Slow Observation: A Preliminary Study Using Photogrammetry on the Built Environment to Discover Latent Longevity Needs

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Abstract. This preliminary study introduces slow observation as an embodied, photogrammetry-enabled method for examining how everyday built environments can reveal longevity challenges and opportunities. Conducted during Dubai Design Week 2025, the study integrates smartphone-based photogrammetry with the Design for Longevity (D4L) Unclock Framework to guide workshop participants in noticing, documenting, and interpreting spatial details relevant to aging in place. Seven participants used the framework's three pillars (longevity, service, system) and three lenses (design, technology, society) to structure their scanning and reflection process, producing 3D models and qualitative insights captured on a learning sheet. Findings suggest that slow observation, supported with photogrammetry, develops environmental awareness by slowing down the act of seeing—requiring participants to move around objects, attend to fine-grained details, and interpret spatial features through an embodied, iterative process. Photogrammetry enhances this method by generating revisitable 3D models that surface subtle issues such as accessibility gaps, service touchpoints, and socio-technical interactions. The study positions slow observation as a promising methodological contribution to design ethnography and longevity research, offering a practical way to uncover implicit needs and opportunities within built environments. Results highlight its potential to inform the creation of longevity-friendly products, services, and urban systems.

Keywords: Slow Observation · Design for Longevity · Longevity City · Human-Centered Design · Photogrammetry

1 Introduction

According to the World Health Organization (2025), the proportion of people aged 60 and older is projected to nearly double from 12 to 22% of the global population between 2015 and 2050. The latest UN World Population Prospects (2024) report estimates that there are currently about 830 million people aged 65 and over worldwide, a figure

Q. Gao and J. Zhou (Eds.): HCII 2026, LNCS 16735, pp. 311–330, 2026.
https://doi.org/10.1007/978-3-032-30421-6_19

expected to reach 1.7 billion by 2054 (Teutem, 2024). Global life expectancy has also risen dramatically—from 34 years in 1913 to 72 years in 2022—and is projected to continue its long-term upward trend (Bloom & Zucker, 2023). As people live longer and healthier lives, traditional notions of retirement age and older adulthood are being redefined, signaling the emergence of what Andrew Scott (2021), an economist whose work focuses on longevity and ageing, describes as a "longevity society."

Preparing for this demographic shift requires rethinking and redesigning social infrastructures. Increasingly, people are defining their lives not by chronological age but by life stages and transitions (Golden, 2022). Ensuring quality of life in later years depends not only on extending lifespan (how long we live) but also on extending healthspan (how well we live) at a comparable rate. The goal is to maintain a high quality of life until a rapid decline at the very end—a concept that physician Peter Attia (2023) refers to as "squaring the longevity curve." (Fig. 1)

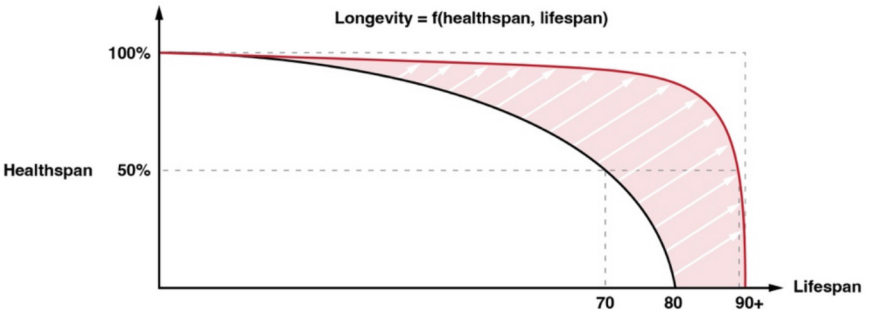

Fig. 1. Concept of "squaring the longevity curve." Shifting the curve from the black line to the red line extends lifespan while maintaining high healthspan and delaying decline. Adapted from Attia & Gifford (2023).

One response to this shift is the Longevity Preparedness Index (LPI), developed in 2025 by John Hancock Investments in collaboration with the MIT AgeLab, which provides a comprehensive assessment of how well U.S. adults are positioned to thrive in later life across eight domains: social connection, finance, daily activities, care, home, community, health, and life transitions. In the academic sphere, the Stanford Center on Longevity, founded in 2007 by psychologist Laura Carstensen, aims to accelerate the translation of scientific discoveries, technological innovations, behavioral insights, and societal norms to help ensure that lives spanning a century are not only longer but also healthier and more fulfilling.

Beyond research institutions, longevity innovation is increasingly becoming part of urban development. For example, in Abu Dhabi, TDA Investment in Commercial Enterprises & Management Co. L.L.C. recently announced Longevity Island: the world's first comprehensive healthcare and lifestyle complex designed explicitly for older adults. Featuring advanced medical care, personalized regenerative therapies, and high-quality residential environments, the project integrates sustainability, wellness, and cutting-edge medical treatments, including stem cell therapy, robotic rehabilitation, and ozone therapy.

