore, nature-related auditory-visual stimuli were typically rated as having better health benefits than only visual stimuli (Deng, Luo, et. al., 2020). Introducing the sound of wind to a landscape possessing high coverage of vegetation increases the restorative quality (Zhao, Xu, et. al., 2018). For soundscape comfort, acoustics should not be extremely vibrant or “full of life”, nor should they be monotonous and boring (Shao, Hao, et. al., 2022).

Color, Light, and Shading

Specific conditions of Color, Light and Shading may significantly improve the meditative quality of an environment. Natural lighting or visibility of natural or warm artificial light and shade adds

to the meditative quality of a landscape (Browning, Ryan, et. al., 2014). Use of light and shadow displaying the natural circadian processes occurring in nature – conveying movement, intrigue, and calm – may increase the meditative quality of a space (Browning, Ryan, et. al., 2014). The contemplativeness of a landscape, broken natural colors are more appropriate than vivid, contrasting colors (Olszewska-Guizzo, 2018). The visibility of sunlight, or shade movements is also important. Observers should not be directly exposed to the sun, as shady locations are better for contemplation (Navickas, Olszewska-Guizzo, et. al., 2016). As prognosticated by Cooper Marcus, healing gardens should display views to the sky and changing cloud formations, reminding those in ill-health that life goes on (Cooper Marcus, 2005). The human body responds to daylight color transition; the response is apparent in body temperature, heart rate, and circadian functioning (Kandel, Schwartz, et. al., 2014). Higher content of blue light (similar to skylight) produces serotonin, whereas, an absence of blue light (which occurs at night), produces melatonin; the balance of serotonin and melatonin can be linked to sleep quality, mood, alertness, depression, and other health conditions (Kandel, Schwartz, et. al., 2014).

Tactile Materials

The implementation of Tactile Materials, natural materials that encourage us to engage with our sense of touch can help individuals focus on the present moment, which is shown to be beneficial to their mental wellbeing (Channon, 2018). Touching living plant life (versus synthetic plants) has been shown to induce relaxation through a change in blood flow rates (Koga & Iwasaki 2013). Compared to materials such as ceramic tile, polished marble, and stainless steel, touching wooden material with a hand or foot activates areas in the prefrontal cortex and autonomic nervous system activity which may induce physiological relaxation (Ikei & Song, 2017). The sensation of a breeze against our skin is psychologically calming; this may bring the smell of flowers, grass, or rain on concrete which is shown to be stress-reducing (Channon, 2018). When measuring the perceived restorative effects of auditory-visual stimuli of UGSs, one experiment’s findings imply that touching water is much better than just viewing it (Zhao, Xu, et. al., 2018).

Enclosure

Enclosure, or physical refuge in an environment contrasting with urban chaos, is an essential component to the design of a meditative space. People need to feel psychologically secure: a garden needs to feel and be safe, with some sense of enclosure and the absence of feeling that users are in

a ‘fishbowl,’ being stared at (Cooper Marcus, 2005). A sense of surround provides the feeling of being embraced and sheltered within the space, a feeling of refuge and safety (Srinivasan & Sachs, 2021). Areas enclosed by vegetation contribute to the restorative quality of UGSs (Peschardt & Stigsdotter, 2013).

Secluded Space and Accessible Paths

Secluded Space and Accessible Paths promote exploration and opportunity to meander. It is important to have universally accessible paths which accommodate every individual of a community; variations of ground-plane materials activate and enhance the idea of zones and new spaces. Walking in green settings may offer enhanced emotional wellbeing through both exposure to nature and participation in exercise (Barton, Bragg, et. al., 2013). Relatively flat topography normally promotes the restorative quality of tranquil landscapes (Zhao, Xu, et. al., 2018). Appropriate topography changes provide conditions for an optimal balance between openness and enclosure and creating a sense of privacy and encirclement that is positive for meditating alone (Deng, Li, et. al., 2019).

Seating Options

Seating Options is a practical feature which can be helpful in attaining heightened positive feelings in a garden setting (Cooper Marcus, 1997).

Shaded, comfortable and mobile seats must be provided for people to rest when they need (Göker & Kahveci, 2020). People enjoy flexible seating – not just movable chairs, but also the choice of sitting on grass, ledges, walls, and stairs (Srinivasan & Sachs, 2021). As noted in the WELL Building Standards, having a variety of places to sit, with different types of ergonomic seating and spaces to rest or gather can reduce physical strain and increase bodily comfort (International WELL Building Institute, 2022).

DESIGN ELEMENTS FRAMEWORK

A conceptual framework was developed to be used as an evaluative tool to quantify the meditative quality of an environment. This framework in the

form of a matrix, Figure 1, includes each design element integral to a meditative environment to be measured on a scale of 1 to 5, with 5 being the greatest quality and presence of such element and 1 being the lowest quality or little to no presence of each element.

URBAN GREEN SPACE AND PARK OBSERVATIONS

Field observations were conducted at five existing parks and UGSs within the United States. The following spaces were chosen based on their varied scale, differing landscape elements, spatial compositions, and relationship with the surrounding urban context. Paley Park, The New York Times Lobby Garden, Little Island in Hudson River Park, the Western Shore Boat Landing in Central Park, and the Lincoln Park

	DIVERSITY OF VEGETATION	PRESENCE OF WATER	MEDITATIVE SOUNDSCAPE	COLOR, LIGHT AND SHADING	TACTILE MATERIALS	ENCLOSURE	SECLUDED QUALITY	ACCESSIBLE PATHS	SEATING OPTIONS
5	Various species and plant types; lush plants that seem native; seasonally-changing vegetation; flora with diverse sensory stimuli	High presence of water throughout space; many diverse forms of water; ability to see, hear, or touch water	Natural sounds are prominent; strong sense of solitude; imperceptible negative sound presence	Natural or warm colors, great fluctuation and ever-changing movement between light and dark/ shading; highly visible sky and sunlight	Abundance of natural material and living plantlife of varying textures within reach; minimal artificial materials	Areas enclosed by vegetation; strong sense of surround and safe shelter; urban environment seems psychologically or physically distant	Strong sense of solitude and privacy; in contrast to urban environment	Multiple paths promoting exploration; universal accessibility	Abundance of seating; comfortable and/or mobile seating; situated in shade or pleasant setting
4	▼	▼	▼	▼	▼	▼	▼	▼	▼
3	Moderate diversity of species and plant types; moderate changes across seasons	Moderate presence of water; moderate variety of water forms; moderate ability to see, hear, or touch water	Mix of natural and negative sounds present; moderate sense of solitude	Moderate amount of contrasting colors and variability between light and shade; moderately visible sky and sunlight	Moderate amount of natural materials and living plantlife within reach	Areas partially enclosed by vegetation; moderate sense of surround; urban environment seems moderately distant	Few secluded areas; moderate sense of solitude and privacy; moderate contrast to urban environment	Few paths; exclusive accessibility	Adequate amount of seating; neutral comfort or mobility; set in moderately pleasant setting
2	▼	▼	▼	▼	▼	▼	▼	▼	▼
1	Low diversity of species and plant types; minority of native species; no seasonal changes; sparse or dead plantlife	Little to no presence of water throughout space; no variety of water forms; minimal or imperceptible ability to see, hear, or touch water	Negative sound sources are prominent; no sense of solitude; natural sounds are minimal or imperceptible	Many vivid, contrasting colors; minimal or imperceptible variability and movement between light and dark; sky and sunlight are not visible	Little to no natural materials obtainable for touch, or artificial materials are more apparent or plentiful	Areas which are barren or enclosed by man-made materials; no sense of surround; urban environment seems to be central focus, at the forefront	No sense of solitude and privacy; little to no contrast to urban environment	One or no distinct paths; rugged, unmanageable topography; limited to no accessibility	Little to no seating; very uncomfortable or immobile seating; situated in sun or unpleasant setting

Figure 1: Matrix Measuring Design Elements of Meditative Spaces, Source: Author

North Pond Nature Sanctuary were all observed. The Design Elements matrix was used to assess and score individual elements of each park and UGSs. Figure 2 shows the five parks and green spaces’ measurements for each category. The total score of meditative quality impacted by design element strength and presence can be found by calculating the mean value, shown as a percentage.

Overall, the observations led to the following conclusions:

- Seclusion as a primary factor – despite the expansiveness of Central Park, the extreme amount of human occupation and activity (distracting mechanical and anthropologic sounds and varying levels of movement), the potential meditative qualities of the natural landscape were significantly diminished.
- A single or group of strong design elements may outweigh the potential stressful surrounding urban atmosphere – at Paley Park, a space open to a heavily-populated sidewalk and busy street, the powerful, tranquilizing effects of the large waterfall feature overrode the noise, movement, and commotion of its surroundings.
- Although Presence of Water was found to have beneficial health impacts as a primary design element, simply being present is not enough – Little Island, for example, is in reality elevated above the Hudson River, essentially extracted and separated

from the natural water body, so much so, that at many points while traversing the island, the water was hidden from sensory perception – showing how a landscape feature can be present but have little to no impact if inactive or unengaging.

- Consistent with the abundance of vision-based surveys and experiments referenced throughout this publication, engaging only the optical sense does little to promote mental relaxation and stress-reduction; the NY Times Lobby Garden, for instance, while possibly considered a beautiful recreation of natural environment, is an ineffective, uninhabitable area designed for purely “visual connection to nature,” as individuals are restricted from experiencing any potentially impactful sensory engagement (Browning, Ryan, et. al., 2014).

While all of these principles and elements are important for stress reduction, recognizing that each element plays a role in affecting the overall atmosphere in a synthesized manner, and this varies from site to site is important.

	DIVERSITY OF VEGETATION (1-7)	PRESENCE OF WATER (1-7)	MEDITATIVE SOUNDSCAPE (1-5)	COLOR, LIGHT & SHADING (1-5)	TACTILE MATERIALS (1-3)	ENCLOSURE (1-5)	SECLUDED & ACCESSIBLE (1-7)	SEATING OPTIONS (1-3)	OVERALL SCORE (%)
PALEY PARK	6	7	4	5	3	4	6	3	90%
NEW YORK TIMES LOBBY GARDEN	3	1	2	2	1	1	1	1	29%
LITTLE ISLAND HUDSON RIVER PARK	4	2	3	3	2	4	4	3	60%
WESTERN SHORE BOAT LANDING CENTRAL PARK	6	6	1	4	2	4	3	2	67%
LINCOLN PARK NORTH POND NATURE SANCTUARY	6	6	3	4	2	3	5	2	74%

Figure 2: Total Scores of Design Element Presence and Effectiveness, Source: Author



Figures 3 – 5: Paley Park, New York City, NY., Personal Photos by Evan Bobo



Figures 6 – 8: New York Times Lobby Garden, Personal Photos by Evan Bobo



Figures 9 – 11: Little Island – Hudson River Park, Personal Photos by Evan Bobo



Figures 12 – 14: Western Shore Boat Landing, Personal Photos by Evan Bobo



Figures 15 – 17: Lincoln Park North Pond Nature Sanctuary, Personal Photos by Evan Bobo



Figure 18: Turtle Creek Park, Dallas, TX
Source: The Cultural Landscape Foundation



Figure 19: Chongming Island, Shanghai, China
Source: TimeOut Shanghai



Figure 20: Al Ittihad Park in Palm Jumeirah, Dubai, UAE
Source: Nakheel



Figure 21: City Hall Park, NYC
Source: NYC Go

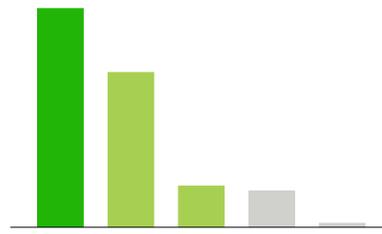
SURVEY

A survey was conducted where 98 individuals from 12 metropolises in five different countries participated to evaluate their relationship with the outdoors. Participants included architects, landscape architects, designers, and others from a global architecture, planning and design firm, who were tasked with assessing the features and quality of meditative environments they visit within their local city. Respondents described specific attributes and landscape elements which were perceived to be meditative, and then rated the quantity of diverse

vegetation, presence of water, and sense of seclusion and privacy within their chosen parks and UGSs. Some respondents included the name of their visited park or green space which are included in Figures 18 – 21.

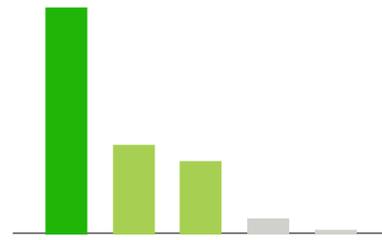
The survey results offered insights into the qualities of parks and UGSs, as well as the frequency in which participants visit these spaces in 12 different geographic locations. Nearly 62% of respondents reported to visit their primary meditative space within their city daily, whereas 28% of respondents visit their favored meditative space a few times a week,

Time spent outdoors during a typical workday:



- 48%** <30 min
- 34%** 30-60 min
- 9%** >1 hr, <workday
- 8%** None at all
- 1%** Most of the day

Duration of time spent outdoors during a typical week:



- 56%** >3 hours
- 22%** >1 hr, <3 hrs
- 18%** 30-60 min
- 4%** < 30 min
- 1%** None at all

Descriptions of green space or park to relax/meditate in within your city:



44%
Vegetation
/trees



29%
Water
feature



9%
Walking
paths/trails



4%
Seclusion

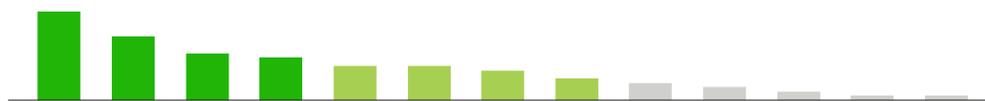


3%
Seating



3%
Peaceful

Features that attract you to this place:



- 21%** Vegetation/Trees
- 15%** Near body of water/water features
- 11%** Peaceful
- 10%** Proximity to Home/Office
- 8%** Walking Paths/Trails
- 8%** Open
- 7%** Seclusion
- 5%** Wildlife
- 4%** Varied Terrain
- 3%** Accessibility
- 2%** Safety
- 1%** Seating
- 1%** Shading

and only 6% of respondents visit this space once a month or less. When describing the park or UGSs participants visit to relax and meditate in their city, vegetation/trees and the presence of water made up nearly 75% of answers. The vast majority of respondents listed vegetation/trees, presence of water, peacefulness, and proximity to home/office as features which attract them to these locations. The design elements and landscape features that were described in the open-ended comments portion of the survey at an above-average frequency included: diversity of vegetation, presence of water, and seclusion and privacy. These results reinforce the recurring findings identified in the literature review and field research results which postulate these design elements and principles as primary factors and attributes of meditative spaces.

CONCLUSION

The discoveries from the literature review, field observations, and the survey substantiate the range of existing research on the advantages of human experience in natural environments. While the majority of previous explorations focus on measuring and accounting for visual experience, this study has expanded the ability to understand elements of a meditative setting which affect non-visual sensory systems and emphasizes the significance of multi-

sensory engagement in affecting stress-reduction and mental wellbeing.

Principal findings of this paper put forth a set of core principles and elements of meditative environments. The relationship between meditative spaces, surrounding urban environments, and inhabitants of such environments are as follows: one or many primary design elements may override the urban stimuli and create great meditative quality; for example, the activated waterfall in Paley Park dominates the visual (twenty-foot tall, occupying the full width of the park, constant varying movement), auditory (water emitting from the summit, rushing down the wall, and crashing at the base controls the soundscape and diminishes all negative sound sources), and tactile senses (rush of cool air from the waterfall) of park inhabitants; conversely, a landscape feature may be present but have minimal impact if inactive or unengaging; case in point is Little Island; albeit on the water, it is raised above the Hudson River so that the body of water is often imperceptible, and thus, the beneficial health impacts of Presence of Water cannot be realized; and lastly, vision-based stimuli alone does not necessarily promote mental relaxation or stress-reduction; while the New York Times Lobby Garden appears like a fine example of a natural environment, the benefits from a visual connection are minimal and the potentially impactful non-visual sensory engagement is missing.

This study has revealed the considerable need for natural places of respite and meditative environments in the urban context and supports the vast implementation of meditative spaces to improve the quality of life for the ever-expanding urban population. The relationship between natural environmental exposure and mental health benefits is clearly established. The emphasis on mental health, magnified by the ongoing pandemic, impacting urban conditions prompts the need for the development of original means of evaluating and re-conceptualizing the quality and type of daily environmental interactions.

This study can be used conceptually; to inform thoughtful, more deliberate public realm design, we must realize how our sensory systems perceive local stimuli on a daily-basis, and how our overall well-being is impacted. With respect to the mental health of city inhabitants, this study can be used in practice, specifically in landscape architecture and urban planning, to identify improvements in existing environments as well as the probable effectiveness of new interventions, and ultimately, generate change by creating healthier built environments.

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LIVEABILITY DESIGN: UNDERSTANDING HOW TO DEVELOP AN AREA IN RESPONSE TO RESIDENTS

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Joe Ravetz, Debapriya Chakrabarti, and Junyan Ye from University of Manchester, UK

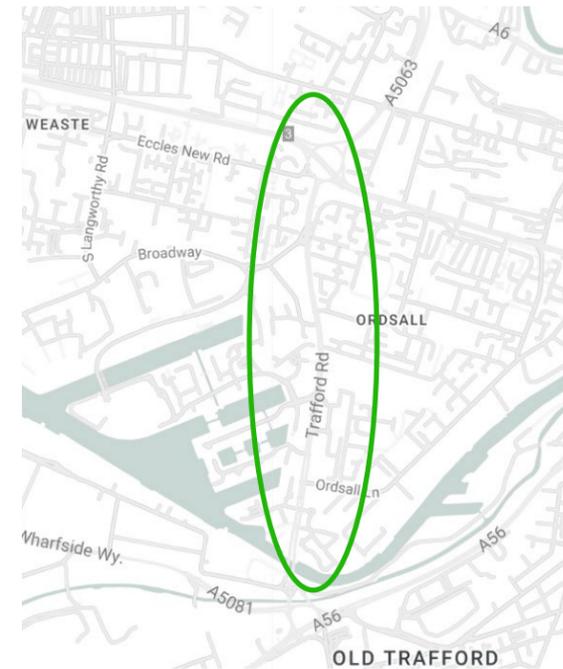


Figure 1 (Left): Location of the chosen site for the pilot study, Source: Google Maps

Figure 2 (Right): Location of the site showing the boundary of Manchester and Salford, Source: Google Maps

INTRODUCTION

This paper describes a pilot study, which explores how to design a specific urban area based on community insight. The pilot study site location is within the city of Salford, UK but lies close to the boundary with the city of Manchester, UK. The area chosen for evaluation is around Trafford Road in Salford, noted in Figures 1 and 2. The exploration stemmed from the University of Manchester’s Innovation Lab, where businesses and University leaders explored potential projects to partner on. This study combines thought leaders from the residential team at CRTKL with the University of Manchester’s Innovation Lab.

