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Short Communication: Geographical Insights in Brief

Integrating Technology into Urban Open Space Assessment: The 'YouWalk-UOS' Approach

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Abstract: This article introduces the YouWalk-UOS mobile application that evaluates urban open spaces (UOS) using functional, social, and perceptual dimensions. This app uses the Likert scale for user feedback, allowing for a more nuanced study of user perspectives and interactions. Allowing users to add images to evaluations and providing visual evidence, the app generates quantitative data and enriches future decision-making. It helps decision-makers analyse UOS for adaptive, inclusive, and sustainable urban planning by combining data visualisation tools. The article highlights the significance of YouWalk-UOS in bridging urban design and environmental psychology to promote collaborative urban space assessment and design that meets community needs and perspectives.

Keywords: urban open spaces, co-assessment, participatory approach, mobile application

Highlights:

- **Innovation in Assessment:** Introducing the YouWalk-UOS mobile application as a transformative approach in urban open spaces assessment that integrates real-time data collection with user feedback.
- **Participatory Mechanism:** Democratising the assessment process, YouWalk-UOS emphasizes a co-assessment, participatory mechanism, allowing urban residents to contribute insights and preferences.
- **Digital Assessment Framework:** YouWalk-UOS utilises a three-dimensional framework, encompassing functional, social, and perceptual aspects, leveraging GPS technologies for precise mapping and participatory data gathering.

1. Introduction: Navigating the Dynamic Landscape of Urban Open Spaces Assessment

Urban open spaces (UOS), including plazas, waterfronts, parks, civic spaces, and greenways, are critical to the sustainability and resilience of urban environments (Beck, 2009; Páramo, 2017). Far from being mere voids in the urban fabric, these spaces are vital for enhancing urban ecosystems, promoting physical and mental well-being, facilitating social engagement, and fostering a connection with nature. They significantly mitigate climate change, conserve biodiversity, and enhance community resilience against environmental stresses (Beck, 2009; Wolch et al., 2014). However, the dynamic nature of UOS and their inter-relationship with human activities pose significant challenges to their effective assessment and management.

Traditional assessment methods often fail to capture the fluidity of urban open spaces and their users, highlighting a pressing need for innovative approaches that align with the changing demands of urban societies and environmental protection. In this context, developing a mobile application for assessing urban open spaces represents a pioneering shift towards integrating technological innovation with geographic inquiry to support urban sustainability goals from a socio-spatial perspective. By enabling real-time data collection and analysis, the tool offers a novel approach for urban residents and decision-makers to assess and shape the future of UOS collaboratively. This premise underscores the potential of technology-driven assessments to revolutionise our interactions with and manage urban open spaces. By leveraging these innovative tools, we can create resilient, vibrant, and inclusive urban landscapes that respond to their inhabitants' needs and contribute to the broader objectives of urban sustainability and resilience.

2. Theoretical Foundations: Enriching Urban Open Space Assessment

The evaluation of urban open spaces (UOS) is increasingly guided by a comprehensive theoretical framework that blends emergent and traditional urban planning theories, offering a multifaceted understanding of these spaces as vital components of urban ecosystems. At the heart of this framework lies human-centric design principles (Carmona, 2014; Gehl, 2011; Madanipour, 2010), which prioritise pedestrian experiences and facilitate social interactions within urban spaces. This approach accentuates the significance of creating UOS that enhance the quality of urban life while demonstrating the importance of social connections and pedestrian-friendly environments. Parallel to human-centric considerations, ecological urbanism (Mostafavi & Doherty, 2016) integrates natural systems into urban planning, advocating for UOS that support biodiversity, provide ecosystem services, and bolster urban resilience against climate change. This perspective aligns with contemporary environmental concerns which highlight the role of UOS in sustaining urban ecosystems and contributing to the city's overall environmental health.