Longevity Island exemplifies the growing global movement to design environments that support extended health, autonomy, and well-being in later life.

1.1 D4L Unclock Framework

Given the complexity and systemic challenges of an aging society, design researchers require more comprehensive frameworks to guide inquiry and intervention. In this preliminary study, we applied the authors' Design for Longevity (D4L) Unclock Framework (2025; Fig. 2) to design and facilitate a participatory workshop at Dubai Design Week 2025.

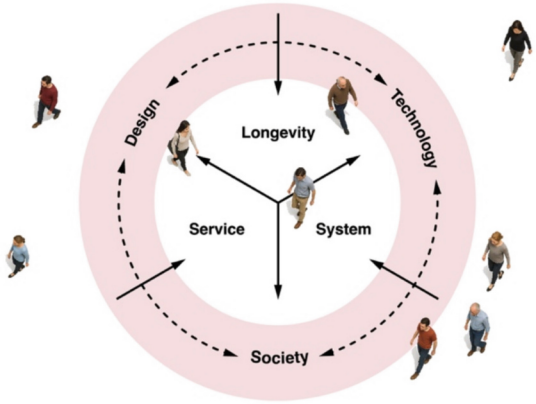

Fig. 2. The Design for Longevity (D4L) Unclock Framework is employed as an analytical guide to examine the concept of slow observation and to explore the applied value of photogrammetry (diagram adapted from Lee, 2025).

The D4L Unclock Framework emerged from a three-year research program (2022–2025) on longevity and retirement planning at the MIT AgeLab. Developed through a systematic literature review spanning product lifecycle, financial planning, and gerontology (Lee et al., 2024), the framework provides a lens for identifying longevity-oriented design opportunities and envisioning products, services, and experiences that help people thrive across the lifespan amid shifting age demographics (Lee et al., 2023). In contrast to approaches based on linear consumption (purchase–use–dispose) or circular resource flows (Ellen MacArthur Foundation & IDEO, 2017), D4L foregrounds the co-evolutionary relationship between longevity service providers (e.g., wealth management firms, health insurance companies), service recipients (e.g., users, consumers), and design artifacts (e.g., toolkit) across life stages and scales—from product to service to city.

Structured around three core pillars: longevity, service, and system, and three lenses: design, technology, and society, the D4L Unclock Framework functions as an experimental model for prototyping "slow observation" as both method and mindset. It invites participants to reinterpret the clock not as a fixed, linear measure of time, but as a flexible and relational metaphor—an "unclock" that reframes time as situated, contextual,

and evolving. In practice, workshop participants would pick one pillar and one lens to explore a specific site on the Dubai Design Week campus. Figure 3 presents two illustrative focus areas generated by pairing one pillar with one lens: longevity and society (left) and longevity and technology (right).

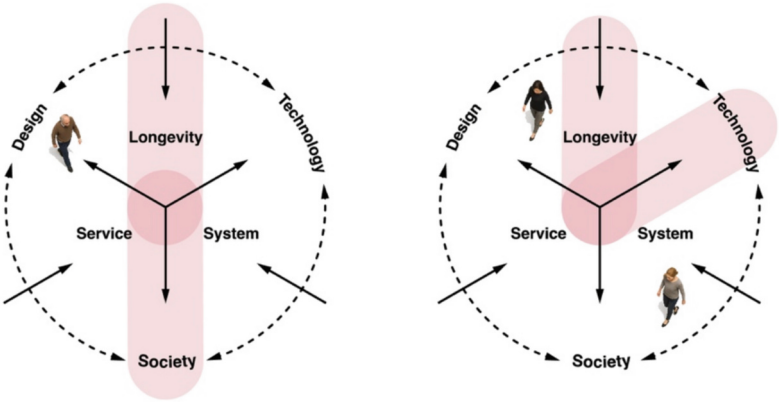

Fig. 3. Two example configurations created by pairing one pillar with one lens in the D4L Unclock Framework (adapted from Lee, 2025).

1.2 Re-envisioning Shared Bicycle Systems via D4L Unclock

In this preliminary study, Bluebikes—Boston's bicycle-sharing system (Fig. 4)—serves as a real-life case to operationalize the D4L Unclock Framework, illustrating how its three pillars (longevity, service, system) and three lenses (design, technology, society) can be activated in practice. The learning sheet applies the same content for workshop participants (see Tables 1 and 2).

The three pillars (longevity, service, and system) form the backbone of the D4L Unclock Framework, offering designers and researchers a clear sense of direction. Beginning with the longevity pillar, researchers can examine how design solutions accommodate users of different ages and abilities. Key questions include: What can we observe about accessibility across user groups? How do design elements support children, adults, and older adults? How might these needs evolve as users age? Such prompts help researchers consider accessibility needs across dynamic and changing conditions. For example, Bluebikes could expand accessibility by offering additional seat options, such as easily attachable child seats for families.