The relationship between the ground floor of large residential buildings to the street and the community it serves is often debated. The ground floor of these buildings acts as the interface between the public realm of the street and the private realm of the housing above. Overall, there is competition for space and place between two kinds of values and uses:

- Private realm with defined uses: mainly an economic value agenda (city for enterprise)
- Public realm with open uses: mainly a social value agenda (city for humans)

Figure 3 (right): Location of the site showing the boundary of the Salford Quays and Ordsall neighborhoods, Source: Google Maps

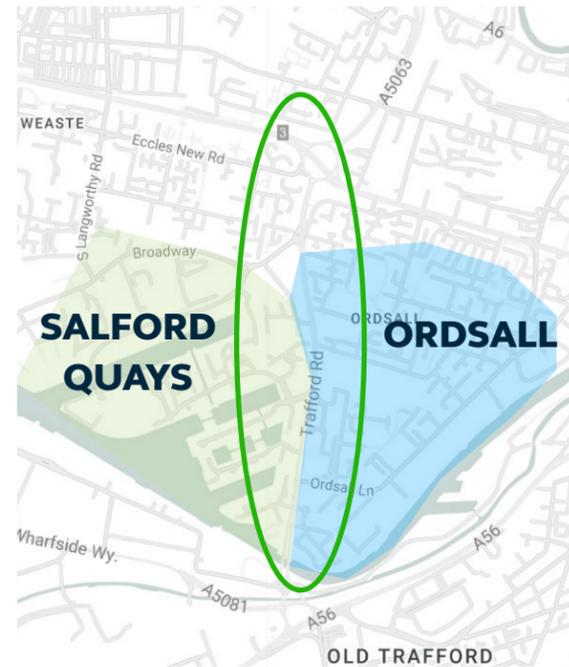


Figure 4 (bottom): Introductory image from 'Salford Quays: The development Plan for Salford Docks'. Source: Salford City Council, 1990



It is important to consider how design of this interface impacts the success of the neighborhood and the value of the building. The purpose of conducting this study is twofold; determine the best options for the design of the ground floor with community input and to develop a methodology for future project use.

BACKGROUND

The chosen neighborhood is close to the former Salford docks, where the Manchester ship canal brought goods into the city of Manchester, a 36-mile inland waterway originally constructed in the 1890s to allow the inland city of Manchester to compete with the city of Liverpool as a trading city. It also forms the boundary between the relatively 'new' neighborhood of Salford Quays, formed following the redevelopment of Salford docks, and the much longer established neighborhood of Ordsall (Figure 3).



Figure 7: Sectoral Growth of jobs in MediaCityUK 2011-2016 Source: ONS, Business Structure Database (Centre for cities, 2012)

Figure 5 (right): Drawing from 'Salford Quays: The development Plan for Salford Docks' Source: Salford City Council, 1990

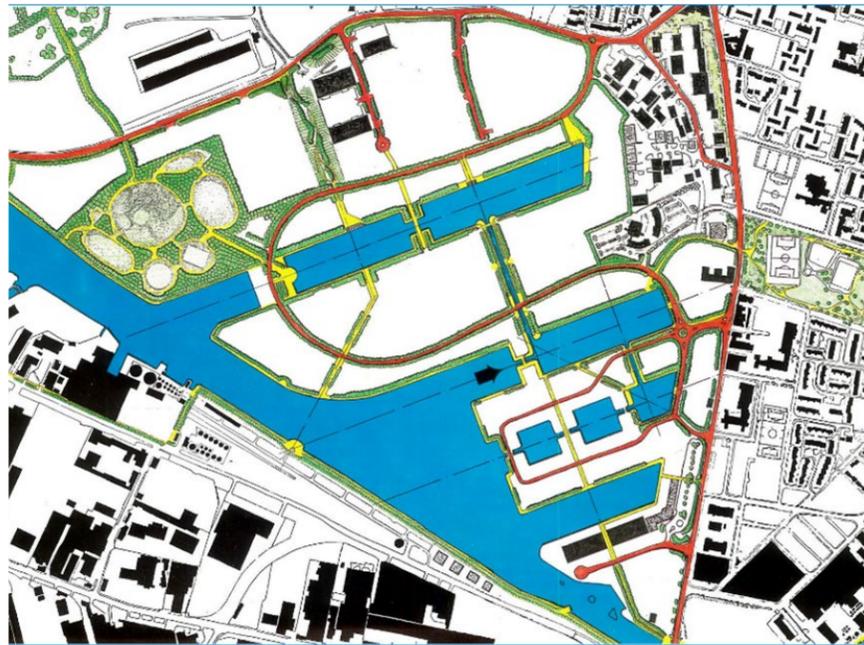
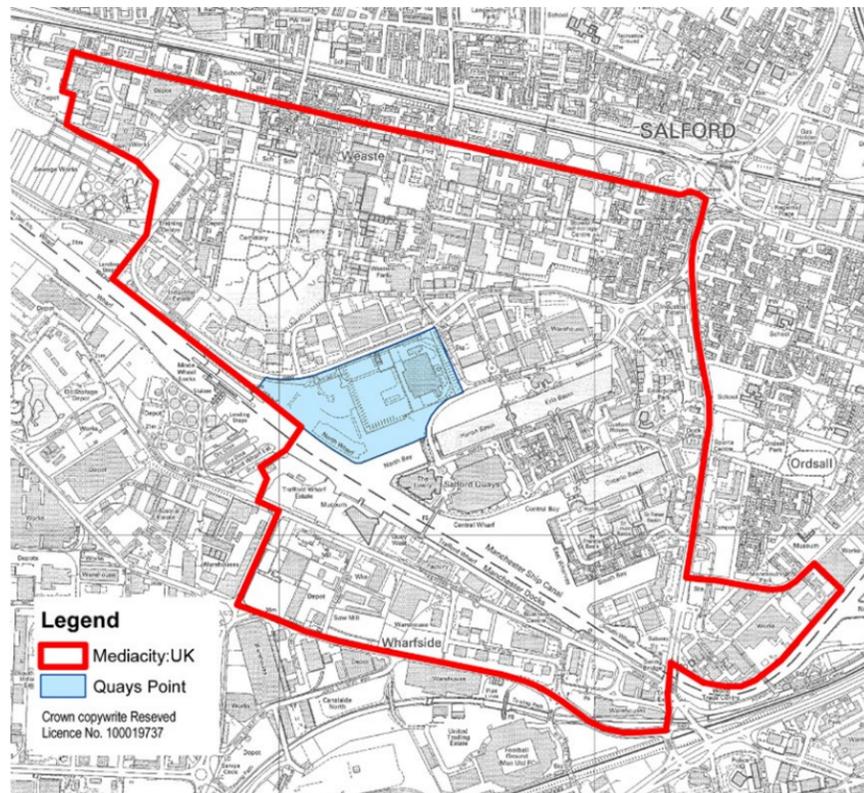


Figure 6 (bottom): Location plan taken from 'Mediacity:uk & Quays Point: Salford Quays & Trafford Wharfside Planning Guidance - August 2006. Source: Salford City Council & Trafford Metropolitan Borough Council, 2007



Many planning documents were reviewed to provide context including:

- **SALFORD QUAYS:** The original proposals for the redevelopment for Salford Quays date back to a development plan written in 1985, then reprinted in 1987 and 1990 (Salford City Council, 1990). Figure 4 illustrates an aerial view of the docks, showing the very low-density use of the area from the time. Due to Salford Council purchasing most of the land around the docks, regeneration followed. The proposals were to redevelop the quays by introducing the current loop road and bridges; the connecting canal gives the area the shape it currently has. Figure 5's drawing highlights the roads, which is considered the land to the left of Trafford Road, with Trafford Road forming the boundary edge to the Salford Quays area.
- **MEDIACITY UK:** In 2007, updated planning guidance was provided, this time through a joint publication between Trafford Planning, for the area of Manchester to the south of the docks, and Salford Planning (Salford City Council & Trafford Metropolitan Borough Council, 2007). This guidance was connected to the decision for the BBC (British Broadcasting Corporation) to relocate many of its functions to Salford, and this document aimed to create a media hub around new facilities, rebranding the area as 'MediaCityUK'. Trafford Road again forms a boundary to the site as identified in figure 6. Following this period and BBC's move of some

- of its workforce to Salford, and the subsequent increase of media centered businesses in the area produced an increase in jobs in the area (Centre for cities, 2012), figure 7.
- **ORDSALL RIVERSIDE:** In 2008, planning guidance developed for Ordsall Riverside was completed to redevelop the area along the River Irwell/Manchester Ship Canal with Trafford Road at one edge. This led to residential development from Ordsall extending down to the ship canal (Salford City Council, 2008), see figure 8.
- **BEE NETWORK - CHANGES TO TRAFFORD ROAD:** Along with changing planning policy around the Pilot site location identified in figure 1, Trafford Road has recently been part of the Bee network, a proposal to improve Greater Manchester's cycling and walking infrastructure. The Bee Network is a vision for Greater Manchester to become the very first city region in the UK to have a fully connected cycling and walking network; the most comprehensive in Britain covering 1,000 miles (Transport for Greater Manchester, 2019). Once complete, this will enable much more cycling and walking in the area while increasing the ease of crossing Trafford Road on foot or by bike. As the wider connections plan shows (see figure 9), there will be cycling routes throughout the pilot area providing good connections to both sides of Trafford Road.



Figure 8: Aerial image from Ordsall Riverside, Source: Salford City Council, 2008



Figure 9: Bee Network, Trafford Road, Source: Salford City Council, 2018

Liveability Design: program & method

Program & method: based on the pathways toolkit, with visual templates for mapping & design

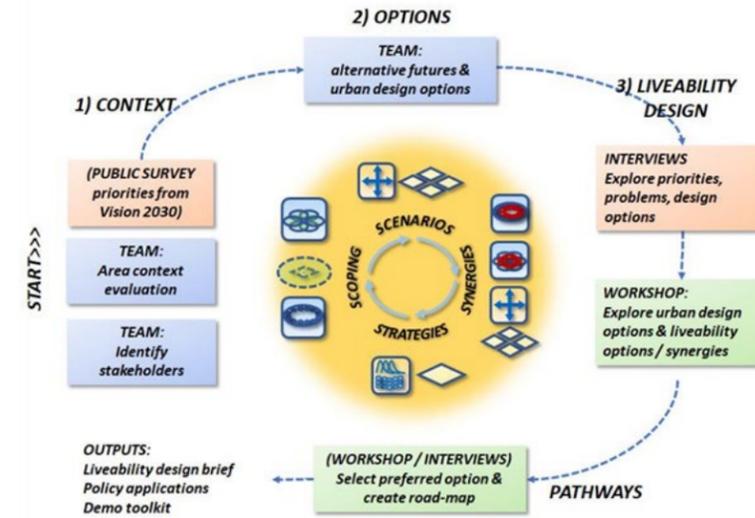


Figure 10: Pathways Toolkit flowchart, adapted from the book titled *Deeper city: Collective intelligence and the pathways from smart to wise*, Ravetz, 2020.

METHODS

A method on how to collect community insight specifically for the area around Trafford Road was developed based upon the *Pathways Toolkit* noted in the book, *Deeper city: Collective intelligence and the Pathways from Smart to Wise* (Ravetz, 2020). The process has three main phases: (1) context, (2) options, and (3) livability design, see figure 10. The context stage explores the site and surroundings, to understand the current condition, and to gain a very broad idea of how residents might want to see change. The options stage then generates ideas of how the area might change, both in terms of physical changes which might occur, as well as political, ecological, or social changes that might be needed to enable them to happen. The livability design stage

is the culmination of everything we will have discovered in earlier stages, allowing us to summarize what we have found for future use. This is also based on the synergistic process borrowed from a University of Manchester document published in 2018 outlining a similar process, see figure 11.

FINDINGS

Phase 1: Context

Identifying key stakeholders: To understand who the key stakeholders were in the area in order to ensure a fair representation when planning the workshops for the second phase was included is important. Several groups within the local neighborhood who could be contacted to provide input into the workshop and interviews of the next phase were included in a stakeholder list.

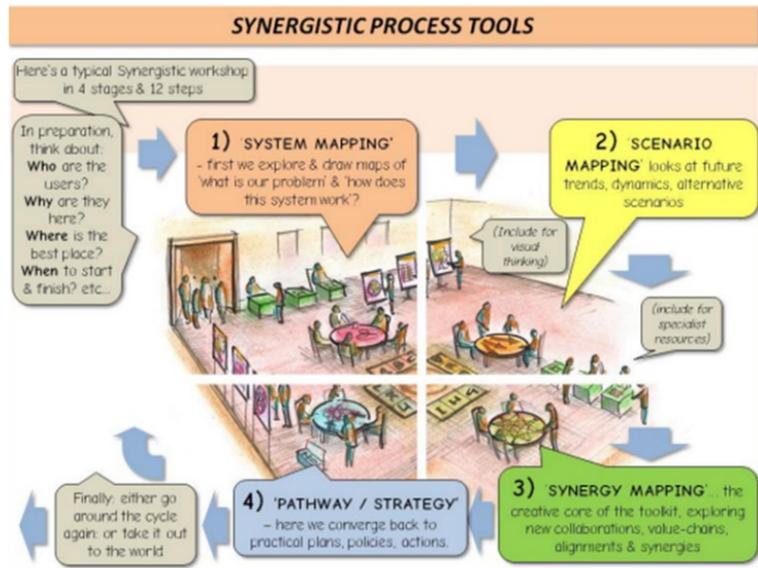


Figure 11: Synergistic Process Tools, Source: Manchester University, 2018

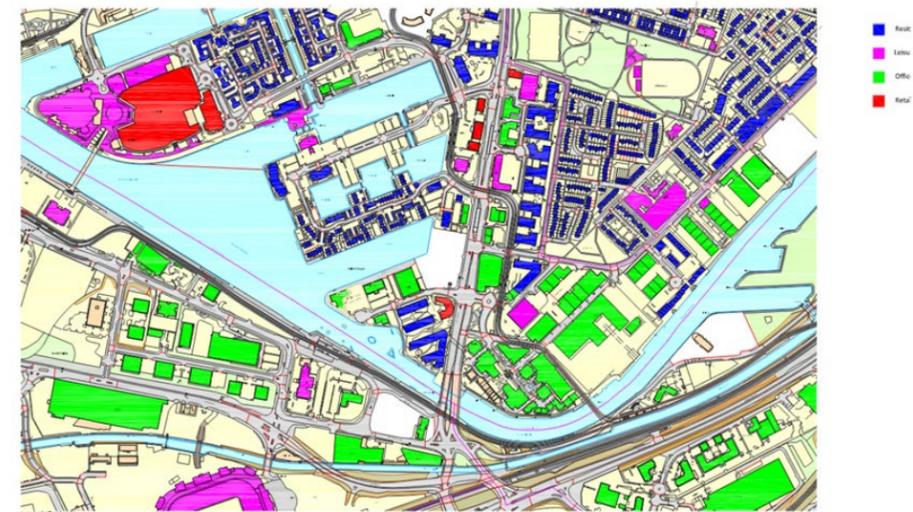


Figure 12: Map of the area colored to show ground floor uses, Source: Google Maps

Area context evaluation: to understand the current use of the ground floor of all of the buildings around the site, taking a map of the area, figure 12 illustrates color coded buildings to show the different ground floor uses. The map shows how areas of the pilot study area contain largely residential

buildings and which areas contain largely offices. Walking around the site provided additional context in understanding how this area of the city has changed from relatively low-density development, see image 13 to higher density development, see image 14. Moving into phase two, it is important



Figure 13: Example of lower density residential development built following the initial development plan in the 80s/90s, Source: Author



Figure 14: Example of more recently completed, higher density residential development built following the more recent development plan, Source: Author

to identify how these changes to the area have also changed how residents view their neighborhood and what they anticipate the future to look like. Over different periods, the regeneration of the area has developed in different ways, and the pathways toolkit can help us look at how future changes might be influenced by other factors, such as the economy and climate change, which will have an impact on how future development takes place.

Public survey: feedback from residents enable new ideas, it was important to understand how residents view the area and to identify which improvements they think could be made. When working on alternative futures for the area, focusing on what local residents wanted is a good starting point. A list of priorities which had been developed through the Salford city council specifically asked the public what

they wanted to see in the area and as the council felt this was such a good reflection of the public response, this list has been published in 2021, see figure 15. The ideas generated offered a good place to start for developing our alternative futures to be discussed at workshops in the next phase.