The digital era has introduced digital placemaking (McQuire & Wei, 2021) into the realm of UOS assessment, exploring how digital media and technologies can enrich physical spaces. This innovative approach enhances cultural engagement, improves accessibility, and strengthens

community bonds, reflecting the evolving dynamics of urban environments and the potential of technology in transforming urban spaces. Furthermore, theories focusing on social equity and environmental justice (Wolch et al., 2014) emphasise the need for equitable access to UOS across diverse urban populations. This lens ensures that the design and management of UOS confront and address disparities, promoting inclusivity and representation within urban environments. Adopting a system thinking perspective (Salvia et al., 2022) UOS are viewed as interconnected components of the broader urban system. This perspective encourages considerations beyond the immediate physical attributes of spaces to examining the cumulative impact of urban planning decisions on social, ecological, and infrastructural systems (Chondrogianni & Stephanedes, 2021). Collectively, these theoretical underpinnings advocate for a holistic approach (Salama et al., 2017; Vukovic et al., 2021) to evaluate and develop spaces that prioritise human and ecological well-being, embrace technological advancements, and champion social equity.

3. Co-assessment: Participatory Approach to Urban Open Space Assessment

Traditional assessment approaches, often rooted in quantitative measures and periodic observations, offer a limited snapshot of urban dynamics. They may overlook the temporal aspects of urban life, such as the seasonal variations in space use, daily fluctuations in public engagement, and the evolving needs of urban communities. This static view is increasingly seen as inadequate for understanding and responding to the rapid transformation which is a key characteristic of contemporary cities.

One fundamental limitation is the lack of real-time data. Traditional methods rely heavily on surveys, manual counts, or time-consuming observations to gather data, are often outdated by the time they are analysed. This temporal lag hinders the ability of urban designers to respond proactively to emerging trends or immediate issues within urban open spaces. Moreover, conventional assessment methods have been criticised for their siloed and top-down approach, which may not adequately capture users' diverse experiences and perceptions. This lack of effective engagement restricts the ability of assessments to reflect the rich tapestry of needs, values, and aspirations that different community members have for their urban open spaces.

Within the preceding context, the co-assessment approach supported by the YouWalk-UOS mobile application represents a pivotal step forward. As a participatory method, it empowers residents to actively contribute their insights and preferences, fostering a more inclusive and democratic approach to understanding and enhancing urban open spaces (Sutherland et al., 2017). It aligns with the call for a multidimensional evaluation framework, which acknowledges that urban spaces are not just physical locations but are also infused with social, cultural, and emotional values. By incorporating Geographic Information Systems (GIS), social media analytics, sensor technologies, and mobile applications, co-assessment methodologies enable the collection and analysis of data. This allows for a more nuanced understanding of UOS considering the various ways these spaces serve the community at different times, for diverse purposes, and for various user groups.

4. Technological Advances in Urban Open Space Assessment

The contemporary landscape of urban open space (UOS) evaluation is marked by the synergistic use of quantitative and qualitative research methodologies, powered by the latest technological advancements (Townsend, 2013). Geographic Information Systems (GIS) are at the forefront, offering detailed mapping and analysis capabilities to assess the accessibility of these spaces. These are complemented by innovative approaches like the Gaussian two-step mobile search for quantifying access within specific pedestrian distances.

Emerging mobile technologies further enhance this evaluation toolkit (Chatel & Falk, 2017). For example, augmented reality (AR) applications superimpose digital information onto the real-world view of urban spaces, enabling an interactive and immersive analysis. Crowdsourcing applications (Lane et al., 2013) mobilise community input, amassing extensive data on how individuals interact with and utilise urban spaces. Wearable tech devices offer insights into pedestrian movement patterns, which are vital for examining walkability and the connectivity of urban areas. Additionally, drones equipped with advanced sensors provide comprehensive aerial data, capturing environmental attributes and usage patterns from a unique vantage point.

However, existing mobile applications for urban open space (UOS) assessment have notable gaps including a lack of comprehensive integration of ecological, social, and infrastructural features for a holistic view of open spaces. Many fail to offer real-time data analysis for immediate insights or to sufficiently engage users. This limits user engagement and the development of the sense of ownership and belonging (Verma & Raghubanshi, 2018). Accessibility and inclusivity for all user groups, including those with disabilities, are often overlooked as is the interconnectivity with broader urban systems to enhance accessibility and use. Enhancing these applications to include localised content and multilingual support would further ensure they meet the diverse needs of urban communities and foster more vibrant, inclusive, and sustainable urban environments.