The service pillar emphasizes user journeys and transitions between touchpoints. We ask questions such as: What can we observe about the user journey? Where pain points or satisfaction points emerge? How do users transition between touchpoints (e.g., entering, paying, using, leaving)? These prompts can reveal opportunities for experience and interaction designers. For instance, Bluebikes could enhance service integration within its app-based rental and return processes or refine user interfaces for both regular and electric bikes.

Fig. 4. Re-envisioned Bluebikes design proposal using the D4L Unclock Framework, highlighting how bicycle and service touchpoints can support a longevity-friendly mobility system within future social infrastructure (Photo credit: Sofie Hodara).

The system pillar highlights interconnections among infrastructure, environment, and policy. Researchers may consider: What can we observe about interconnected physical, social, and digital systems? How do infrastructure, environment, and policy intersect? Where do boundaries and overlaps occur? In practice, Bluebikes stations are often situated near parks, playgrounds, and transit nodes, reinforcing their role within Boston's broader urban mobility ecosystem. Table 1 summarizes these Bluebikes examples and presents reflective and observational questions aligned with the three pillars.

The three lenses (design, technology, and society) offer new perspectives that help generate context-dependent insights based on the pillars. This additional level to the framework adds complexity and therefore opportunity for innovative, longevity-oriented solutions. The design lens examines how physical and cognitive features support safety, trust, and equitable access. Here, we ask questions such as: How does the design of the space or service facilitate safety and successful use? Are there physical, cognitive, or emotional barriers that limit participation? These prompts help reveal usability challenges. For example, Bluebikes' current seat-height adjustment range does not fully accommodate riders with shorter or taller body proportions. Additional features, such as options for device placement (e.g., GPS navigation) and water-bottle storage, could also better support riders' practical needs.

The technology lens raises questions about inclusivity and reliance on digital tools: How does technology enable or constrain safety, trust, and successful use? What devices are required? Is the experience overly dependent on personal technology? How inclusive are the digital systems? At present, Bluebikes' user interface and maintenance system primarily support smartphone-based interactions, creating barriers for users who rely on traditional payment methods or people who don't have smartphones.

Finally, the society lens considers the broader social norms, cultural practices, and policies that shape behavior. Researchers may consider how norms, policies, and community behaviors influence the experience. Who uses or avoids the service and why? What collective responsibilities (e.g., safety, maintenance, etiquette) are visible or overlooked? As shared-bike usage increases, policy updates, such as helmet-use guidelines or expanded bike-lane networks, may be needed. Table 2 summarizes these Bluebikes examples and presents reflective and observational questions aligned with the three lenses.

Table 1. An example of the three pillars and their corresponding prompts for reflection and observation.

Pillar	Observation prompts	Example (Bluebikes)
Longevity	– What can we observe about accessibility for people across different ages and abilities? – How do design elements accommodate children, adults, and older adults? – How might these features evolve over time as users age?	Bluebikes could better accommodate people traveling with young children by adding easy-to-install child seats.
Service	– What can we observe about the user journey? – Can we identify pain or bright points along the experience? – How do people transition between touchpoints (e.g., entering, paying, using, leaving)?	Bluebikes makes renting, using, and returning both analog and electric bikes seamless through its mobile app.
System	– What can we observe about interconnected systems—physical, social, and digital? – How do infrastructure, environment, and policy interrelate? – Where do boundaries and overlaps occur?	This Bluebike station is part of a larger mobility system, as it is located at the edge of a park and playground, connecting recreation, transportation, and public destinations.

Table 2. An example of the three lenses and their corresponding prompts for reflection and observation.

Lens	Observation prompts	Example (Bluebikes)
Design	– How does the design of the space or service facilitate safety, trust, and successful use? – Are there barriers (physical, cognitive, or emotional) that prevent equal participation?	The limited height adjustment on Bluebike seats does not accommodate edge cases; the lack of a dedicated GPS feature on the bikes favors locals over tourists; the lack of water bottle holders favors riders of short distances.
Technology	– How does technology enable or limit safety, trust, and successful use? – What tools or devices are required? Is the experience overly dependent on personal technology (e.g., smartphones)? – How inclusive are digital systems?	Bluebikes is primarily designed for smartphone users, making it less accessible to those who rely on traditional payment methods.

(*continued*)

Table 2. (*continued*)

Lens	Observation prompts	Example (Bluebikes)
Society	– How do social norms, policies, and community behaviors shape the experience? – Who uses or avoids this service and why? – What collective responsibilities (e.g., safety, maintenance, etiquette) are visible or invisible?	Social pressure encourages helmet safety; civic infrastructure creates dedicated bike lanes on city streets.

1.3 Photogrammetry for Slow Observation

Photogrammetry is a technique for analyzing and reconstructing the geometric and spatial properties of physical objects using photographic images (Moreno-Nava, 2023). It generates 3D models from multiple 2D photographs by extracting spatial information, such as depth, scale, and positional relationships, through specialized software. The discipline is rooted in optics, projective geometry, and remote sensing, and has increasingly converged with computer vision (Foster & Halbstein, 2014). Photogrammetry has been applied extensively across domains such as archaeology (Magnani et al., 2020; Douglass et al., 2015), geographic information systems (Fonstad et al., 2013), urban 3D mapping (Wu, 2021), and emerging pedagogical and professional training methods (Chapinal-Heras et al., 2024). A recent advancement—ultra close-range digital photogrammetry (UCR-DP)—provides a low-cost, efficient means of rapid 3D data acquisition and has proven particularly valuable in virtual anthropology (Lussu & Marini, 2020).