Phase 2: Options

Alternative futures and urban design options: This phase of the process is to engage with stakeholders through interviews and workshops to understand what they want to see in the neighborhood. As part of the preparation for the workshops, we produced a series of overlay sketches, showing the application of priority ideas overlaid onto photographs taken in the neighborhood. It is important that these are loose sketches to ensure that participants understand they are to help visualize ideas and are not set ideas,

Your priorities		In summer 2021 we asked you what mattered most for the future of Salford Quays. These are your priorities.	
Put people first.	Activities for all abilities.	Less in quieter areas.	An outdoor gym.
A new town centre.	Activities for all pockets.	Ground floor spaces that contribute to, rather than deaden street life.	Better cycle and public transport links.
A new focal point for everyone: residents, workers, visitors.	A lido.	Showcasing the art and content made here.	Easy routes and transport for people with mobility issues.
Space to play.	Buildings that open onto the water (not turn their back on them).	Highlighting the innovation and tech that happens here.	Preserving our waterside views and sight lines.
More things for children and young people to do.	Clearly defined neighbourhoods.	Creating jobs in media and tech for everyone.	An allotment or community garden.
Places to sit.	Safer neighbourhoods.	Open air cinema, theatre, comedy, art.	Spaces where you don't have to spend money to be there.
Shelter from the wind and rain.	Free, high quality, creative events unique to the area.	A place where we can all come together.	Making better connections to the rest of Salford.
Independent shops, cafes and restaurants.	Cleaner neighbourhoods.	Prioritising people over traffic.	Showcasing our history.
Useful shops.	What we already have, refurbished.	More cycling, more walking routes, more pedestrian areas.	More green space.
A medical centre.	Street food, markets or a market hall.	Running routes.	More parks.
More use of the water: houseboats, floating markets, floating cafes.	Prioritising residents for event tickets.		
Better use of the water: more organised water sports.	More street signs and furniture in leisure areas.		

Figure 15: Priorities list taken from Salford Quays: a new vision 2030, Source: Salford City Council, 2021

examples shown in figures 16 and 17. While looking at these various scenarios from the priorities list, the pathways toolkit, figure 10, prompts a discussion to occur on what the conditions could be that would allow any of these priorities to manifest, whether commercial, societal, political, or ecological.

At the time of this publication, our team is currently in this phase—planning the workshops and interviews in detail.

Phase 3: Liveability Design

Once data from the workshops and interviews has been gathered at the end of phase 2, a final record of the future options preferred by the participants

and the pathways (societal, ecological, political) which would be required to achieve them will be recorded. The final document will be presented back to residents along with the Salford council, ahead of anticipation for renewal of the development plan for the area.

CONCLUSION

Although this project will finish outside the time frame of the Microgrant process, this project will continue to progress. The collaboration with the University of Manchester has offered a new way to understand how architects and designers can add research capability to a variety of

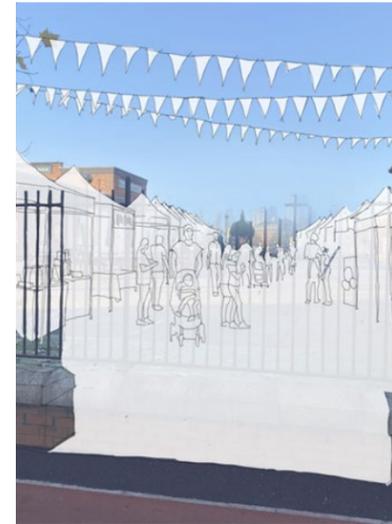


Figure 16 (left): Photograph from the neighborhood with overlay of potential future market stalls, Source: CRTKL



Figure 17 (right): Photograph from the neighborhood showing overlay of potential future running track, Source, CRTKL

projects and processes. Researching this neighborhood has helped to develop a depth of understanding, not usually available for an area. This is particularly valuable for additional potential sites in the area, and this research will help to better design for those sites. The University of Manchester also hopes to develop this research further, working with Salford Council to inform their future plans.

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REVISIONING THE CULTURE OF THE WORKPLACE OF THE FUTURE

Sahil Dagli



PURPOSE

The world is at the brink of the Generation-Z (also known as Zoomers) entering the workforce. Generation-Z is the generation that succeeds Millennials and Generation Alpha. To give a precise idea, Generation-Z are usually categorized as born between mid-to-late 1990s till the early 2010s; as opposed to Millennials, who are categorized as born between early 1980s till the mid-1990s. For this research, both of these generations and their corresponding traits are used to understand how we can inform the future of the workplace. The next 15 years will be determined by Gen-Zs ideas and their understanding of the world. Millennials have been considered the first “global” generation with the development of the internet, as more of the world comes online, Generation-Z is now becoming more global in their thinking, interactions, and relatability. Research suggests that Generation Z teens are more concerned than older generations with academic performance and job prospects; an underlying trait that would be impactful in the way companies structure policies, ethics, and work environment (Henn, 2022).

The following research uncovers the following:

- Questions to consider for the design of the future workplace
- Considerations to adapt the workplace for different generations

CONTEXT

Different generations influence a variety of factors including socio-cultural impacts, technology, and the fabric of real estate management. How can architects and designers adapt our spaces for a work environment that supports both Generation-Z and Millennial needs? A study, conducted in 2022 by Glassdoor, published an infographic to understand the primary factors that are different from both generations. A variety of factors like motivation, impact, outlook, work style, education, trust, privacy, and inclusion were included, see figure 1. Understanding these workplace confluences and synergies and their impact on the spatial design of office space should be considered when analyzing the future of the workplace.

Socio Cultural Impact

Studies suggest that amongst Gen-Z, priority is given to workforce issues, such as talent retention, hiring and diversity, equity, and inclusion (Colemann, 2022). At the same time, pandemic driven changes in work models have created a range of challenges, including a major push for flexibility. As the hybrid work model becomes the norm, for many workers in the corporate United States, concerns about the dilution of culture have become a challenge in addressing the ethos of many employers (Nelson, 2022).

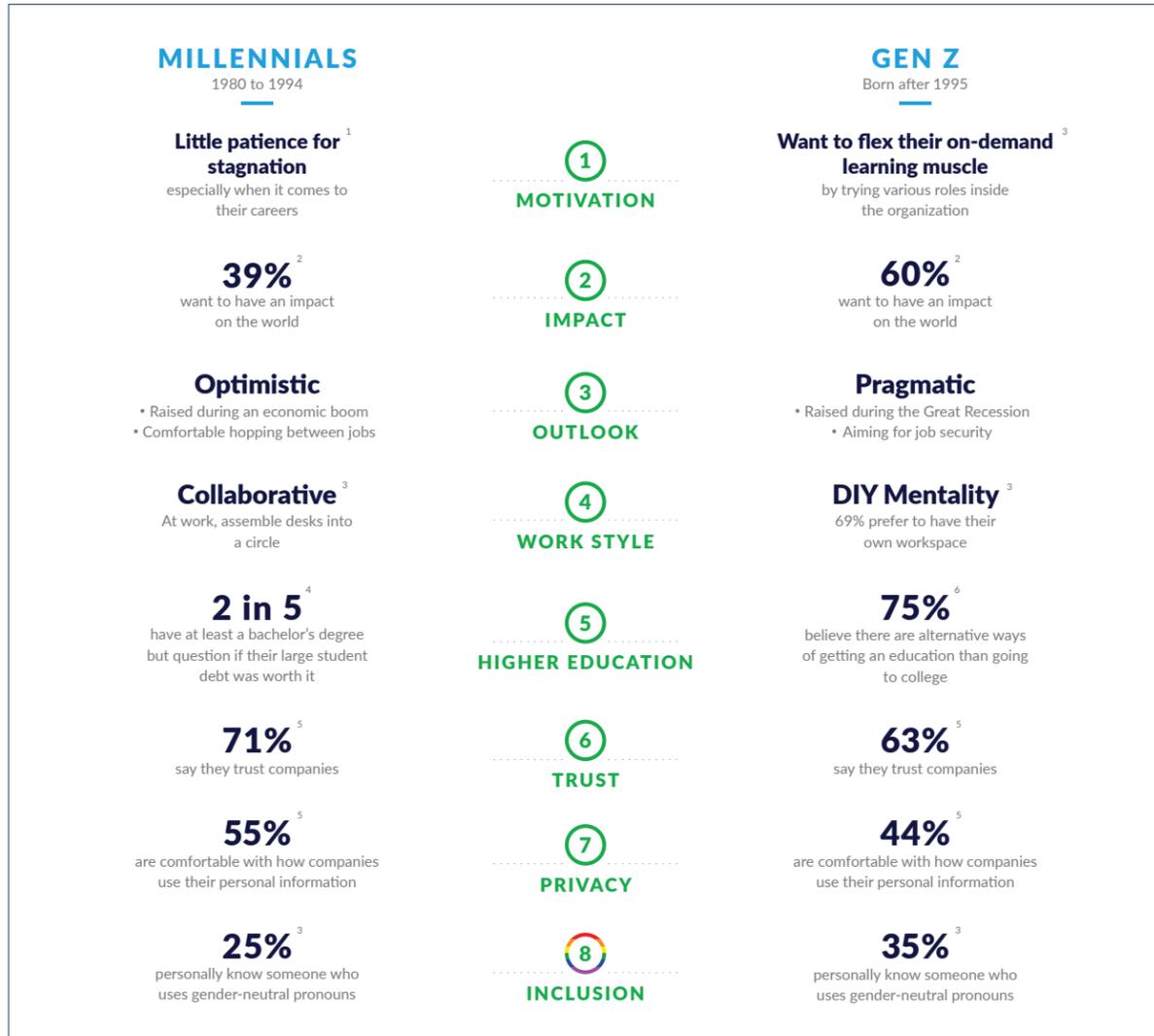


Figure 1: Millennials vs Gen Z In The Workplace. Source: Glassdoor

During the first half of 2022, 20-million Americans quit their jobs (Henn, 2022), while the Bureau of Labor Statistics claimed that over 47 million more resigned during 2021 (Fuller & Kerr 2022). Noting that this collective is bigger than the population of Canada or Spain, this post- pandemic phenomenon has become known as the Great Resignation (Henn, 2022).

The socio-cultural aspect of the future of workplace can be questioned based on the aforementioned alone and also to contemplate how the interaction in the office, how priorities in mental health, flexibility and ethics could further define the function of the workplace.

Technology

With Gen-Z’s technology acumen and the time spent on “screen” ever increasing, the future of workplace relies heavily on technological platforms, tools, and information technology teams that provide support for the needs that enable a smooth transition for in person, remote, and hybrid work.

Real Estate Management

Collective insight gathered from peers, colleagues, and counterparts from across workplace industry has alluded to knowing that most employees are using office spaces to interact and have meaningful meetings verses just using desk spaces. It is imperative to look at different office relationships and their requirements of space and real estate for the future to address flexibility of space and time, Gen-Z technology savviness and requests for quieter individualistic spaces, and millennials push for more traditional work and desk space.

FINDINGS

A small online workshop, conducted via Microsoft Teams and Miro, with 15 architects and designers identified different questions that would be useful to have as discussion prompts when considering the future workplace under socio-cultural issues (mental health support, diversity, equity, and inclusion, career growth) real estate management (flexibility, activity-based settings),

and technological tools. In addition to the workshop, one on one interviews with 10 people of varying age groups (Gen-Z, Millennials, Boomers). Each interview provided an understanding of the priorities deemed important for the different generations. The resulting questionnaire serves as a starting point for architects and designers when designing future workplaces.

CONCLUSION

The questionnaire developed provided prompts that can be useful when designing future workplaces. In addition to developing a list of key questions to consider, a toolkit is currently under development that will include tried and true solutions that answer the questions included in the questionnaire. It is necessary to consider how future designs of the workplace can meet the needs of all generations.

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FUTURE DESIGNS OF THE WORKPLACE QUESTIONNAIRE



FLEXIBILITY

- What does flexibility mean to you?
- Is it just work time or the work environment?
- What is balanced work culture according to you?
- What is your work style? Why does it work best for you?
- What makes your work environment comfortable?
- Where do you take breaks?
- What is your preference for hybrid work?
- What is the environment that allows you to explore?



MENTAL HEALTH SUPPORT

- How can a flexible work environment help you mentally?
- How many conversations do you have about mental health at work?
- What spaces are best for your mental wellbeing?
- Do you let your mood distract you from work?
- How does mental health of your colleagues affect you?



DIVERSITY, EQUITY, AND INCLUSION

- What determines feelings of inclusion? How can we foster it?
- Have you determined what makes you feel inclusive?
- What can you do to make your colleagues inclusive?
- How do you approach language barriers?
- Does hierarchy change how you communicate?
- List some activities that may help break down barriers.



CAREER GROWTH

- What makes someone proud towards the company they work for?
- What would you like the company to program to help achieve your goals?
- Would you like to have more programs on mentorship and learning?
- What makes your work environment nurturing?



REAL ESTATE MANAGEMENT

- How can remote work be made more productive?
- What are the main reasons you would like to be in the office?
- Do you like office chairs or conference rooms?
- How productive are teams calls v/s how productive are in person meetings?
- What kind of spaces would you like to be more productive in the office?
- How important is commute subsidy?
- Can costs be saved in terms of every employee's commute to work?
- What are other subsidies that would be important to be included in the future?



ACTIVITY BASED SETTINGS

- Does the office need only collaborative spaces?
- Can a remote work culture reduce real estate requirement and cut costs?
- What are different types of work relationships that impact the physical space?
- Does the space requirement change on the basis of office situations and types of meetings? Ex: intra team meetings, one-on-one meetings, inter team meetings, social events, client-vendor meetings, etc.
- What would individual space requirement be considering the above scenarios?



TECHNOLOGICAL TOOLS

- Does my company's technology enable me to work efficiently and without friction?
- What are the tools required for my remote set up?
- What are the factors affecting lack of communicating devices?
- What can be done better in terms of technology to increase focus and mental wellbeing?

WHAT GOES IN MUST COME OUT: APPLYING THE CIRCULAR ECONOMY IN PRACTICE

Yarden Harari, Crystal Cheung, Jodi Williams, and Maryam Saidian



PURPOSE

The building industry is one of the greatest users of resources and producers of waste around the world. Building materials are estimated to consume 50% of all global materials extracted (European Commission, n.d.), and represent about half of all solid waste generated every year (Transparency Market Research, n.d.), with an estimation that building material waste will be generated at a rate of over 1 billion tons per year by 2025 (Redling, 2018).

As these trends have continued to accelerate globally, they contribute to depleting natural habitats while concurrently growing landfills, risks, and pressure on frontline and fenceline communities. The harsh reality is that less than 9% of materials flow back into use (Circle Economy, 2021).

While efficiencies are being developed, they are often in the mining, manufacturing, or shipping processes; industrial activity which allows materials to be produced faster and travel farther. This availability and convenience only exacerbate the problem of material waste and associated greenhouse gas emissions, whereby durable products are considered 'disposable'.

Despite the benefits of material innovations to decrease energy and carbon emissions, a systemic

and cultural change of material use behaviors is vital to truly address these issues and support a circular economy. In current practice, it is simpler and expected to dispose existing materials and purchase new products, than deconstruct and reuse the components.

Hundreds of millions of tons of material are landfilled in the US each year (U.S. Environmental Protection Agency, Office of Resource Conservation and Recovery 2018), but materials used in interior environments are often more complex and specific than would be represented in EPA data or reports (e.g., metals, wood, gypsum). Prevailing research does not track products, such as light fixtures, electrical receptacles, or doors, making it unclear if or how they are captured within the broader material categories, and that much more challenging to indicate how much and what could be re-usable.

This paper explores how architecture and design teams to work with reused products to proactively distribute existing materials. The following research focused on two overarching needs; one, how to quantify products and two, identifying processes and workflows for reuse.

One of the key objectives is to identify which current industry practices can be adapted to enable processes and behaviors that support a circular economy in the built environment.

CONTEXT

Impact of interiors

While the EPA estimates that over 100 million tons of waste are generated by building construction and demolition in the US each year, these calculations are based on 25- to 75-year material lifespans (U.S. Environmental Protection Agency, Office of Resource Conservation and Recovery 2018). The typical lifespan of commercial interior projects is less than one third of even the lower end. The average office lease term in the US is only 7 years, 6 years in the UK, and as short as 3 years in Hong Kong (JLL, 2020). Similarly, the average lease duration in general retail is 4.5 years in the US (Urbanski, 2019).

It is likely that the actual quantities of landfilled building materials are grossly underestimated, and that the products with which we build our spaces can significantly outlast the projects in which they are installed.

While much public focus of environmental impact is on the core and shell of ground up buildings, the square footage of interior renovations, and the complexity of the products within them, add up quickly. Reuse, or lack thereof, becomes especially impactful in interiors projects such as retail environments or offices, because their typically short life spans compound the cyclical issues of extraction and disposal.

These projects also present unique opportunities for change due to:

- **Product quality:** products selected are often durable, standardized, and designed for efficient assembly. Therefore, products should be able to be disassembled and reused with ease.
- **Availability of data:** existing drawings and documentation are often available and can provide more accurate information of what products are already installed.
- **Predictability for planning:** part of the owner's business planning is to forecast when a particular location may be renovated, and therefore plan for what will come out. With shorter lease terms and commercial owners, the same people may still be connected to the project.

When we acknowledge that these space types are not intended to last 60 or 100 years, we can start to address the fact that what goes into these spaces tends to come right back out only a few years later to be replaced again with similar products. We see the current challenges of this part of the industry as opportunities to begin standardizing a process through which every project can be evaluated for its material reuse potential, especially in fast turnover typologies like commercial interiors.

Transitioning towards a circular economy- reoccurring barriers

A literature review was performed to determine the range of existing studies

related to the construction industry's transition towards a Circular Economy. The following keywords were used to focus research: circular economy, reuse, end-of-life, building components, value retention, life cycle, deconstruction, sustainability, circularity metrics, assessment, recycling, architecture, circular design, and sustainable development. Twenty articles published from 2017-present were assessed; four recurring barriers to implementing a Circular Economy were determined.

'Circular economy' – a vague definition and concept

Although the term 'circular economy' is still a niche in the building industry, the past decade witnessed an increase in usage of the terminology across reports, publications, and marketing communications, as well as prevalence in policy making documents (European Environment Agency, 2015).

Existing research examined a multitude of existing definitions (Kirchherr, Reike and Hekkert, 2017) and concluded that there is no universally agreed upon definition. The vagueness of the term, referred to as a "catch-all" philosophy (Whalen, et al., 2018), could be counter-effective to the main objective of circular design (Korhonen, et al., 2018; Moraga, et al., 2019). Research to date largely focuses on theoretical and conceptual approaches, with limited studies

focusing on the practical and technical strategies required to implement circular economy in building design (Dokter, Thuvander, and Rahe, 2021).