5. YouWalk-UOS Initiative: Development and Testing

The YouWalk-UOS mobile application emerges as an innovative tool for the comprehensive assessment of urban open spaces (UOS), featuring a unique three-dimensional framework that evaluates functional, social, and perceptual aspects of urban environments (Salama & Patil, 2023) (Figure 1). The functional dimension assesses the practical utility and accessibility of urban open spaces and places emphasis on aspects such as walkability, connectivity, and infrastructure adequacy for user needs. The social dimension evaluates the role of urban open spaces in facilitating community interaction, cultural events, and social inclusivity. It captures the spatial impact on community bonds and social life. The perceptual dimension examines aesthetic and emotional responses to urban open spaces. It considers various aspects such as design quality, ambiance, and the significance these spaces hold for users. The application leverages a Likert scale for a nuanced user feedback, allows image uploads for a visual assessment layer, and utilises GPS for precise location tagging of evaluations. Additionally, the app offers advanced data visualisation tools, such as interactive graphs and maps to facilitate the analysis of usage patterns and trends, while ensuring user privacy and data security through robust protection measures. This sophisticated, user-centric approach captures the complex dynamics of urban spaces and promotes active involvement, making YouWalk-UOS a pivotal tool for achieving more adaptive and inclusive urban spaces.

The YouWalk-UOS app (Figure 2) innovatively integrates spatial analysis with GPS and data visualization capabilities since it enables in-depth exploration of urban open spaces. It supports the study of human-environment interactions by gathering user feedback in real-time thereby offering insights into how public spaces are perceived and used. By facilitating participation, YouWalk-UOS encourages user involvement the assessment process and can be regarded as a methodology that places high value on local knowledge.

The process of testing the YouWalk-UOS application was crucial for ensuring its effectiveness and user-friendliness. Testing was rigorous and iterative, spanning over three months from mid-August to mid-November 2023, and involved 88 participants representing a wide user base.

The participants ranged in age from 18 to 65 years and varied in their abilities and levels of technological proficiency. This offered a comprehensive spectrum of feedback to ensure that the application is inclusive and user-friendly and is suitable for diverse demographic groups. Initial testing phases focused on usability to streamline the interface for ease of navigation and clarity of features. Subsequent rounds of testing concentrated on the accuracy of the data collected, such as the GPS functionality for location tagging and responsiveness in different urban settings and under various use conditions. Feedback gathered during testing was methodically analysed and used to refine the app. The final stages of testing validated the application's utility in real-world scenarios, confirming that the data and insights generated align with the objectives of urban open space assessment. The app's ongoing enhancements aim to support sustainable urban space management, adapting to the diverse needs of modern urban dwellers.

The YouWalk-UOS application strictly adheres to GDPR, as it does not collect personal data, maintains user anonymity. We have secured ethical permissions from the Ethics Committee at Northumbria University before the app's development. For users interested in downloading the YouWalk-UOS mobile application, it is available on both major platforms. Apple device users can find the app on the App Store by following this link: [YouWalk-UOS on the App Store](#). Android users can download the app from the Google Play Store at this link: [YouWalk-UOS on Google Play](#).