In this preliminary study, the free smartphone application Scaniverse was used to create 3D models using the photogrammetry process tool. The concept of slow observation is introduced through the use of a smartphone-based photogrammetry app as an instrument for ethnographic-style research (Suri & Howard, 2006). This definition and approach build on a scholar and educator Shari Tishman's (2018) notion of slow looking—a mode of learning through prolonged observation—and align with context-dependent inquiry practices in design ethnography (Li, 2025; Pink et al., 2022; Cranz, 2016). By scanning the built environment, participants engage in an embodied, interactive form of observation that builds on traditional ethnographic methods, such as photo journaling (IDEO, 2015b) and drawing (IDEO, 2015a) to capture contextual, explicit, and implicit behavior and information (Salvador et al., 1999). This experimental research method encourages reflection on how longevity-related challenges manifest in everyday spaces and helps reveal opportunities for design intervention. The workshop participants applied this by systematically scanning specific sites within the Dubai Design Week campus to generate 3D models (Fig. 5). Participants used the application to "scan" an object or site with their bodies, noticing textures, materials, hidden elements, affordances, fixtures, and improvised structures through movement.

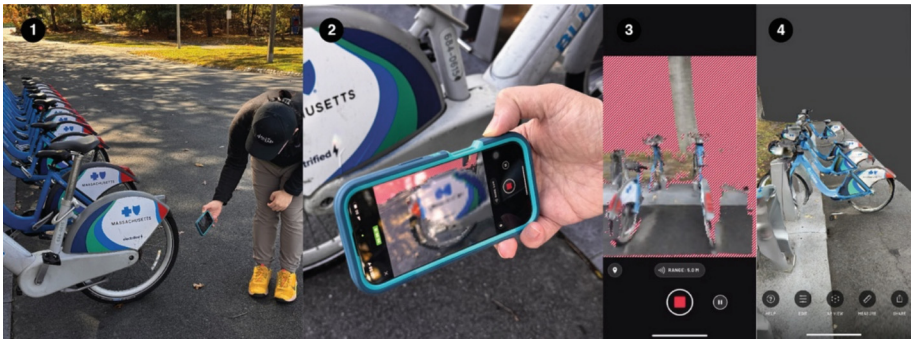

Fig. 5. Illustrated is an example of documenting a Bluebikes station by using a phone-based photogrammetry app (Scaniverse): 1. scanning the object from multiple angles, 2. moving in closer to capture fine details, 3. the Scaniverse interface indicating unscanned areas in red, and 4. the resulting 3D model generated through photogrammetry (Photo credit: Sofie Hodara).

The method draws conceptual parallels with bodystorming (Lee et al., 2023; Schleicher et al., 2010), a hands-on, embodied ideation technique that uses the body to prototype and understand situations beyond the limits of verbal brainstorming. A computer and behavioral scientist Antti Oulasvirta et al. (2003) argue that bodystorming is a way of "being there"—working and playing with data through embodied engagement. Its value lies in activating tacit knowledge, the "knowing more than we can tell" (Schleicher et al., 2010), revealed through acting out, enacting, and physically navigating scenarios. In this study, slow observation through phone-based photogrammetry functions as an embodied form of inquiry, where iterative scanning becomes a mode of situated, immersive exploration.

The intention behind slow observation resonates with an expert in future cities Anthony Townsend's (2013) concept of slow data, which contrasts with the efficiency-driven logic of big data. As Townsend writes, "Big data may make us lean and mean. Slow data will speak to our souls" (p. 319). Whereas big data operates through volume, automation, and opportunistic collection, slow data is intentionally and thoughtfully gathered, enabling deeper behavioral and cultural insights. Examples of big data include real-time streams, such as smartphone GPS traces, that update urban mobility patterns by the second. These contrast to slow datasets which emerge from sustained, repeated observations over long timescales—such as multi-decade phenology datasets tracking the changing timing of leaf-out and bloom—where meaning accrues only through duration. When paired strategically, slow data complements big data: the former supports reflection and social transformation, while the latter enhances efficiency.

In this study, photogrammetry serves as a slow data practice—an intentional, situated mode of documenting experience that opens space for new ways of seeing and designing longevity-friendly environments. Photogrammetry can be applied to support big data, creating robust, dynamic digital twins of both natural and built systems, but in the context of this study, the processing of collecting a scan using a mobile phone can be seen as akin to slow data. While meaningful patterns in slow data are revealed only through duration, photogrammetry offers insight through the methodical, embodied act of scanning itself.