Complexity of having many actors across the building's lifecycle

The complexity of buildings' lifecycle which involve many stakeholders over a long period of time is a barrier to circular practices. The stakeholders involved with the manufacturing, design, and construction of the building are unlikely to be present at the buildings' end-of-life.

With many actors involved across a building's lifecycle, no single entity is accountable for the impacts. To combat the lack of continuity and enable a better transition towards a circular economy, the British Standards Institute (BSI) proposed two key principles in 2017: Stewardship and Collaboration (Pomponi and Moncaster, 2019). The BSI 8001 (2017) defines stewardship as the responsibility 'for the management of all facets of its decisions and activities, from inception through to fulfilment and end-of-life. Although it is a much-needed solution, the absence of an overseeing body, and the lack of collaboration throughout the process makes it very challenging to achieve to date (Pomponi and Moncaster, 2019). With many actors involved across a building's lifecycle, no single entity is accountable for the impacts.

Unclear financial case – value retention of materials & reuse of secondary materials

Design teams are often faced with ‘short-termism’, whereby investors, clients, and developers are more concerned about the capital expenditure rather than the operational expenditure and certainly more concerned about CAPEX than undocumented carbon costs (e.g., social and sustainability values) (Carra and Magdani, 2017). In addition, the low prices for virgin material and even lower retention of value for those materials at its end-of-life suggest that it is often preferable to spend upfront as a sunk cost, without speculating a return on material value in the distant future (Kirchherr, Piscicelli, et al., 2018). Technical and economic challenges for material recovery, particularly the materials with structural properties (Hopkinson, et al., 2019) lead to complications in the certification and compliance process which then make them less appealing for considering in the reuse process. The unclear financial case, especially in the unpredictability of resource prices, and lack of consistent carbon pricing or calculation into overall life cycle cost, makes it difficult for people to invest in the future market for the materials they purchase when the prospective benefits are uncertain or abstract.

Knowledge gap

Recent comprehensive literature reviews highlight the lack of awareness and associated practices for further consolidation of a circular economy (Meri, 2018; Mhatre, 2021). It is also evident that there is a lack of regulatory standards across the construction industry to incentivize organizations (Adams, et al. 2017). There are existing examples, such as the BS 8001:2017, one of the world’s first standard on circular economy proposed by the British Standards Institute (BSI, 2017), however they are often flexible, recommendatory guidance and are not enforced by law. Given the growing selection of tools and strategies for design and collaboration, such as material passports, BIM data integration, knowledge hubs and building assessment methods, introducing a new indicator to measure the circularity of buildings and materials based on market value is also required (Di Maio, et al., 2017). Due to the lack of process and regulation, a knowledge gap persists on how materials can be fed back into the circular loop of the end of the building lifecycle.

METHODS

Survey: existing conditions data gathering tools

A survey was conducted in September 2022, distributed electronically to 515 architecture and design employees. The survey focused on the start and

end points of interior design and construction projects to identify key intervention points that would allow for closing the loop between the end of one project and the beginning of another.

Participants were asked questions focused on interiors and existing spaces, including identifying what documentation or information a team may receive at the outset of a project, how familiar they may be with the specific client or project space, how site conditions are verified, what is used for punch lists to document conditions on site at construction completion, and what is delivered back to a client for their use and records at project closeout. The information gathered from the survey helped identify which tools or processes may be leveraged for reuse that are already part of standard practice, even if not currently directed toward reuse efforts.

Survey recipients included CRTKL employees whose records indicate that their work may include or be closely related to interior design and construction; 68 CRTKL employees who are architects and/or interior designers responded to the survey.

Reuse rubric: building product attributes

A qualitative exercise was performed to further categorize which attributes of different product types may enable or inhibit reuse. A list of parameters that may affect reuse potential was

generated. Variables that affect the level of effort or space needed for disassembly, transfer, storage, and therefore impact the potential cost of labor, along with viability for future resale were considered.

Using the parameters that apply to common product categories, in terms of physical attributes, attachment details, or performance requirements, figures 1 and 2 identify the parameters that were considered along with the determination of whether each factor might encourage or inhibit reuse. It is important to note that none of these factors act independently and each product in a space may have certain inherent aspects that make it worthwhile to reuse alongside properties that make it more challenging. External market factors that change due to project context were not addressed.

Every construction project is composed of a large range of products, provided by different trades and manufacturers throughout the course of construction. A small subset of product categories were selected for further study and analysis in the context of projects. Products were selected for being widely present in commercial spaces, while presenting a variety of challenges and opportunities for reuse. Furniture, as a product category, was not considered for further analysis due to the relatively mature market for commercial furniture reuse.

Variable	Enables Reuse	Neutral/Depends	Inhibits Reuse
High value	X		
High volume	X		
Complex product		X	
Simple product	X		
Universal/generic	X		
Branded		X	
Standard	X		
Custom-built			X
Regular shape	X		
Irregular shape			X
Fixed (adhered/cast)			X
Fixed (fastened)		X	
Semi-fixed		X	
Free-standing	X		
Certification req'd.		X	

Figure 1: Reusability parameters, Source: Author

Product	High Value	High Volume	Standard	Universal/generic	Regular Shape	Simple Product	Free-standing	Semi-Fixed	Fixed (fastened)	Fixed (adhered)	Complex Product	Branded	Custom fab	Irreg. shape	Req. cert/code
Ceiling (ACT)		○	●	●	●	●		●							
Specialty Ceiling	○	○			○				●				○		
Flooring (Carpet Tile)			○		●	●		○		○		○			
Flooring (Inset Carpet)	○					●		○		○				○	
Resilient Flooring		○	●		●	●		○		○					
Flooring (Wood)	○				○	●		○		○					
Flooring (Stone/Tile)	○				○	●				●			○		
Demountable Partitions	●				●				●		●				
Electrical Receptacles	○	●	●	●		●			●	○	●				
Doors/Frames		○			●	●		●					○		○
Light Fixtures	●	●	○		○			○	●		●			○	●
Millwork/Cabinetry	●	○	○		○				●		●		●		
Furniture	●	○	○	○		○	●	●						○	○
Plumbing Fixtures (Faucets)	●		●	●	●				●		●				○

Figure 2: Reuse parameters with common interior elements, Source, Author

FINDINGS

Survey results

Practitioners from retail and workplace interiors comprised 78% of survey respondents. Of these respondents, 88% work frequently with the same client on multiple projects. They are likely familiar with the design concepts, vendors, and processes to apply lessons learned across projects. This provides significant opportunity to both iterate with a client over time, as well as take a portfolio-level view.

Additionally, 35% of respondents reported that the project team was frequently involved in an earlier fit-out of the space. This offers a potential added benefit of anecdotal knowledge that otherwise may not be captured in project documentation, as well as

access to historical files that provide more detail than typically transferred during a standard hand off.

What the team hands off at the end of the project gives us clues to what will most likely be available to a future team preparing to start a renovation project in an existing space. Nearly all projects provide a PDF record set to the client, while some also provide AutoCAD files. As BIM and Revit grow in use, we see that a number of projects also share Revit models, though this was more limited in projects under 10,000 sq. ft.

It was regularly noted that as-built documentation or record drawings provided by the client to the design team have discrepancies that deviate from what is on site. It is rare that all minor changes or adjustments are

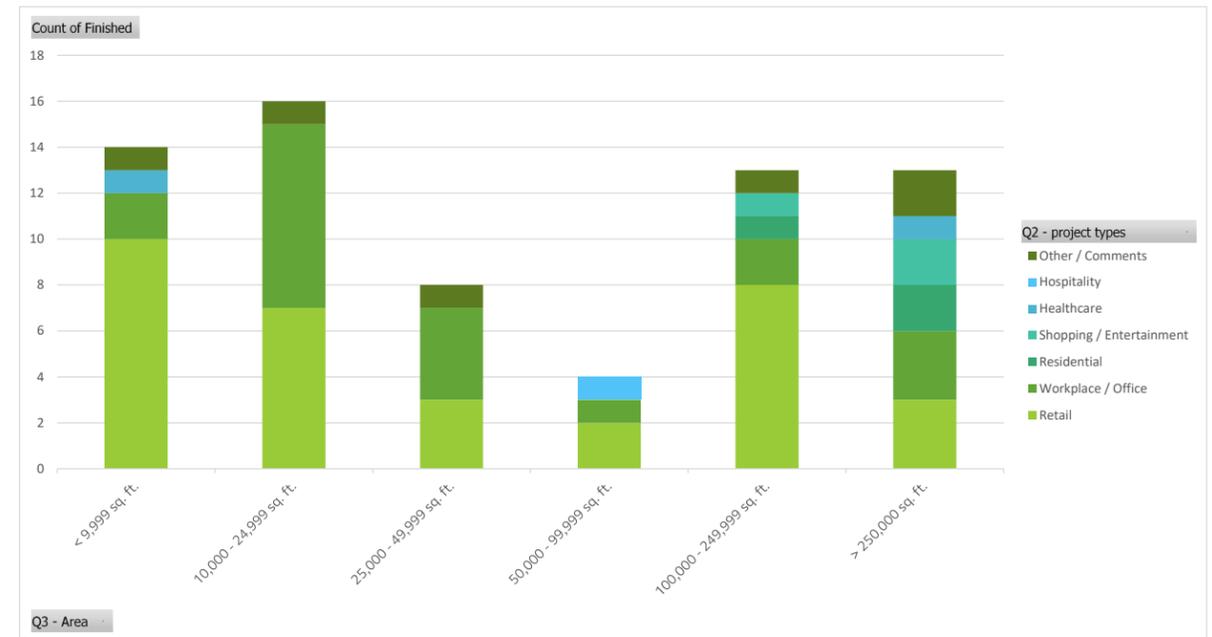


Figure 2: Survey responses by square footage distribution and project type, Source, Author

Project	Client	Project Type	Square Footage (est.)	Project Location
Project 1	Client A	Workplace	30,000	Pittsburgh, PA
Project 2	Client A	Workplace	20,000	Houston, TX
Project 3	Client B	Workplace	21,100	Mclean, VA
Project 4	Client C	Workplace	26,000	Washington, DC
Project 5	Client D	Workplace	48,603	Atlanta, GA
Project 6	Client E	Retail	27,300	Cleveland, OH
Project 7	Client E	Retail	19,943	Columbia, SC
Project 8	Client E	Retail	26,830	Rochester, NY
Project 9	Client E	Retail	38,565	Rockville, MD
Project 10	Client F	Retail	7,600	Miami, FL
Project 11	Client F	Retail	7,345	San Francisco, CA

Figure 3: Historical CRTKL assessed projects, Source, Author

Product	Total	Unit
Ceiling (ACT)	46,128	sq. ft.
Flooring (Carpet/Carpet Tile)	63,786	sq. ft.
Resilient Flooring	39,901	sq. ft.
Flooring (Wood)	1,205*	sq. ft.
Flooring (Stone/Tile)	2,737	sq. ft.
Flooring (Sealed/Finished Concrete)	1,359	sq. ft.
Electrical Receptacles (Wall/Floor boxes)	2,489	# units
Doors	488	# units
Ceiling Light Fixtures	5,333	# units
Millwork Cabinetry	4,665*	linear ft.
Faucets	82	# units
Exit Signs	120*	# units

Figure 4: Cumulative product amounts *Indicates data was missing from one or more projects, Source: Author

incorporated or captured, and so there is risk associated with relying solely on existing documentation. Respondents overwhelmingly noted that being on site helps catch items that might not have been picked up in the drawings, and that validating this information in person at the start of the project helps prevent future conflicts and issues.

75% of respondents used some sort of digital tool for their punch list visits, such as Procore or PlanGrid applications that allow for real-time sharing, coordination, and tracking of open items (in this case, deficiencies) and reviewed as a benefit by respondents. Even if they are contractor-driven, they are platforms with which most design teams are familiar.

Quantification of select products in CRTKL historical projects

To move towards standardizing and operationalizing reuse in commercial construction, detail about what is going into and coming out of projects needs to be tracked and shared. This is often directly available in the documentation that teams already develop.

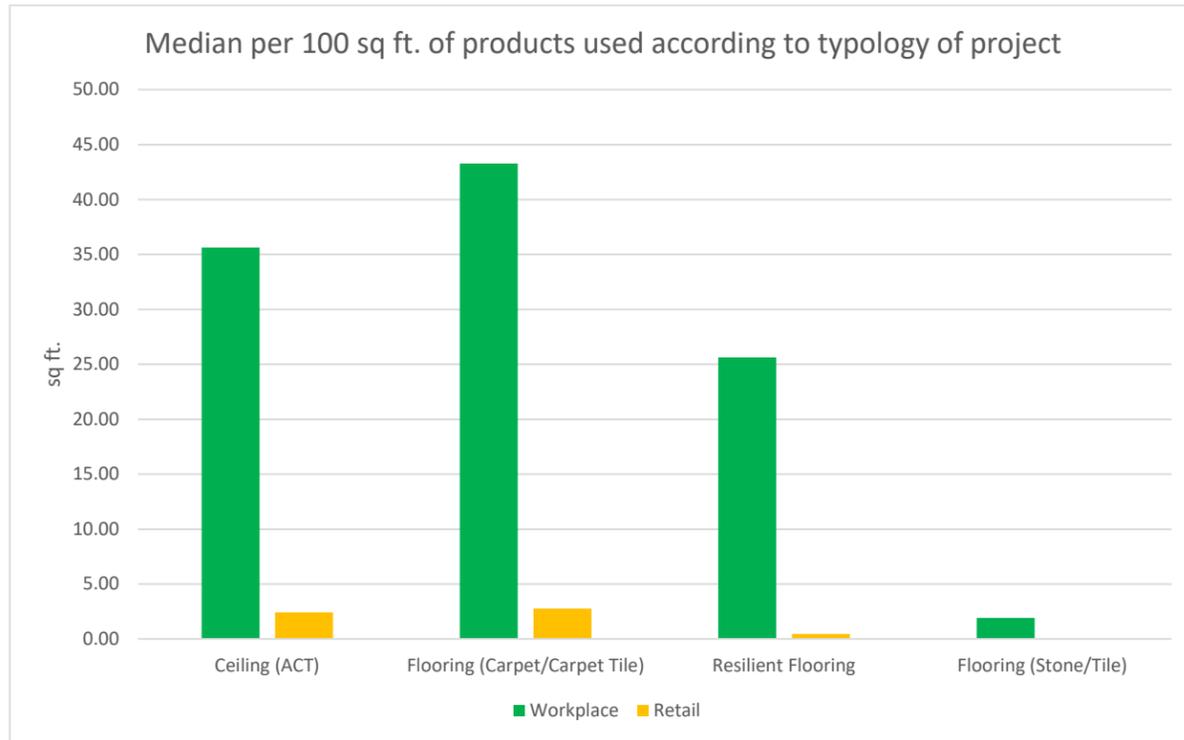
Existing documentation of 10 historical CRTKL workplace and retail projects was analyzed to quantify actual numbers of selected products within a sample set of representative projects (e.g., floor tiles, ceiling tiles, doors, light fixtures). Commonalities or anomalies across projects by scale, use type, and more

were explored. The selected projects ranged in size from approximately 7,000 to 50,000 sq. ft., with a mix of workplace and retail use, and included examples from repeat clients, i.e., multiple projects with the same client, noted in Figure 3.

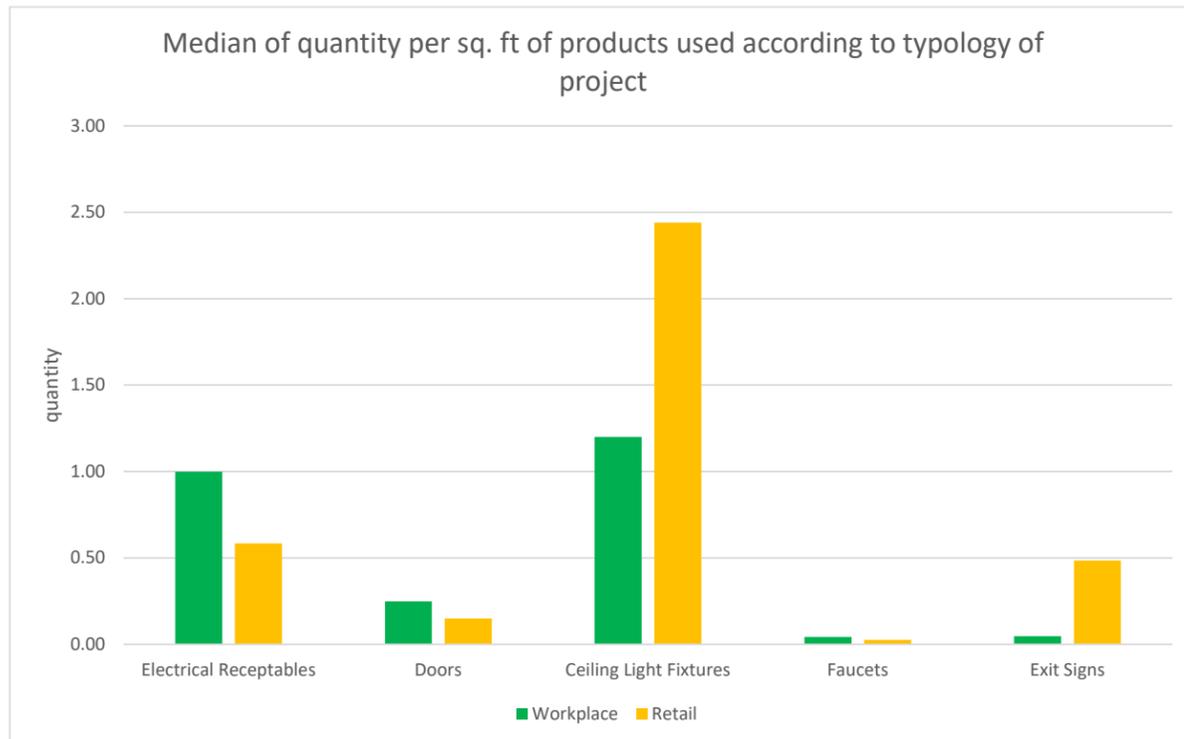
Because CRTKL often works with repeat clients across many different locations and jurisdictions, this specific portion of the study was not geographically focused to a single metropolitan area, but rather by typology of space. All examples are within the United States. The way that the data is assessed is limited to the small sample size and limited subset of materials studied, but the process and analysis can help predict the flow of materials into and out of commercial spaces.