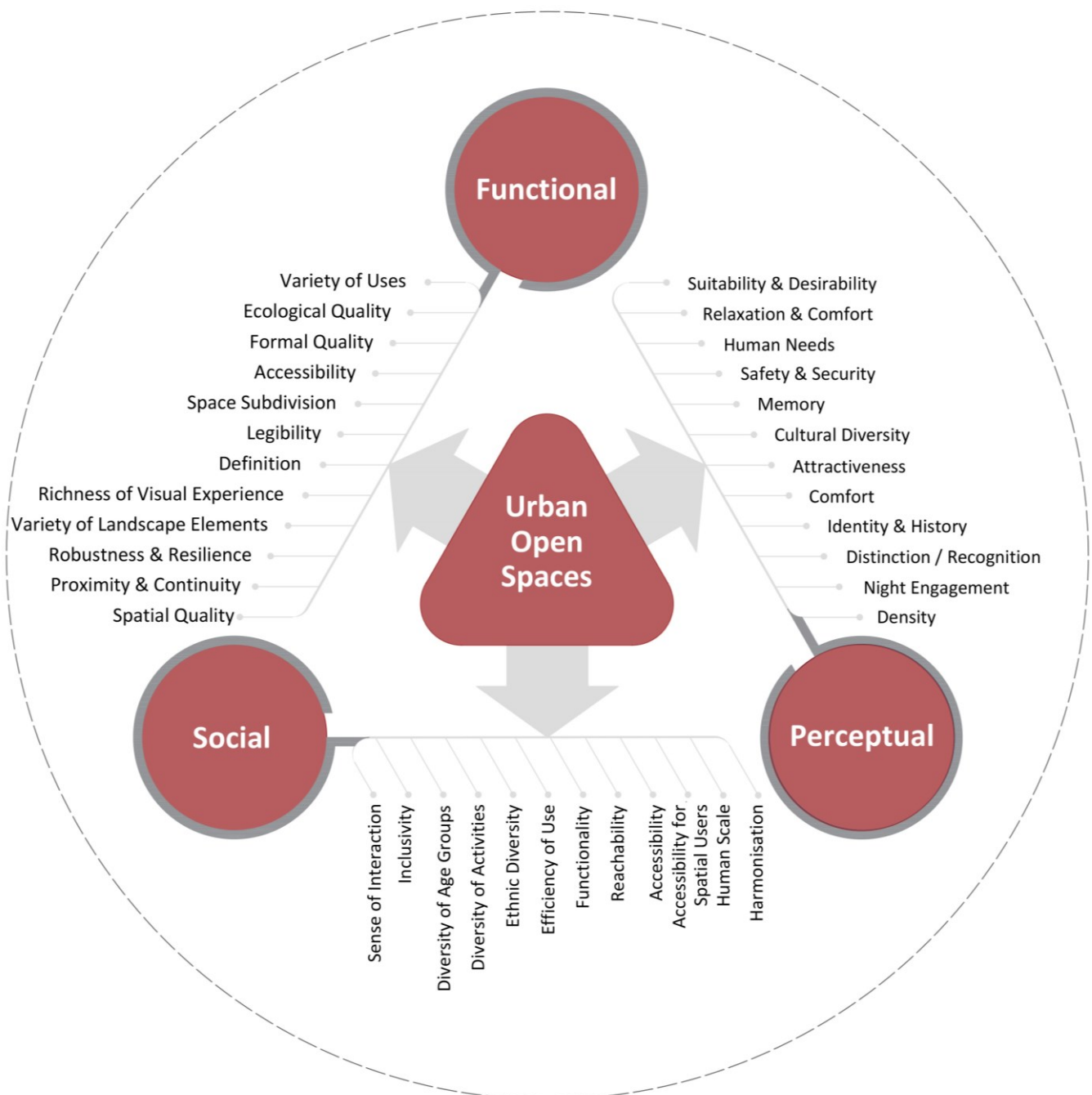


Figure 1. The three-dimensional assessment criteria developed for YouWalk-UOS (source: the authors).