1.4 Research Question

This preliminary study investigates the value of photogrammetry in a participatory workshop setting. The workshop responds to the following research question: *How might the D4L Unclock Framework and photogrammetry be applied to conduct slow observation and support the development of longevity-friendly cities?* The contribution of this work is a conceptual proposition and design approach that positions slow observation as an ethnographic method for informing the creation of new products and experiences that enable aging in place, ultimately supporting the cultivation of a longevity-friendly society.

2 Case Study

This case study reports on a collaborative pilot workshop conducted during Dubai Design Week 2025. Table 3 presents key information about the participatory workshop.

Table 3. Workshop information.

Location	Dubai Design District (d3), Dubai, United Arab Emirates
Date and time	November 4, 2025 13:00 ~ 16:00
# of attendees	7 participants, 2 facilitators, 3 volunteers, and 1 photographer
Workshop challenge	How might the D4L Unclock Framework and photogrammetry be applied to conduct slow observation and support the development of longevity-friendly cities?
Key material	1. The D4L Unclock Framework (printed on foamcore) 2. A three-page learning sheet 3. Scaniverse, a smartphone-basedphotogrammetry app

2.1 Research Process

The research process consisted of four main steps: 1. workshop proposal, 2. participant recruitment, 3. workshop flow and materials, and 4. data analysis and synthesis.

1. *Workshop proposal:* The workshop was structured around the core research question: How might the D4L Unclock Framework and photogrammetry be applied to conduct slow observation and support the development of longevity-friendly cities? To explore this question, a two-month preliminary study (September–November) was conducted in collaboration with Dubai Design Week 2025. Dubai Design Week provided branding, promotion, and venue support—including space, utilities, and volunteers—while the authors designed and facilitated the workshop.
2. *Participant recruitment:* Participants were invited to complete a five-minute pre-workshop survey and attend the in-person workshop held in the designated space provided by Dubai Design Week. Because the registration link was publicly accessible, the study did not target a specific demographic at this stage. Instead, the workshop

served as an exploratory, interactive way to gather direct feedback from participants. In total, ten individuals registered; seven attended the workshop, and three completed the pre-workshop survey.

3. *Workshop flow and materials:* The three-hour workshop was structured around three sequential materials: 1. the D4L Unclock Framework (printed on foamcore), 2. a three-page learning sheet, and 3. Scaniverse, a smartphone-based photogrammetry app. Following a 5-min pre-workshop survey and a 30-min introductory presentation, participants first annotated the D4L Unclock Framework using pens and Sharpies to identify areas of focus and interest, then shared their interpretations with the group (Fig. 6).

Fig. 6. Participants annotated the D4L Unclock Framework foamcore board with pens and Sharpies to highlight their areas of focus and interest, then shared their insights during the workshop (Photo credit: Mivan Makia).

Next, participants used the three-page learning sheet (Tables 1 and 2) as a guided prompt to deepen their understanding of the framework's three pillars (longevity, service, system) and three lenses (design, technology, society). The sheet also functioned as a structured documentation tool during fieldwork for slow observation (Fig. 7).

Fig. 7. Participants used a three-page learning sheet to document observations while using Scanaverse and to support sharing and discussion. (Photo credit: Sheng-Hung Lee).

Participants then applied Scaniverse as the primary photogrammetry tool to capture environments of interest on the Dubai Design Week campus. They were given 30 min to conduct slow observation, using their smartphones as both scanning and sensing instruments, while documenting what they saw, felt, and imagined on the learning sheet (Fig. 8).

Fig. 8. Participants explored areas outside the classroom to identify environments of interest and scan them using Scaniverse, a smartphone-based photogrammetry app (Photo credit: Mivan Makia).

4. *Data analysis and synthesis:* This descriptive study drew on four primary data sources: 1. pre-workshop surveys, 2. learning sheets, 3. photogrammetry-based environment

scans captured with Scaniverse, and 4. participant discussions. The authors analyzed and synthesized these data collaboratively to identify observation patterns, participants insights, and design opportunities.

2.2 Research Result

The research process consisted of four main steps: 1. workshop proposal, 2. participant recruitment

1. *Pre-workshop survey:* The pre-workshop survey was completed before participants arrived at the venue. Three of the seven participants submitted responses. The following insights are drawn from an analysis and synthesis of those three responses. All respondents came from design- or art-related backgrounds. When asked, "When you hear the phrase 'Design for Longevity (D4L),' what three keywords come to mind?", participants mentioned terms including health, wellness, systems thinking, long-lasting, future-thinking, user-centric, prototyping, and people. Participants also shared expectations and questions for the workshop hosts, for example: "How can we educate about longevity in ways that meet people where they are and integrate easily into everyday life?" and "Can bio-geometry support wellbeing?"

The survey additionally explored participants' motivations for attending the workshop. As shown in Fig. 9, all participants expressed curiosity about D4L. One participant hoped to learn about new technologies such as photogrammetry; two were interested in collaborative ideation and prototyping methods; and one sought business opportunities to connect with the design community.