Using existing PDF, AutoCAD files, and Revit models, the 10 projects accounted for 247,286 square feet, and the cumulative values of studied products are illustrated in figure 4. After extracting the quantities from the selected projects, the data was analyzed and compared under the following conditions: project scale, type of client (i.e., repeating), and considering variations across project types and product categories.

The following graphs illustrate the aforementioned comparisons: *Graph 1: Workplace projects tended to have a higher ratio of Acoustical Ceiling Tile (ACT) per area than retail projects.*



Graph 1: Median of sq ft. of products used according to typology of project, Source: Author



Graph 2: Median of quantity of products used according to typology of project, Source, Author

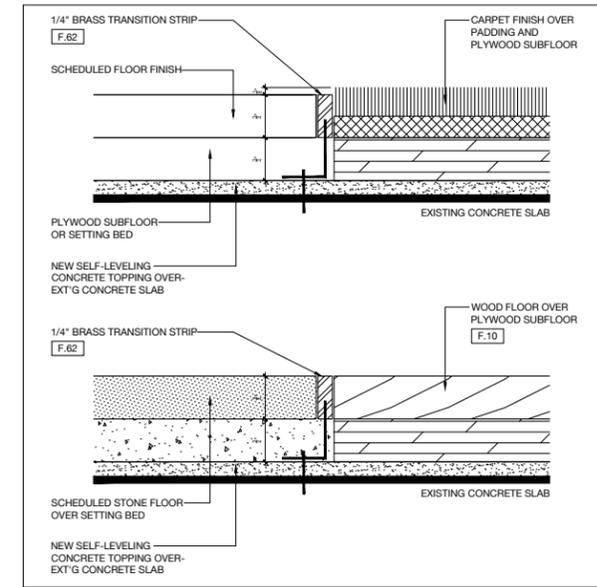


Figure 5A: Example flooring detail - retail, Source: Project CRTKL documentation

This is likely due to the importance of acoustics in an office environment, whereas in retail spaces, ACT ceiling was limited to back of house or office areas within the store, which take up a much smaller square footage proportionally than the sales area.

Graph 2: Generally, workplace projects present a higher usage of resilient flooring and carpet tile than retail. Again, this may be in part due to acoustical requirements that are more critical in a work environment than a public retail space. Client D, a retailer, limited carpet to fitting rooms only, similar to use of ACT ceilings, resilient flooring is minimal, limited only to specialized back of house areas.

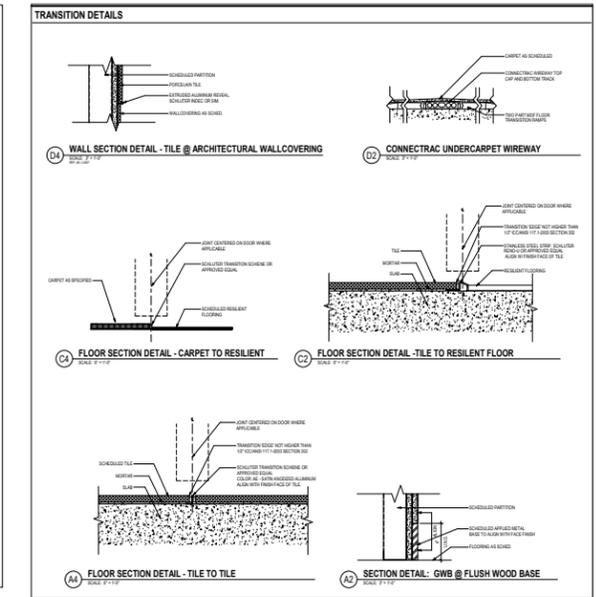
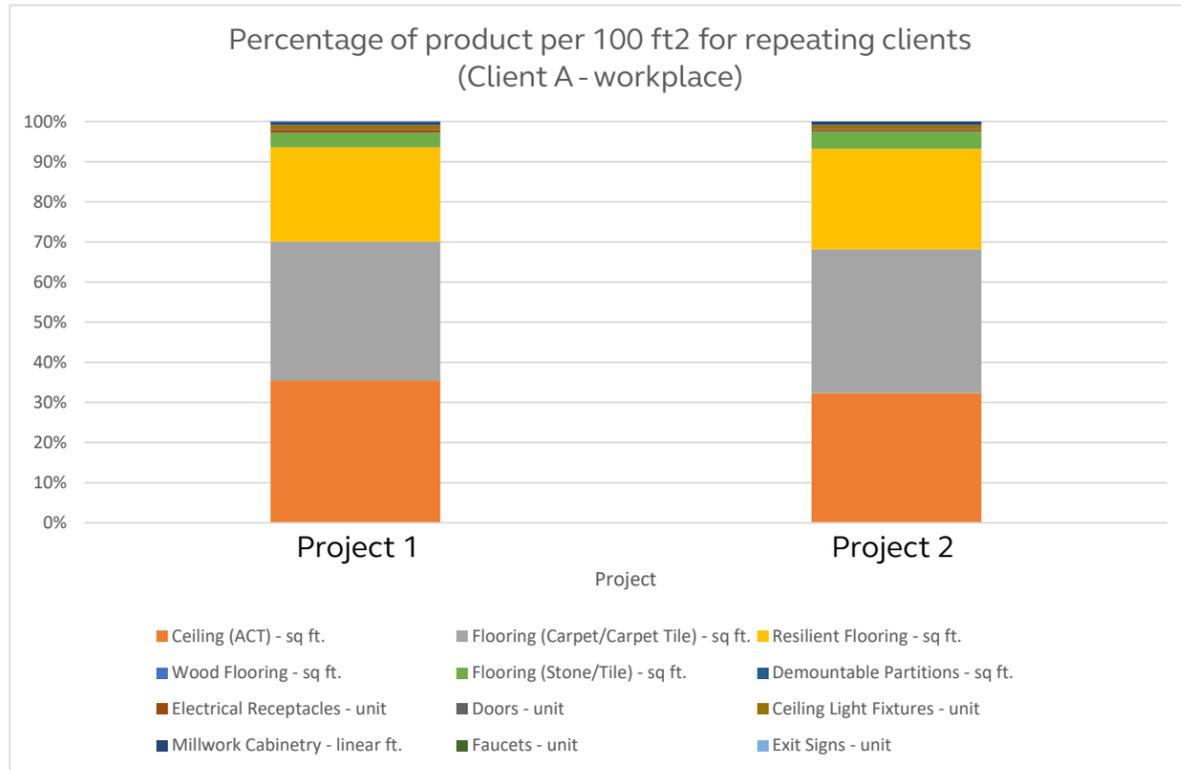


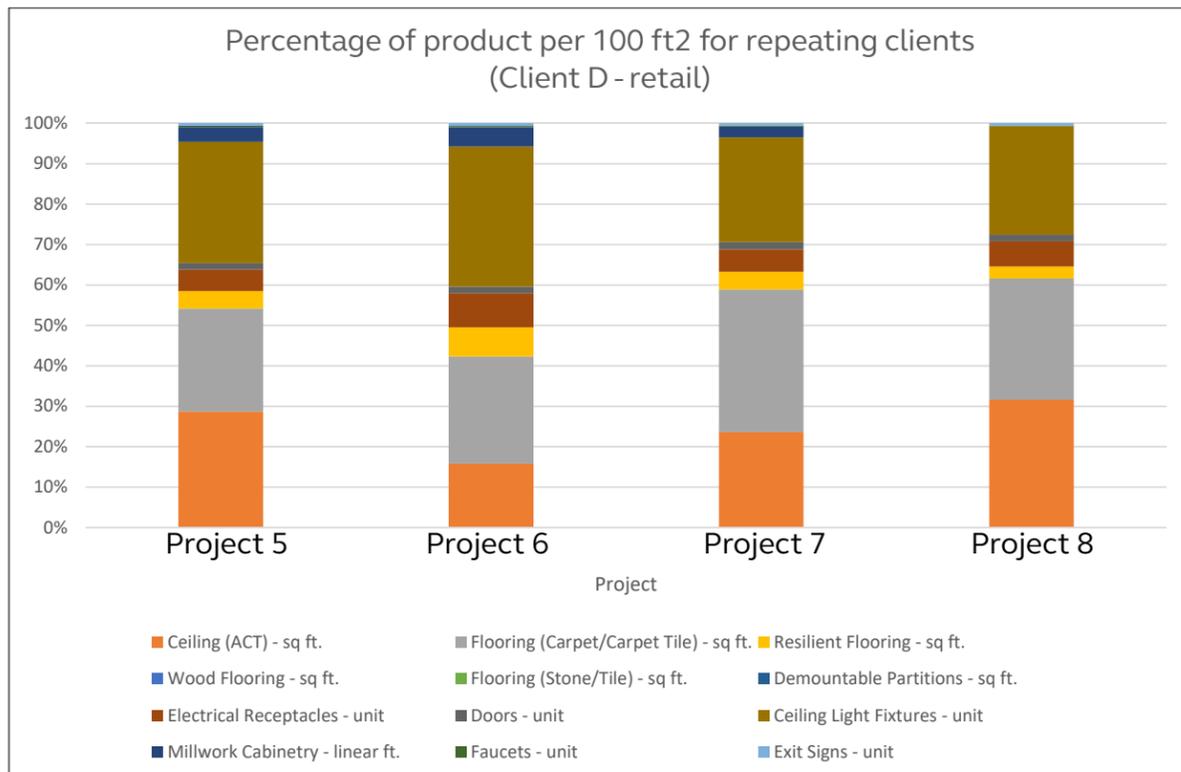
Figure 5B: Example flooring detail - workplace, Source: Project CRTKL documentation

While not differentiated from carpet tile in the charts, retail projects by Client E use a significant amount of carpet, but it is a thicker wool carpeting throughout the sales area, as opposed to carpet tile.

An interesting aspect of this may also be the difference in typical available floor depth, as illustrated by the flooring details in Figure 5, where generally workplace floor finishes are kept to minimum thickness, less than 1/2", and incorporate areas of unfinished or minimally coated flooring, such as concrete (which was not illustrated in the chart). Retail Client D does also take this approach, but other retail spaces, particularly for the smaller scale of projects like Client E, have nearly 1 1/2" between slab or subfloor and finished floor height. This gives more opportunity to work with materials like



Graph 3: Percentage of product per 100ft2 for repeating clients (Client A - workplace) Source: Author



Graph 4: Source: Author

wood, carpet, or stone tiles, that tend to be thicker than resilient flooring, carpet tiles, and ceramic tiles.

Graph 3: Resilient flooring may further be driven by specific project needs and concept, than by the use case. We see that retail projects for Client E and workplace projects with Client A had more comparable ratios of resilient flooring than the other projects.

Graph 4: This chart explores anomalies driven by specific design layouts and needs. The higher ratio of exit signs per area visible in projects by Client E are not proportional to project size, but rather due to a concept that includes more enclosed spaces that require the additional life safety wayfinding, whereas the workplace projects and the Client D retail projects utilize more open plans. Excluding Client E, the remaining projects across both typologies have similar ratios of exit signs by area.

The retail projects studied have higher ratios of ceiling light fixtures than the workplace projects. Likely this is due to retail spaces incorporating additional specialty lighting focused on merchandise, beyond general lighting for circulation.

Graph 5: Explores the variation in products used for projects with repeat clients. Repeat clients tend to use consistent proportions of products across their spaces.

CONCLUSION

While the products studied represent only a tiny subset of what actually goes into a particular space, we already see how the impact quickly adds up.

This study identified nearly 250,000 square feet of interiors, and included over 5,000 light fixtures, 2,400 electrical receptacles and 4,500 linear ft. of millwork cabinetry; in 2021 alone, CRTKL reported 148 interior-only projects in design totaling 6,298,601.35 sq. ft.

Extrapolating this further to all the interior renovations occurring in one typology, in a specific region, or even more broadly, this type of product-based data can also support jurisdictions in developing more targeted incentives and regulation to keep existing products in use, from what is otherwise an extremely complex and multi-faceted supply chain. It can also provide context for manufacturers or small businesses to evaluate new business models that consider reuse. Because of the detailed documentation and logistics already required to build these spaces, the industry has many of the tools needed to kick off projects with circularity in mind.

Beyond quantifying and evaluating existing materials, a major challenge in standardizing processes for closing the loop with existing materials is ensuring and tracking follow through on reuse

and distribution. This is where punch list apps, which are built for tagging items to their locations in a space, collaborating across trades, assigning responsibilities, and tracking tasks to completion, offer a promising and nearly ready-made option and solution at the beginning of the project process to tag existing conditions for reuse and circulate with appropriate stakeholders.

Future work could include mapping out a workflow prototype to highlight the potential actions at intervention points within a project, how the data captured at each stage may flow to different project stakeholders or even jurisdictions, to be interactive and ensure that what comes out of projects can still go back in.

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A THEORETICAL PERSPECTIVE: THE METAVERSE'S PREDICTED IMPACT ON THE PHYSICAL WORLD

Garrett Lumens



PURPOSE

From science fiction to reality, the concept of the Metaverse entered the mainstream consciousness during the year 2021. Meta, previously known as Facebook, is in large part responsible for this trend due to a re-brand; their rename occurred on October 28, 2021 (Meta, 2021). The term “metaverse” scored a 100 of peak popularity during the week of the Facebook/ Meta rename according to Google trends data which gauges relative peak popularity, while one month prior scored a four, (Google, 2021). Currently at the time of publishing this paper, the rating has dropped to a score in the twenties. Despite this drop, the introduction of “Meta” made a clear impact as the value and possibility were brought into the public eye. For this developing technology to reach its potential, this increased level of public awareness is critical.

While there are many examples of attempts at a living Metaverse, there are also many challenges before a fully realized Metaverse can exist. Despite the current limits, predications by Gartner indicate that 25% of people will spend at least one hour per day in the Metaverse within the next five years (Gartner, 2022), or mathematically put another way, that is the equivalent of eighty-three million years of human activity per year. Time is money, but so is actual money, with \$225 billion worth

of Metaverse digital assets expected by 2027 (Adegeest, 2022). Forecasts are not the only indicators of the Metaverse potential. Spending on Metaverse research and development has seen a noticeable uptick as well, from \$29 billion in 2020 to more than \$120 billion in just the first five months of 2022 (McKinsey & Company, 2022). These investments are made in hardware, software, and everywhere between.

Video games are a natural environment to leverage this modern technology given their similarities, but the adoption does not begin there. Education, entertainment, healthcare, fashion, and even governments have been exploring ways to leverage the newly anticipated technology. As with most new technologies, the general understanding is still growing and changing. This presents an opportunity to be at the front of the possibilities. With high investments and even higher expectations of the Metaverse, it is important then for a critical mind to understand what the Metaverse is and associated potential for the built physical world. For those individuals invested in the architecture of the physical world (or the “meatverse”), how will it be disrupted, changed, or impacted by the Metaverse”?

DEFINING THE METAVERSE

What exactly is the Metaverse? The term was first used in Neal Stephenson's 1992 book *Snow Crash* (Stephenson, 2008). As summarized by CNBC, Stephenson's Metaverse "envisions a virtual reality-based successor to the internet. In the novel, people use digital avatars of themselves to explore the online world, often as a way of escaping a dystopian reality." (Huddleston, 2022). The current real-world version of the Metaverse is still developing and evolving, therefore does not have a constant and agreed upon universal definition. An entire book could be dedicated to defining what is the Metaverse, but for the purposes of this paper, the definition can be noted as a *shared, 3D digital experience with persistence and user individuality*. It is important to note that the Metaverse will not replace the internet or computers. Just as the smartphone did not replace the desktop computer, and the computer did not replace books. There are situations that will be more appropriate and conducive to a certain format. The Metaverse will be a new weapon in the arsenal of possibilities.

EXAMPLES OF THE METAVERSE

Despite a new public spotlight and public interest, precursor examples already exist in pop-culture, just without the associated tag of being a "Metaverse". The 1999 film *The Matrix* was a prime Hollywood version of a

Metaverse set in a dystopian future with humans unknowingly living their entire lives in a virtual space. Loose examples have not been limited to viewership, as virtual platforms allowing human control and interaction have also persisted. *World of Warcraft* is an online game initially introduced in 2004 by Blizzard Entertainment; it is a space where players could choose their characters appearance and garments worn, build character experience and backstory, interact with others from elsewhere in the world, all in a virtual environment. (*World of Warcraft*, n.d.).

The most direct example is *Second Life*, self-described by the owner Linden Labs, it is "the pioneering virtual world that's been enjoyed by millions of people and seen billions of dollars transacted among users in its economy" (Au, 2008). Launched in 2003 and having only 15,000 users within the first year, the *Second Life* world has persisted and as of 2021 had 200,000 average daily users with more than seventy million registered accounts. *Second Life* is a space that has its own economy and ownership with the ability to define your own character/avatar and live the life you choose.

A more modern example, *Fortnite* is an online video game developed by Epic Games, released in 2017. Originally created as a game, *Fortnite* has since branched into other forms

of entertainment. In 2020, the nine-time Grammy nominated singer, Travis Scott performed live within *Fortnite* to 12.5 million viewers. *Fortnite* leveraged their platform beyond the game and expanded their influence. Despite this attempt, the platform still fell short of a "true" Metaverse. Due to the limited capacity of each in-game world having only 100 individuals, "While Epic Games can rightly say that more than 12.5 million people attended this "live" concert, attendees were split across 250,000 separate copies, meaning, they watched 250,000 versions of Scott's performance that did not even start at the same time" (Ball, 2022). Furthermore, the data for the performance environment was preloaded to each viewer's computer via a game patch prior to the concert.

Other games, such as *Minecraft* and *Roblox*, have similarly created common environments for their players where opportunities exist to create worlds, effect other players in a semi-permanent way, and harken to the notion of a Metaverse. These examples still lack some fundamental pieces of the modern Metaverse but are examples that get closer to being an example of a true Metaverse.

With technology evolving, the most recently developed examples are becoming closer to this reality. The most known examples that are most closely align are: *Meta Horizon*

Worlds, *Decentraland*, *Sandbox*, and *Cornerstone*; each with varying strengths, focuses, and challenges.

- *Meta Horizon Worlds*, it is a low fidelity environment focused on people interaction and connection to other Meta owned tools, thus the reality of a centralized platform. It is built on the idea of data mining from its users' experiences, much like the reality of how Web2.0 functions.
- *Decentraland* is a complete break from the current ownership mentality in that everyone who buys into the ownership of *Decentraland* has a voting say in all decisions. This environment is entire decentralized with the content being user created and controlled.
- *Sandbox* is similarly structure with land ownership, a self-contained economy, and a voxel (3-D pixel) based graphic system. Though this system creates unique opportunity for users to develop and monetize their own creations, to purchase and own digital assets (e.g., land, NFTs), they are still far from the realistic and immersive experience that many strive to achieve.
- *Cornerstone*, while is not yet available to the public, it presents itself as attempting to fully align with the above definition.

Only time will tell if the aforementioned examples, or even any other platform, truly deliver on the ideal. Despite these platforms being nascent, their current limits are at least in part because of challenges outside of their

own direct control since they rely on share networks, technology limits, and other greater societal issues.

Despite the challenges that currently exist, technology is improving, investments are increasing, protocols are being developed, and a full-fledged Metaverse seems more of an eventuality than only a possibility. With a collective understanding and foundation to build upon, what does this mean for the physical built environment? Where does an Architect fit into this new world and how should their unique expertise be leveraged?

METVERSE MEETS MEATVERSE

How will the metaverse impact the built environment? Several modern-day examples are useful to consider when exploring how the metaverse may impact the built environment. These include:

- The iterations anywhere in-between, including a gym that surrounds the treadmill with interactive screens that create a unique space for you to explore, with others also exploring this space, and providing the opportunity for virtual human-to human (Chang 2022). As noted by Alex Kuttner, a BMW M Engineer, "...we are not only here for selling products. We are here for selling emotions and experiences. These two things combined in mixed reality are only the start of something really

great in the future." (Swant, 2022).

- A version of the internet café, where an experience-based retailers focus on putting participants into a full immersive Metaverse experience. As technology becomes more readily available to the average user and therefore is priced so each person could own their own at home.

One of the most anticipated uses of the Metaverse, is marketing; anywhere that people spend their time presents an opportunity for marketing and promotions. The Metaverse will be no exception. Physical retailers will soon identify the appropriate method and space for sharing context with those exploring the Metaverse. This could be through background billboards in highly populated virtual areas, games bearing branding, NFT products, or promos that tie back to physical prizes. Fast-Food restaurants have leveraged all of these opportunities and even provided opportunities to feel the rush of working the service counter (Meisenzahl, 2022). Advertising takes place entirely in a virtual space, but can tie back to real world products, rewards, and a company's overall branding. The Metaverse can be another platform to consider incorporating into an Omnichannel advertisement plan.

One of the most unique realities of the Metaverse, is the ability to highlight individuality and present oneself to the world in whatever form desired.

It is logical then that the fashion and beauty industries are the first to jump in with heavy spending (Schultz, 2022). The high success of Instagram filters is an illustration of this same concept, just in a much more limited form. This digital fashion exploration will foster a new acceptance of unique self-expression which can impact the physical market and fashion trends. In some instances, consumers will want a direct association between their digital avatar and their physical wardrobe. Fitting rooms may need to have a digital interface to load an avatar wearing the same outfit. Or taken further, an individual could use an avatar to peruse new clothes, with only those that look good on your avatar being worth physically trying on. A similar premise is already used by Walmart, though currently only in a digital environment with virtual ordering (Hart, 2022).

Once an avatar is configured, it can be leveraged for virtual meetings. Video forward meetings have boomed in popularity in recent years, but it is recognized that this format loses parts of the human experience. No longer are people able to share in the same space or same experiences in the same way. With employers moving to accept remote working environments, the challenge is exacerbated in trying to find a balance in providing in-person and remote employees with equal experiences.

Virtual meetings in a shared Metaverse space could level the playing field, including higher engagement and sense of togetherness (Pickup, 2022).

Virtual meetings could also be used for educational experiences. Educational institutions will need to account for a more variable student body and more modern approaches to education. Why talk about a historical event if you could instead live it and participate in it? Universities have come to this realization and have already developed a virtual experience (Virbela, 2022). While some of this education is not through a formal education entity, but through a general sharing of knowledge.

This new format for education also extends into professional life, with companies finding ways to improve training processes while saving time and money in the process. Both Emirates and Lufthansa airlines are training flight attendants in a partially virtual environment, saving the time and cost of having real planes grounded for the purposes of these trainings (Ultra Leap, 2022) (Maszaczynski, 2022). The United States Military is looking to leverage this technology to explore challenges virtually, that otherwise could not be experienced without a risk of life or injury (Cabanah, 2022).

Studies have shown that recovery after surgery can happen faster, with less complications, when the patient in a

simulated environment. Meditation can also be more controlled and effective when placed in a virtual space (Morgan, 2022). A Metaverse yoga studio could leverage the peaceful nature of a space and place participants in a natural environment, despite whatever the reality of their actual surroundings. It is also useful to note that a Metaverse experience can remove barriers for those who otherwise struggle with disabilities (Lew, 2022).

This interaction between the Metaverse and the physical world does not have to be a direct either/or but could instead be a combination with layers of digital information associated to a specific physical space. Consider the lobby of your office, a blank wall that could show each visitor's own chosen favorite work of art, or a non-existent screen in your physical living room that ties to a virtual living room (McKenzie, 2022). Famous works of art could be digitally layered on every street corner with each person having ability to personalize their experience. Further, the physical space could be affected by exports from the digital space, such as a restaurant theme based entirely upon the owner's purchased NFTs (Abiodun-Victoria, 2022). The shift of the dining experience does not have to stop there, as the entire dining experience could be altered by a virtual environment. One example, consider the heightened experience presented by the trend

of eating in the dark (Roberts, 2020), what if you could eat while on in an entirely replicated space such as on the moon, in a different era, or even in the mess hall of a Klingon Bird of Prey. The Metaverse provides the opportunity to take any experience and change it.

Not all impacts of the metaverse will be directly visible to the end consumer. Many companies are exploring how data from a digital twin can improve efficiencies and otherwise streamline processes (Caulfield, 2021). The base concept of a digital twin is in creating a replica in the Metaverse of a physical space, with data from the physical space tracked and added to the digital. This data is then reviewed and used to run simulations to find methods of improvement. As long as the infrastructure is in place, this notion of a digital twin can be scaled from how a single person uses a space, how a single building operates, or even how an entire city functions and flows (Goldstein, 2021).

Some impacts will be direct to the physical world though, as some Metaverse entities are tying in digital experience events to those in the physical world. For instance, Blockchain company, Aloki will plant a real-world tree after each virtual tree is planted within their Metaverse experience, though this platform is not slated to open until 2023 (Adamowski, 2022).

Despite all of the aforementioned opportunities, the most obvious and currently the most used avenue of the Metaverse is for entertainment. A growing list of performers, Travis Scott, Ariana Grande, Post Malone, and Justin Bieber are exploring this as a means of connecting with a different audience and achieving a new income stream (Tien-Dana, 2022). Video games are currently the largest market, as developers are most familiar with the platforms, and the users are most comfortable with the technology.

The Metaverse is much more than a game though. For the Metaverse to reach its full potential, everyone may need to accept that some experiences will be entirely replaced by the Metaverse, some will be enhanced by it, and some will not be impacted at

all. It is up to each decision maker and each user to realize where does their specific reality fall. The reality is that the above examples do not live in a fully realized Metaverse environment, nor could they since that space does not yet exist. Once it does though, these adaptations and additions to the physical world will have the ability to live in a single digital environment, allowing for a seamless experience for those who choose to enhance their physical lives.

CONCLUSION

Architects have a unique opportunity to work in a world between the digital and the physical to help occupants choose their path and focus on their individual path forward. There are many ways to leverage the Metaverse, ranging from fully immersive experiences, building



Virtual reality studio, CRTKL Mexico City office, Source: CRTKL

connectivity between the physical and the real, or by emphasizing the uniquely physical traits of a Metaverse space. The Metaverse does not have to be all or nothing; it is up to each individual user to help define what it means to them and how they want to use it, and this holds true for physical spaces, especially those in the retail sector, as retailers must decide how their customer wishes to experience sales. Some will likely find that the Metaverse be entirely ignored with their entire focus then on Meatverse experiences like touch, taste, and smell. Conversely, some will find that a highly digital experience is more appropriate for their customer, their product, or their process.

Architects may not be the lead developers of the Metaverse, but they must be acutely aware of its possibilities and development as it is likely to have significant impacts on the spaces and experiences they design. The key to successful incorporation of the Metaverse for Architects, retailers, and seemingly all of society seems rooted in being intentional with how, where, and when it is incorporated.

As technologies improve and a fully functioning Metaverse comes into existence, all assumptions will need to be reevaluated. New technologies create new opportunities for those willing to think beyond the systems already in place, and the Metaverse

is no exception. As major advances take place in technologies and opportunities, further study should be explored. Extra attention should also be paid to the current trends against technology, resource shortages, and those of remote work, as all could have significant impact to what is desired, and thus, useful. This paper was written from the perspective of an industrialized country, which impacts the perceived value and capabilities of the discussed tools. As this paper is forward thinking, future looking terms and statements are predictive for the sake of inducing thought.

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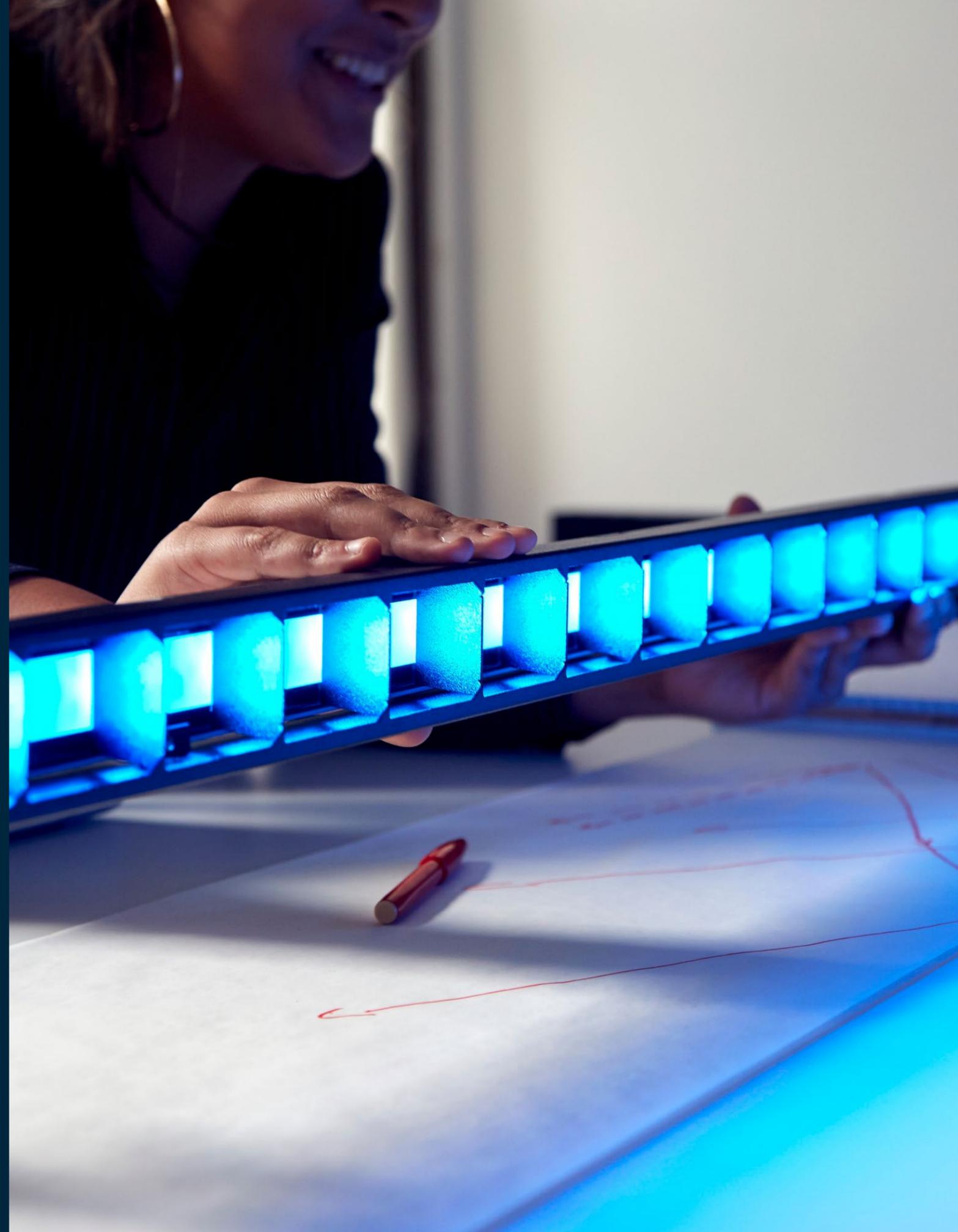
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PART 2

INNOVATION



COMMUNITY-BASED VIRTUAL CARE IN THE THIRD SPACE

Julie Mendoza, Mario Sanchez, & Vincent Riden



PURPOSE

With health equity being a global crisis, this research aims to improve global community wellness by designing a potential solution for better health outcomes within Medically Underserved Areas. Through additional analysis of other Medically Underserved Areas throughout the U.S. research strategies implemented by our team can be applied to other communities to address their unique social and cultural needs. Furthermore, as a mix methods studies, this research aims to understand populations as people, not numbers, and design for each community as a series of individuals with unique wants and needs.

This study expands on a [previous published study](#) conducted in 2020, investigating the feasibility of applying telehealth technology in medically underserved areas to improve access healthcare. This study assesses the potential health improvement opportunities in Pleasant Grove, a socioeconomically and medically underserved community within Dallas. This community faces numerous challenges, with the convergence of a lack of technology, food, and medical access. The focus of this effort is to develop and evaluate a novel health solution in a community where access to both physical and virtual healthcare services is limited, expanding on previous research and innovation. To do this, we developed a prototype care

delivery space, “the third space”, to be located in gas station convenience stores in Dallas, Texas, and conducted user surveys to gather feedback.

CONTEXT

The neighborhood of Pleasant Grove in Dallas, TX., is classified by the U.S. Health Resources and Services Administration as a Medically Underserved Area (MUA), or a geographic area that lacks access to primary care services. It is also defined as a Health Provider Shortage Area (HPSA), which is meaning there is a shortage of primary medical care, dental or mental health providers in the area. Pleasant Grove also faces a number of additional challenges, including high socio-economic need, internet connectivity, and food access. The initial research conducted in 2020, showed gas stations to be the type of business most prominently accessible in this zip code. Through conducting in person observations to understand how people interacted with the gas station convenience store, the 2020 study confirmed that gas stations are integrated into the community and may serve as a potential desirable location for in-person virtual care visits. It was determined that a hybrid typology of what the traditional convenience store provides could be a method that encourages a better relationship with health while solving for the specific

community needs, in places already integrated into the community.

For the purpose of this study, a designed prototype was developed to address the two leading causes of death within the Pleasant Grove area zip code of 75217. The two leading causes of death as noted in the National Center for Health Statistics are heart disease and cancer (CDC, 2017).

Heart disease is the leading cause of death in Pleasant Grove, with coronary artery disease having the greatest impact on heart-related morbidity. Hypertension and diabetes are co-morbidities often treated at the same time as heart disease. Some of the interventions to treat heart disease include:

- Diagnostics: EKG, Holter monitor, stress test, Xray, Angiogram etc.
- Blood work/labs
- Routine physical examinations
- Blood glucose monitoring and diabetes maintenance
- Blood pressure monitoring
- Access to healthy food
- Exercise/open space in community to encourage activity

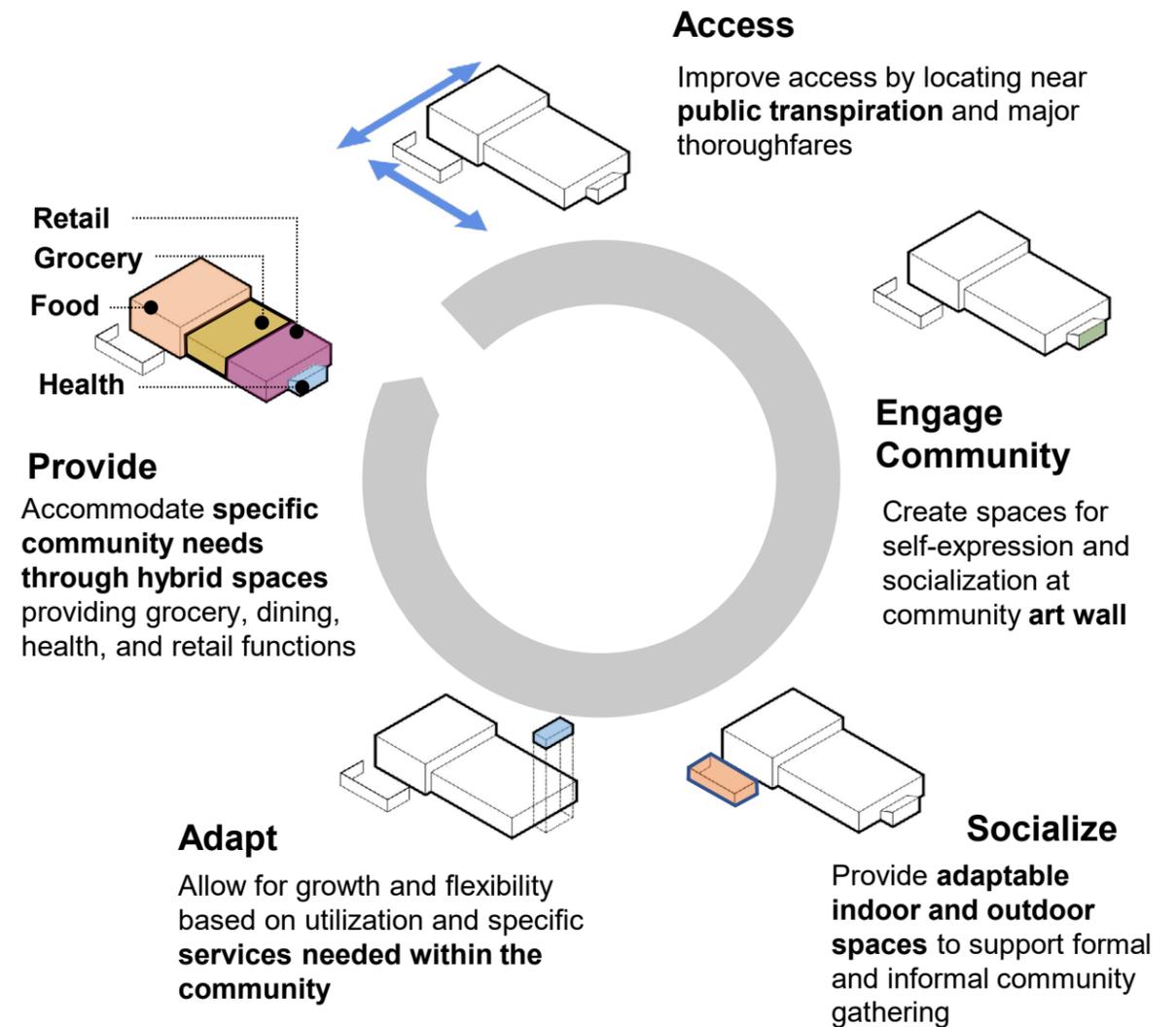
Cancer is the second leading cause of death in Pleasant Grove, Dallas. Lung and breast cancer are the primary forms of cancer impacting this community. Health interventions may include:

- Early screening and routine/annual physical exams
- Blood draw/diagnostics
- Health education
- Radiation Therapy and Chemotherapy treatment

Pleasant Grove also experiences high death rates associated with influenza, which can be attributed to the low percentages of immunizations. Preventative care is also a concern for this population and ensuring health literacy and access to immunizations and vaccines is critical to avoid preventable illnesses (CDC, 2017).