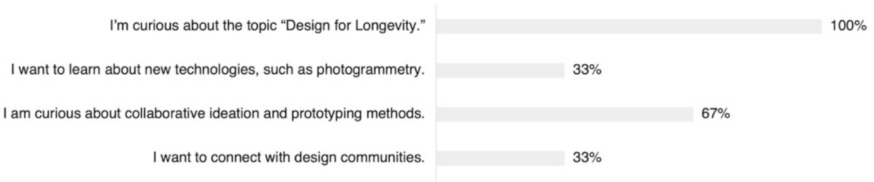

Fig. 9. Pre-workshop survey question and responses: "Why would you like to join this workshop?" (Select all that apply)

2. *Photogrammetry for slow observation:* The study collected 3D photogrammetry models from six participants (Fig. 10). One participant experienced a technical issue preventing her phone from connecting to the internet. The following results focus on two selected participants: no. 1 (bulletin board) and no. 6 (design week wayfinding) in Fig. 10, with whom the authors engaged in more in-depth discussions to co-develop their responses on the learning sheets.

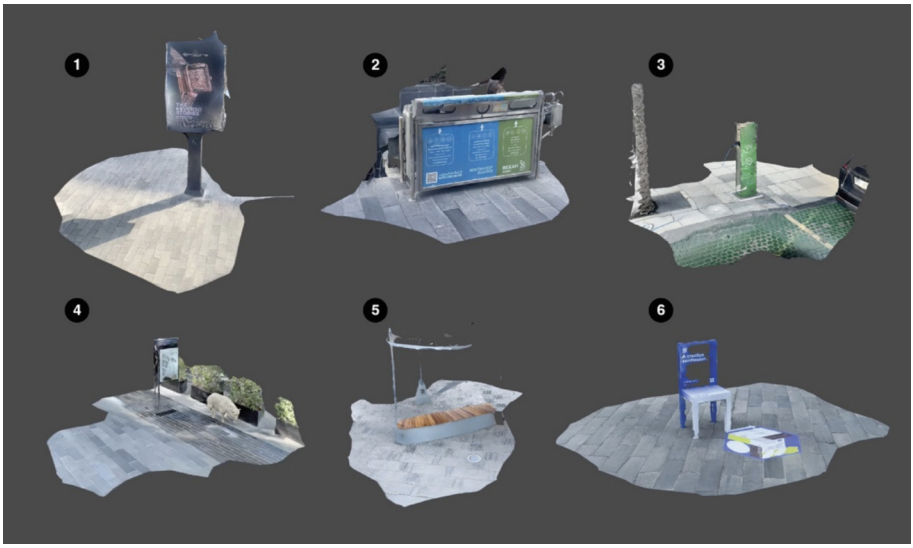

Fig. 10. Participants used Scaniverse, a smartphone-based photogrammetry app, to create 3D observation models on the Dubai Design Week campus, including (from top left to bottom right) 1. bulletin board, 2. public trashcan, 3. EV charging station, 4. coffee shop corner, 5. public seating, and 6. design week wayfinding.

3. *Bulletin board* (no. 1 in Fig. 10): This participant identified a bulletin board along the pedestrian street near the workshop venue and selected it as her photogrammetry study site. The board primarily displayed advertisements for luxury goods. She proposed dedicating one side to educational content to enhance longevity literacy without disrupting the existing business model (service pillar). She also noted that the content lacked adaptability and broader public relevance, suggesting that decision-making around what gets displayed reflects a larger systemic issue (system pillar). In addition, she evaluated the board's height and physical configuration (design lens), prompting the question: How might the bulletin board's dimensions and layout be redesigned to be more user-friendly and accessible for diverse demographic groups? (longevity pillar). She further reflected on the potential for integrating solar-powered electronics to create a more sustainable display system (technology lens). Table 4 summarizes her reflections and insights.

Table 4. Discussion with the participant who scanned the bulletin board using the D4L Unclock Framework and photogrammetry.

Criteria	Consideration
Longevity	Future design should be user-friendly and accessible for diverse demographic groups.

(*continued*)

Table 4. (*continued*)

Criteria	Consideration
Service	Dedicating one side of the bulletin board to educational content could enhance longevity literacy without disrupting the existing business model.
System	The collective decision-making process around what content is displayed reflects a broader systemic issue.
Design	The height and physical layout of the street bulletin board influence its usability and visibility.
Technology	Integrating a solar-powered system could make an electronic bulletin board more sustainable.
Society	The current content lacks adaptability and broader public relevance.

4. *Design week wayfinding* (no. 6 in Fig. 10): This participant selected one of the Dubai Design Week wayfinding elements—a chair placed along the pedestrian street with a wayfinding graphic applied to the ground—as her photogrammetry study site. She noted that using an everyday object, such as a chair, as an interactive signage device effectively encourages engagement across age groups (longevity pillar). She also observed that the chair, along with other outdoor furniture, could be repurposed after the event to reduce one-time-use waste (service pillar). Building on this, she suggested that event organizers might consider incorporating second-hand furniture to further promote a sustainable, circular approach (system pillar). She also remarked that, despite the installation's simplicity, lacking advanced technology or complex design features, the experience remained highly accessible and human-centered (design and technology lenses). She did not articulate ideas related to the society lens during the discussion. Table 5 summarizes her reflections and insights.