DESIGNED PROTOTYPE

A telemedicine care delivery model that combines mobile diagnostics with a permanent preventative care pod model at gas station convenience stores could be used to improve health and wellbeing serves as the hypothesis. The convenience store provides a place for mobile diagnostics to be marketed to the community, encouraging proactive health engagement. There is also an opportunity to combat the lack of access to healthy food options in this community by selling healthier food options to the community. This new model, a ‘telepod’, for the gas station convenience store would prove a space that holistically encourages wellness and health engagement.



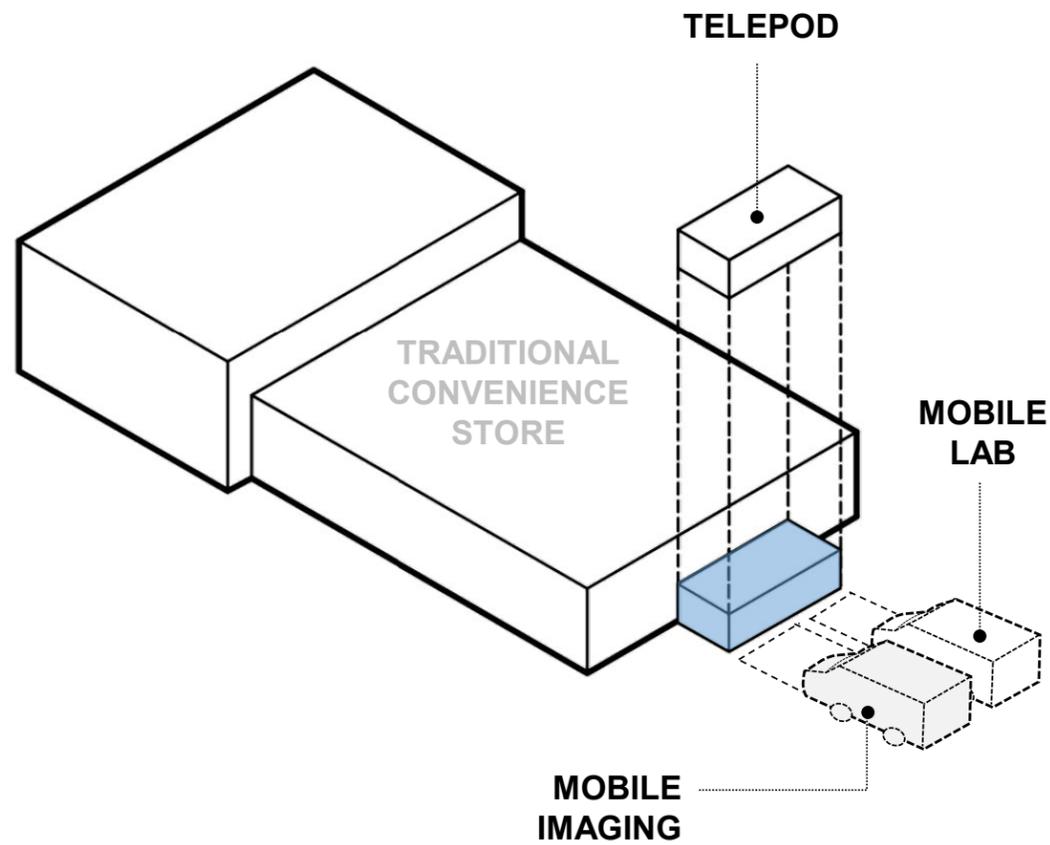
This Operational model locates the third space to promote accessibility, provide for various community needs, and engage community in multiple ways. The space would be adaptable to multiple functions and have opportunity for growth depending on specific community needs.

Pros to tele-visits:

- No wait times
- Convenience
- Great for kids
- COVID/infections

Cons of tele-visits:

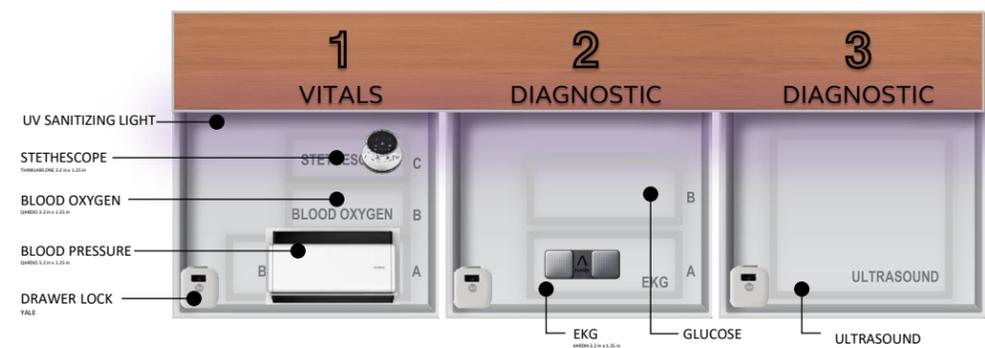
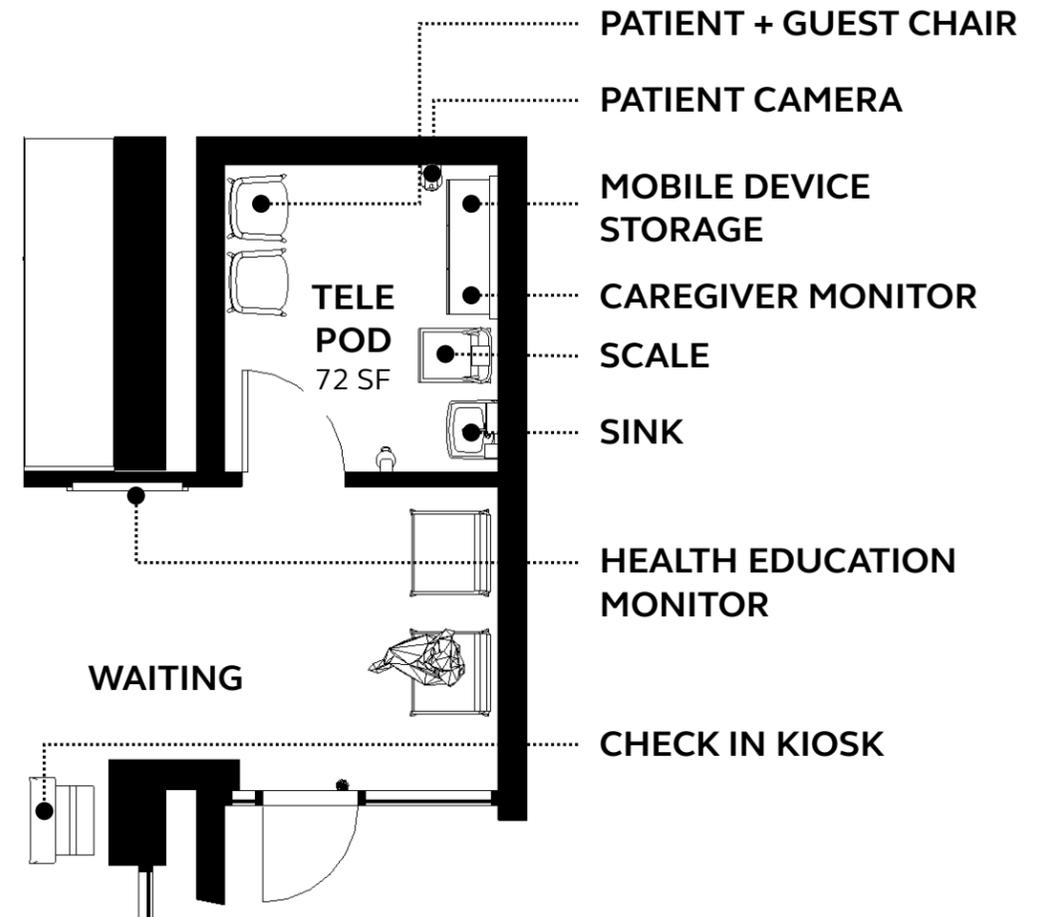
- Concern with not being able to convey health concerns or gauge pain over the phone
- Quality of connection
- Quality of photos sent to physician
- Some visits require physical tests
- Insurance makes scheduling complicated
- Parking could be an issue



The design is adaptable by providing a “plug-and-play” strategy for services. Mobile Imaging and Lab services could be scheduled on a consistent basis. The pod design can also be duplicated to expand services in areas with greater utilization.



Caregiver Interface, Source: Author



Source: Author

Within the room design, check-in occurs at a kiosk, and patients would be able to meander the convenience store and be notified of their appointment start time via text. Upon entering the room, the patient would be greeted by a caregiver on a large monitor with video capabilities. The monitor integrates translation services for improved understanding by non-English speaking patients. Within the room, the sink allows staff to provide physical, in-person care in the space on certain days as needed. The guest chair provides space for children, caregivers, or other family members during visits. Medical-grade devices are located in the room on numbered drawers. Patients would be instructed on what devices to use and how to use them by their caregiver, and results would be instantly visible to the caregiver on their computer.

Based on the types of portable medical-grade devices on the market, more engaged monitoring and treatment of heart disease and cancer can occur within community-based telemedicine environments. The technologies available that could be useful in this prototype are summarized in Table 1.

TESTING THE DESIGN PROTOTYPE

A virtual survey was distributed to gather qualitative information regarding the design and location of the telepods. The intent of the survey was to understand user experience and needs of a general population. Questions specifically focused on gathering design, process, and location feedback, with emphasis on prioritizing health, safety, and community integration. There were a number of questions to understand each participants existing relationship to health, typical provider engagement, health literacy, demographics, and their perception of the gas station convenience store. Participants were asked to view an augmented reality vignette of the pod room and provide their thoughts. The survey was administered to participants living in California and Texas with 34 respondents completing the survey.

The survey findings revealed numerous opportunities for design improvement to the telepod design. Suggestions ranged from adding furniture and/or

fixtures such as a mirror, phone charger, end tables, and plants to help the space “feel cozier” to noting concerns with accuracy and instructions to using the available telepod technologies. Concerns mentioned pertaining to the gas station convenience store stemmed from cleanliness, acoustics, and privacy issues.

While the initial intent of the survey process was to distribute an in-person survey to participants in the Pleasant Grove community, time constraints made it difficult to identify participants easily. Technology literacy impacted the completion of this survey. The survey required participants to view a link to an augmented reality model, which may have been difficult for some users to access. For future data gathering and additional testing, in-person interviews would be ideal.

Heart Disease	Diabetes	Hypertension	Cancer
<ul style="list-style-type: none"> EKG Mobile vitals Continuous24-hr Holter monitoring Mobile blood draw Remote Pacemaker monitoring 	<ul style="list-style-type: none"> Continuous glucose monitoring (CGM) Lab testing 	<ul style="list-style-type: none"> Blood pressure monitoring Education Wellness apps and mobile monitoring 	<ul style="list-style-type: none"> Monitor side effects Mobile Imaging Mobile IV Mobile blood draw and urinalysis

Table 1: Available Medical Devices / Mobile Technology according to Pleasant Grove medical needs, Source: CDC

NEXT STEPS

Our team plans to update the design based on initial feedback, provide further clarification regarding how the space can be used along with an estimate of total cost of construction. Once a finalized design and cost is determined, our team anticipates engaging in discussions with health systems and others regarding prototype testing. The hypothesis of locating the third space telepod at gas station convenience stores is a strategy specifically for this community in Pleasant Grove Dallas, TX., which has a number of gas station convenience

stores. As we finalize design, it is imperative to consider how this model can apply to rural environments and other medically underserved urban environments in an overall effort to improve health equity.

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UNPACKING SOCIAL VALUE: DEVELOPING THE SOCIAL SCOUT

Nathmya Saffarini, Federica Buricco, and Ekaterina Dziadkovskaia



PURPOSE

Social value is an intrinsic aspect of good design. As architects and designers, we often embed it without specifically identifying it during our design process. However, to maximize it, we need to not only demonstrate its value to clients, but also know how to implement it in the most effective way. Currently, the industry is struggling with both, therefore this study's objective is twofold. One, to identify a practical holistic way of measuring social value and secondly, to create a simplified go-to instrument for architects and designers to address and implement the social value in their projects.

Social value for the purpose of this project can be defined as *'the quantification of the relative importance that people place on the changes they experience in their lives'* as noted in the national network, Social Value UK (<https://socialvalueuk.org/what-is-social-value/>). Social Value UK outlines eight principles that further define social value and social impact, these are:

1. Involve Stakeholders
2. Understand what changes
3. Value the things that matter
4. Only include what is material
5. Do not overclaim
6. Be transparent
7. Verify the result
8. Be Responsive

These principles, when applied, allow projects to create consistent and credible accounts of the resultant social value impact a project has on its stakeholders and wider community. However, these principles are not fully understood by architects and designers, and they do not form part of a clear design workflow. To better deliver social value, a number of tools have been developed over the years by a variety of parties ranging from Government groups to architects and housing associations. A review of these tools, currently in use within the architectural industry, was performed to identify key themes that could be addressed on architectural projects and evaluate the methods used to measure any associated outcomes including the Social Value Portal, RIBA Social Value Toolkit, TOMs and HACT.

The built environment creates value for everyone who uses and interacts with it, not just its immediate users. This project aims to increase our understanding of the impact of design decisions and projects have on the wider community. Social value traditionally was not viewed as having a return on real estate investment however clients are now asking architects and designers to demonstrate the real value in designing inclusively, not just for the immediate user. There has been a rather poor perception that success, when it comes to people, is only measured

through footfall or occupancy levels. This project explores the creation of a tool to allow architects and designers to better understand and, ultimately, quantify the impact of their work.

A pilot version of the “SocialScout” tool was created to guide architectural teams through this complex topic in an effective and user-friendly way. Currently in prototype form and under testing within a large global architecture firm, the strategies highlighted within this paper offer examples of how to implement elements or themes of social value in current projects.

CONTEXT: EXISTING TOOLS ANALYSIS

Since Social Value Act 2012 was implemented in England, it has become increasingly important for public sector procurement, contracts, and planning (UKGBC, 2019). The value and impact of Design and Placemaking on various communities is widely recognized. Organizations such as HACT (Housing Association Charitable Trust) have been developing social value proxies for use by housing associations and local authorities to collect information on their portfolios, but until now no toolkits have been developed specifically to capture the social value of all types of design.

Social Value Toolkit, RIBA

The Social Value Toolkit for Architecture has been developed by Royal Institute of British Architects (RIBA) to make it simple to demonstrate and evaluate the impact of design on people and communities, outcomes that are increasingly considered as social value benefits in public policy and procurement. The toolkit presents a library of questions for practitioners to use in the duration of projects and to revisit them once built. The questions are based on assessing existing research on key indicators of wellbeing. It argues that the social value of architecture is revealed in the extent to which it fosters positive emotions. This can be through connections with nature, offering opportunities for an active lifestyle, connecting people and the environment in appropriate ways, providing freedom and flexibility to pursue different lifestyles without conflict and the ability to participate.

RIBA launched this toolkit for architects to use on their projects. It is open source and presents a library of ideas that can be individually tailored to assess the impact of projects on people and increase shared learning in a wide range of circumstances. The limitations of the toolkit include:

- It is designed only for housing.
- It is post occupancy questionnaire.
- Useful for adjustments and amendments, not for early stage of projects.

TOMS, UK Government

The National Themes, Outcomes and Measures (TOMs) Framework is increasingly being used by local authorities in the UK for procurement and now includes a Real Estate Plugin (TOMs, 2019). TOMs Framework aims to provide a minimum reporting standard to help buyers measure and justify the pursuit of social value outcomes in their contracts. It provides a robust, transparent, and defensible solution for assessing and awarding tenders, which is especially important for the public sector. The limitations of this framework include:

- It is more for business and organizations rather than for designers.
- The framework is designed to keep track of multiple projects rather than focus on one.
- Most of the goals refer to the creation of jobs.

Happiness by Design, CRTKL

Global architecture firm, CRTKL, worked with an Egyptian residential developer, Mountain View, whose CEO had created his own company based on the values of happiness, and with Delivering Happiness, a Zappo’s consultancy that specializes in coaching organizations and places to create happy cultures (Happiness-Now More Than Ever) to develop metrics focused on happiness. Based on the science of happiness and the science of design, the dynamic

document or system produced provides a roadmap to make better connections between buildings and the people who inhabit them. With the basic components of happiness designed, CRTKL sought to create a system of metrics, to understand the effects of each component. The metrics consist of a comprehensive baseline survey, as well as a series of ongoing “pulse” touch-base surveys to connect with people in an ongoing dialogue. The baseline survey is organized by The Five Truths and provides qualitative data that is analyzed and visualized in Power BI. The limitations of the roadmap include:

- The tool is based on a post occupancy survey.
- The outcome is limited to project types
- The Happiness Ecosystem Index (HEI) covers one aspect of social influence mainly (Wellbeing) which is where architects and designers have most influence. It leaves out areas such as material sourcing, designing with communities where designers also have direct impact and influence. It also leaves out opportunity creation and learning through construction. It is a tool created for the direct users and occupants.

From this analysis, none of the tools took a holistic approach to social value. Some were focused on the direct user and by doing so ignored the impact a built project could have on its immediate communities, environment,



Figure 1 RIBA Toolkit : 5 Key Dimensions of Social Value, Source: Author

and stakeholders. While others were only limited to a project type typically housing or workplace. Furthermore, there was a marked absence of a step-by-step tool or guide that could set out a workflow providing designers at every stage a clear, informed process that takes social value into account.

IDENTIFYING THE DIMENSIONS OF SOCIAL VALUE

While there are similarities and overlaps across the existing tools evaluated, identifying the key dimensions for a new tool was important. The Social Value



Figure 2: Five key Dimensions of Social Value with examples of sub themes shown. Areas where designers have most influence are shown in bold, Source: Author

Toolkit, by RIBA takes the widest most comprehensive view as it identifies five dimensions where the built environment impacts social value, noted in Figure 1. Not all of the five dimensions are immediately influenced by architects and designers. However, it is important to confirm they are clearly identified and understood by designers particularly through early stages. Out of these five key dimensions, designers and architects’ opportunity for influence

is the greatest in the categories of Wellbeing by Design, Material Sourcing and Designing for the community, with the subcategories noted in Figure 2.

For the pilot version of the “Social Scout” tool, Wellbeing by Design was chosen out of the five dimensions as the area of most influence by designers, subsequently the area that our project would develop. Wellbeing By Design is a well-covered topic in the existing tools

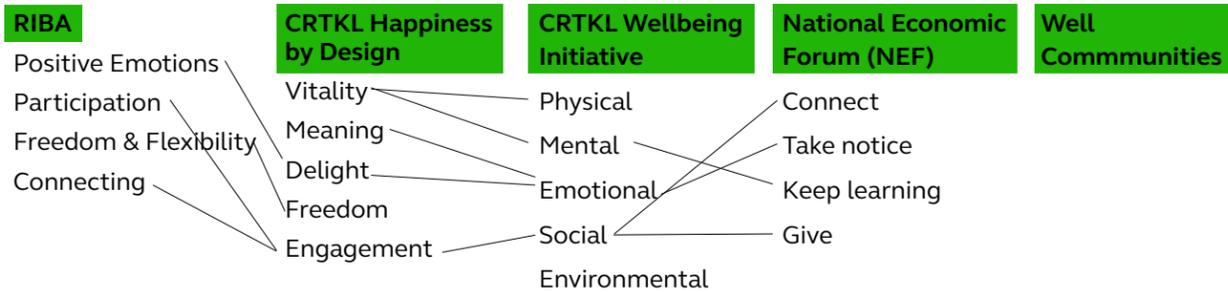
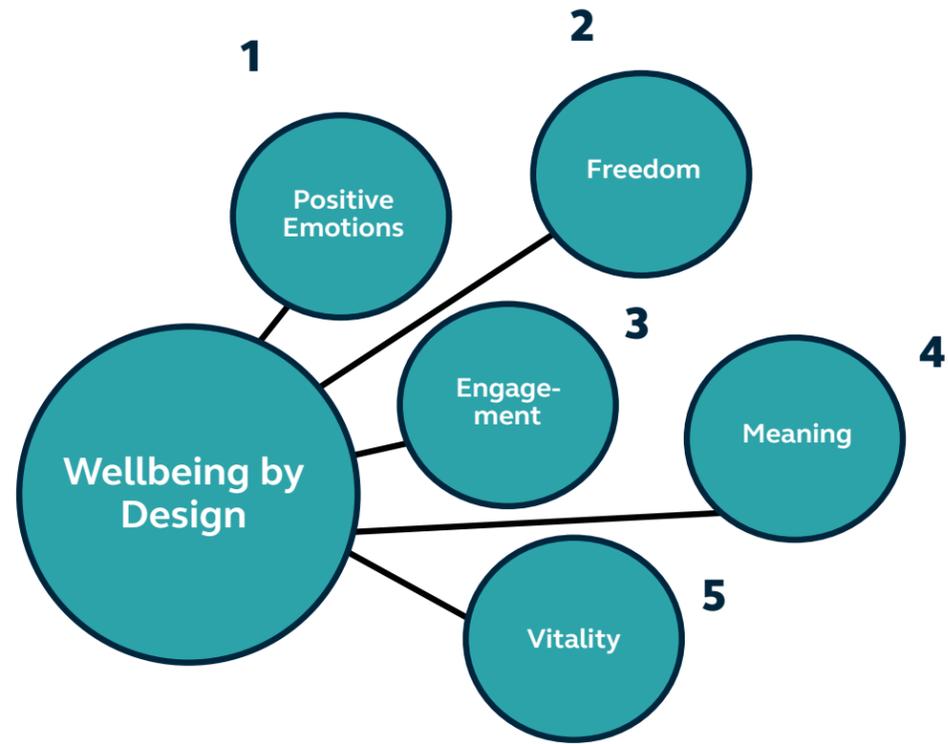


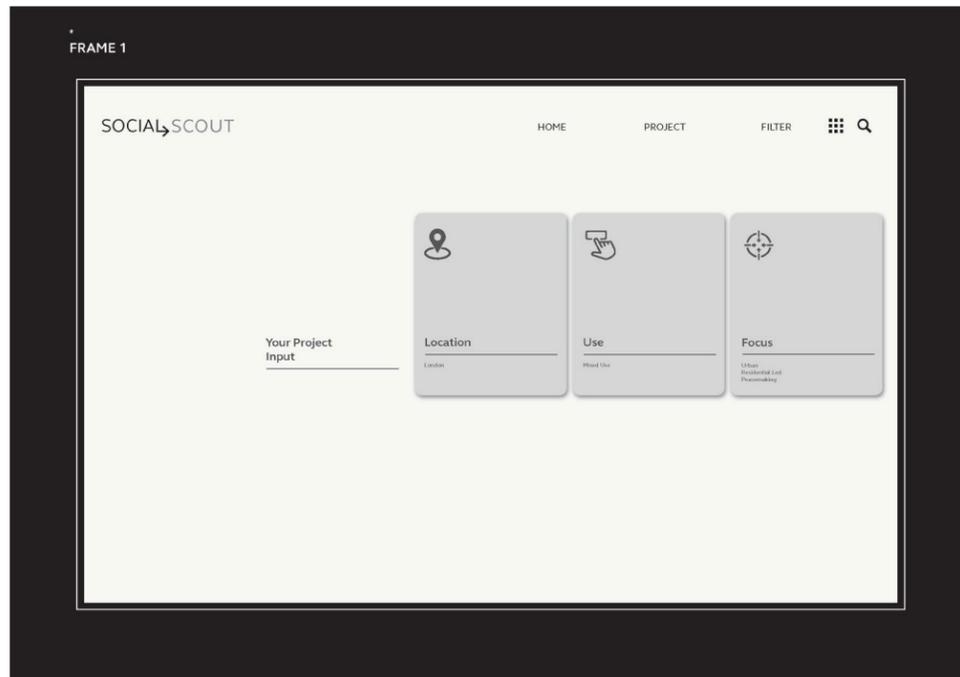
Figure 3: Subthemes of Wellbeing By Design, Source: Author

analyzed; through cross-referencing subthemes, commonalities emerged to include positive emotions, engagement, freedom, meaning, vitality (figure 3).

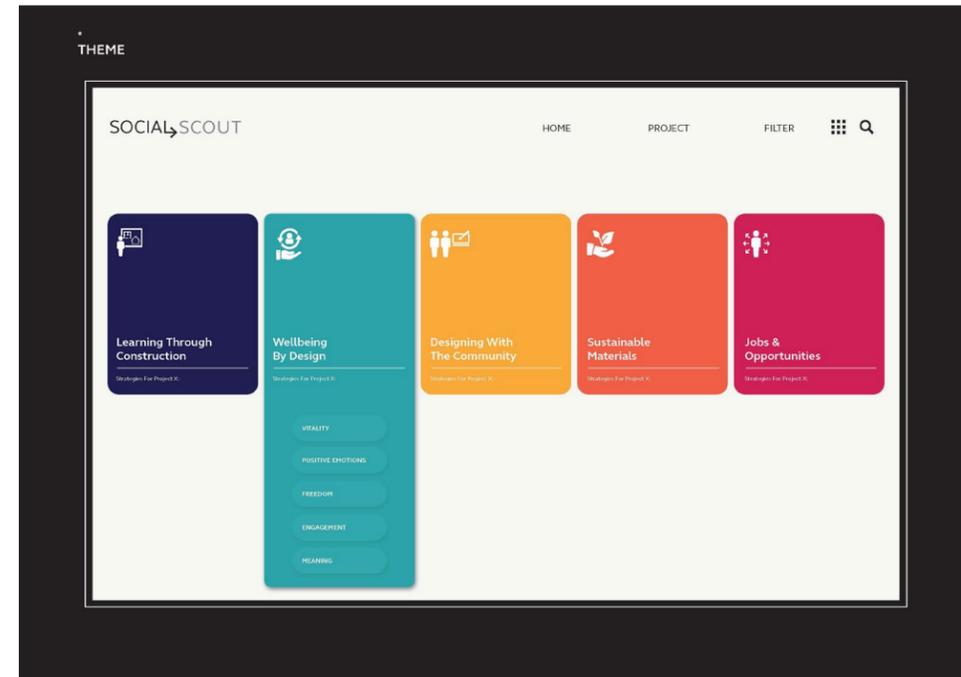
DEVELOPING THE PILOT TOOL

SocialScout is a browser-based educational tablet tool that can help designers quickly understand the social value strategies relevant to their projects. The tool eliminates blind spots that we may omit due to lack of knowledge or experience. It is meant to

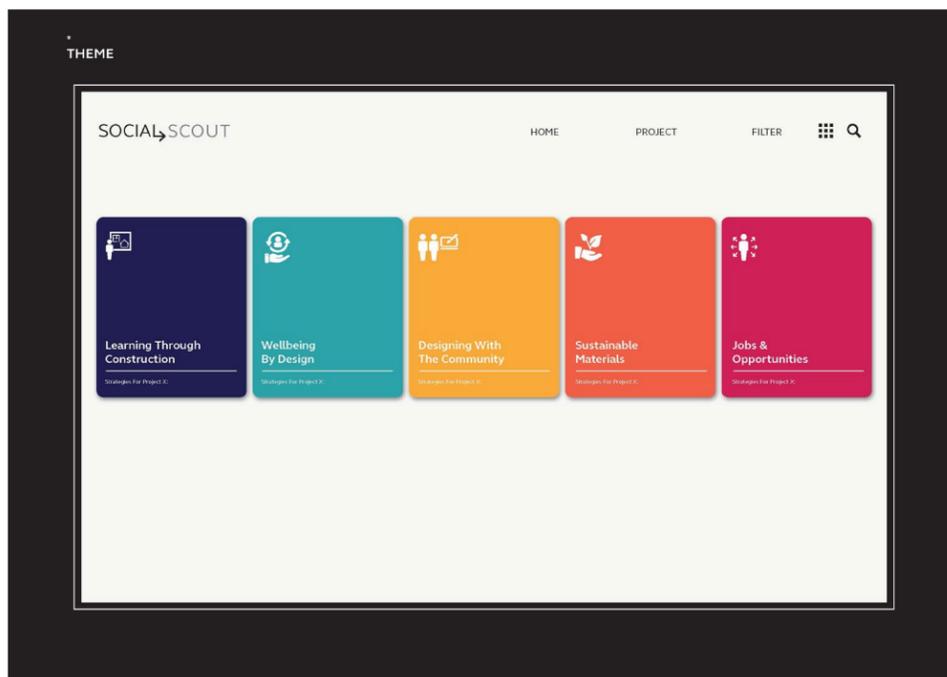
be a highly practical shortcut to design solutions, which can be documented and tested during the lifetime of the project. Design teams can learn about the dimension of social value and how to maximize it on their current projects. The SocialScout will offer real-life case studies for each strategy to support project discussions.



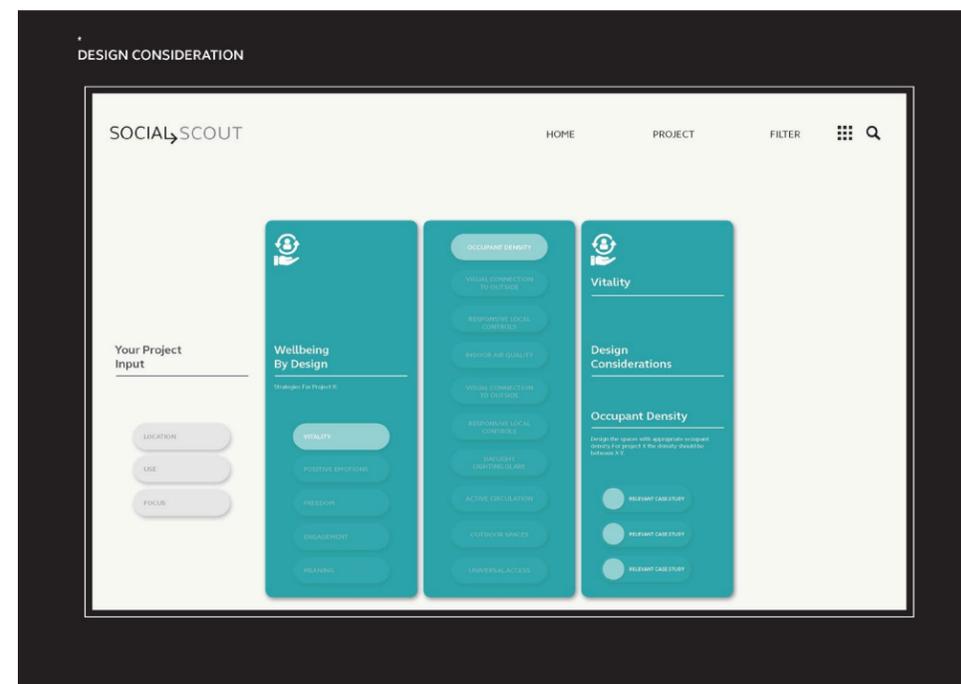
The application starts with a filtering section: the designer answers a set of questions to narrow down the SocialScout suggestions. It includes a location, use(s), and any specific focuses of the project such as event places or high-density developments. The project focus question input can be chosen from the pool of hashtags related to the case study library of the app.



As the user clicks through the Dimensions section, a preview of Themes relevant to the project is revealed. The user then selects a specific theme (e.g., Vitality; Positive Emotions or Engagement under the Wellbeing theme) to learn more about.



The Dimensions section that shows all five dimensions available in the tool (LEARNING THROUGH CONSTRUCTION, SUSTAINABLE MATERIALS, WELLBEING BY DESIGN, DESIGNING WITH THE COMMUNITY and JOBS & OPPORTUNITIES) and is rated by importance based on the user's input.



Each theme contains Design Considerations to be potentially pursued on a project. Aspects such as Occupant Density, Visual Connection to the Outside, and Active Circulation could be included. Each Design Consideration will be then explained with a real-life case study from the industry. Once the designer navigates through a number of those considerations, implementing suggested strategies on their project may become easier and enable discussions on how the project can contribute to the social value.

NEXT STEPS

Social value is a broad complex subject that is typically outside of an architect's expertise, and yet we can have an impact through the early-stage strategic moves on the project whilst consulting the clients. This is where a platform such as the SocialScout could be very helpful. While social value is an intrinsic quality of good spatial design, which is developed unnoticed, it is important to identify the design elements that increase it to maximize the overall social value on the project. Some aspects of the social value are easily quantifiable (like the number of jobs created), whilst others are of the qualitative nature and are subjective. Whereas measuring the social value on projects can be complex that it becomes unviable; that should not stop the strategies from implementation because although unmeasured, the value is still there and may be indirect.

Architects are often more aware of sustainability strategies and are comfortable implementing them in project designs, social value however frequently remains a large unknown. Therefore, developing the SocialScout tool further is our attempt to fill this void. As a next step, incorporating a Social Value POE within the SocialScout tool to involve project stakeholders could allow a measurement of the impact of specific social value elements to roll up to an overall scoring for the project. Specific elements could be evaluated while indicating the specific design consideration's weight in the overall project scoring to identify which are viewed as most impactful and subsequently improve the future practice.

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Integrating research in our design practice is a fundamental component of CRTKL's strategy to achieve our people, planet, and positive design goals. It is exciting to see how the firm wide level of research knowledge has increased in a short amount of time due to the research team's work, especially through their learning series, MicroGrants and the direct integration of research in project work."

- Pablo LaRoche, Ph.D, Principal, Sustainability Leader

CRTKL

CRTKL Research uncovers the relationships between human behavior and the built environment. Our work translates data and tests ideas to generate solutions that inspire teams and clients. The results are smarter design decisions and richer built environments. Our ability to think practically and strategically goes beyond these white papers to directly impact project work.



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