Table 5. Discussion with the participant who scanned the design week wayfinding using the D4L Unclock Framework and photogrammetry.

Criteria	Consideration
Longevity	Using an everyday object, such as a chair, as signage effectively invited people of all ages to interact with the installation.
Service	The chair-based wayfinding element could be repurposed after the event to reduce waste from single-use items.
System	Event organizers could use second-hand furniture to support a more sustainable, circular approach.
Design	The installation provided an accessible and intuitive user experience.
Technology	Despite minimal technological features, the experience remained easy to engage with.
Society	n/a

3 Discussion

3.1 Slow Observation: Iterative Scanning as Immersive Inquiry

This preliminary study investigates the question: How might the D4L Unclock Framework and photogrammetry be applied to conduct slow observation and support the development of longevity-friendly cities? Guided by the D4L Unclock Framework, workshop participants employed phone-based photogrammetry as a research tool to practice slow observation. Although this work represents an early-stage conceptual experiment, it opens broader discussions about designing longevity-friendly cities that encompass aging in place, inclusive workplaces, cultural diversity, governmental policies, and the interplay between visible and invisible social infrastructures.

The complexity of longevity challenges in the built environment calls for immersive and creative approaches to investigating the landscape, cityscape (Lynch, 1992), servicescape (Bitner, 1992), and peoplescape. Slow observation aims to cultivate this immersion by enabling researchers to capture three-dimensional environmental models directly from the field. This process creates a flexible frame of reference for zooming in and out, identifying and constructing emergent meanings, and grounding insights in lived spatial contexts.

Building on Tishman's slow looking model (2018) in Fig. 11, slow looking is primarily associated with discerning, such as describing, depicting, and attending to the complexity of parts, interfaces, perceptual cues, and interactions. Slow observation extends beyond discerning to encompass deciding, including resolving, solving, and taking action. In this study, slow observation emphasizes embodied thinking and acting, for example, using phone-based photogrammetry apps to capture environmental data by squatting, reaching, exploring, and distinguishing between the built environment and behavior, to enhance transparency, permanence, and accessibility through meaningful, strategic movement.

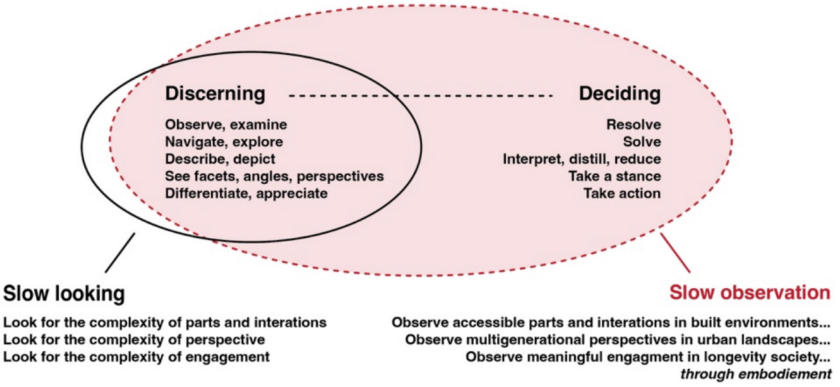

Fig. 11. The relationship between slow observation and slow looking, adapted from Tishman's (2018) continuum of thinking-centered learning outcomes.

3.2 Built Environment for Longevity

The ambition of shaping longevity-friendly cities resonates with an architect and urban planner David Sim's concept of the "soft city," which emphasizes proximity, connection, and the design of humane, livable environments (Sim, 2019). Rather than placing disproportionate expectations on emerging technologies, Sim argues that "softer may be smarter," favoring small, human-centered interventions that make urban life more respectful, connected, and enjoyable.

Within this framing, photogrammetry-enabled slow observation offers a promising entry point. Participants captured 3D models of their surroundings, shared their scans, and analyzed their insights through the D4L Unclock Framework's three pillars (longevity, service, system) and three lenses (design, technology, society). The iterative scanning process becomes a practice of immersive inquiry, enabling participants to discover overlooked details of the built environment that shape long-term usability, accessibility, and quality of experience.

This multi-perspective approach echoes themes in Jeff Speck's *Walkable City* (2012), particularly his four essential walks—useful, safe, comfortable, and interesting—and aligns with Townsend's (2013) notion of slow data and Jane Fulton Suri's foundational work in design ethnography. Together, these human-centered perspectives advocate for designing built environments—streetscapes, cityscapes, and servicescapes—that promote everyday comfort, convenience, conviviality, and community across the lifespan.

David Byrne's reflection in *Bicycle Diaries* (2010) encapsulates the aspiration of this work: "If we can build a successful city for children, we can build a successful city for all people." This vision aligns with the broader aim of cultivating longevity-friendly communities, where the built environment is only one layer, and invisible social infrastructures, such as inclusive cultures, perceived safety, and universal design principles, are equally vital for enabling people of all ages to thrive.

3.3 Photogrammetry in Contextual Design Research

Photogrammetry, the process of generating 3D digital reconstructions from photographic images, has become increasingly prominent in design research as both a documentation technique and a methodological tool (Remondino & El-Hakim, 2006). Beyond its established applications in architecture and heritage preservation, photogrammetry now supports spatial ethnography, design exploration, and participatory research. The following outlines four potential values and applications of photogrammetry in design inquiry: 1. embodied and situated observation, 2. prototyping and ideation, 3. participatory and collaborative design, and 4. rich, spatial documentation.

1. *Embodied and situated observation:* Because scanning requires researchers to physically navigate a space, similar to the intentions behind bodystorming, photogrammetry aligns with embodied and sensory ethnographic approaches (Pink, 2015). It serves as a creative tool for slow, attentive observation that foregrounds lived, situated experience.

2. *Prototyping and ideation:* Photogrammetry-generated 3D environmental models can be incorporated into CAD, virtual reality (VR), and augmented reality (AR) workflows to simulate interventions and evaluate concepts and systems in situ. These digital artifacts also function as vehicles for gathering contextual information and constructive feedback from researchers and participants.
3. *Participatory and collaborative design:* As a highly visual medium, photogrammetry can act as a boundary object (Lee et al., 2025; Star & Griesemer, 1989), offering a practical means of framing complex, longevity-relevant challenges. Its visual clarity supports communication and co-design among diverse stakeholders (Sanders & Stappers, 2012).
4. *Rich, spatial documentation:* Photogrammetry enables high-fidelity capture of contextual and material details, making it valuable for environmental analysis and situated observation. An ethnographer and social anthropologist, Sarah Pink et al. (2017) similarly describe mundane data as the entanglements of people, objects, affects, and temporalities that constitute everyday digital-material environments, relational complexities that extend beyond simplistic, data-driven approaches to behavior change.

Table 6 presents potential applications of photogrammetry as an immersive, context-dependent inquiry tool across six domains.

Table 6. Design research domains and associated use cases of photogrammetry.

Domain	Example uses
Architecture & Urban Design	Historic structures and aging-in-place environments
Interaction/HCI	User environments for UX, AR/VR prototyping
Service Design	Service touchpoints visualization (e.g., care environments)
Ethnography/Anthropology	Spatial ethnography and visual fieldnotes
Product Design	Reverse product design engineering and cultural artifacts
Gerontechnology/Aging	Home modifications, accessibility, and mobility patterns

3.4 Future Study

Further studies can be divided into two areas: improving the learning experience for the D4L Unclock Framework and advancing the concept of slow observation.

1. *D4L Unclock Framework:* Workshop feedback indicated that participants needed clearer instructions when selecting and sketching their pillars and lenses. Several felt uncertain or overwhelmed during this step, suggesting a need to refine both the workshop flow and the interaction process with the framework. Beyond the current three pillars (longevity, service, system) and three lenses (design, technology, society), future studies may explore alternative or additional dimensions to better frame longevity-related challenges.

2. *Slow observation:* The notion of slow observation emphasizes embodied thinking, using the body as a tool for inquiry. In this study, phone-based photogrammetry served as an extension of the observer's eyes, but future work could expand to other sensory modalities such as sound, touch, and smell, as well as emerging technologies beyond smartphones. Increasing the participant sample beyond seven will also help strengthen experimental validity and further refine both the D4L Unclock Framework and the slow observation approach.

4 Conclusion

This preliminary study demonstrates how the D4L Unclock Framework, combined with photogrammetry, can cultivate the practice of slow observation, a design research approach for re-engaging with everyday environments through the integrated pillars of longevity, service, and system, and the lenses of design, technology, and society. This work is a conceptual proposition that positions slow observation as an emergent ethnographic method for informing the design of products, services, and experiences that strategically enable aging in place and contribute to the development of longevity-friendly urban environments.

Photogrammetry, increasingly recognized as a versatile tool in design research, supports embodied observation, spatial documentation, and participatory engagement. While historically associated with architectural and heritage recording, its use now extends to design ethnography, interaction design, and urban inquiry. By generating detailed, revisitable 3D models, photogrammetry facilitates both analytical documentation and speculative prototyping, particularly when integrated with VR/AR workflows. Considering the photogrammetry virtual model as a boundary object, it also strengthens communication and co-creation among researchers, designers, and community stakeholders from different backgrounds.

This descriptive study, conducted in collaboration with the 2025 Dubai Design Week, illustrates the potential of embedding slow observation into contemporary design processes. The findings suggest that photogrammetry-enabled slow observation can serve as a meaningful orientation for future ethnographic design research and practice aimed at advancing longevity-friendly cities.

Acknowledgments. The authors gratefully acknowledge the paper invitation and feedback from Dr. Chaiwoo Lee, Research Scientist at the MIT AgeLab, and the support of the University of Michigan Urban Technology program and Dubai Design Week.

Disclosure of Interests The authors have no competing interests.

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