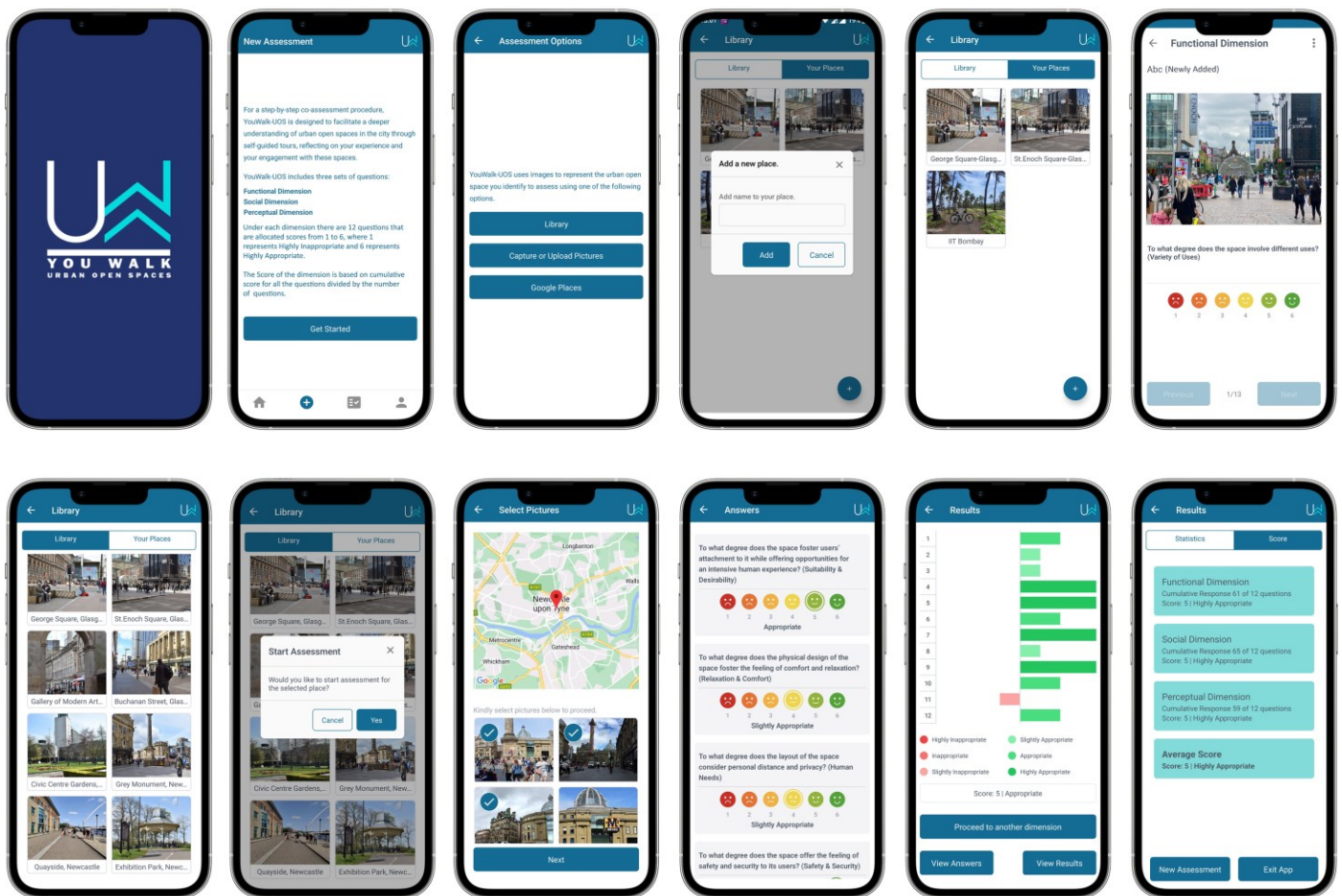


Figure 2. Screen views of YouWalk-UOS mobile application (source: the authors)

6. YouWalk-UOS Vision and Challenges

The integration of mobile applications in urban space assessment, such as YouWalk-UOS, brings several challenges that must be addressed to ensure their effectiveness and equitable use. Ensuring data representativeness is crucial; there must be a systematic approach to include diverse demographic groups to avoid skewed insights. Addressing the digital divide is equally important since reliance on mobile technology can inadvertently exclude those without access to such devices or the internet.

Future enhancements to tackle these challenges include improving the accessibility of these applications, perhaps through more user-friendly designs and alternative data collection methods that do not solely rely on smartphone ownership. YouWalk-UOS app could potentially integrate with the Apple Vision Pro spatial computer, Google's ARCore or Esri's ArcGIS Urban leveraging its AR capabilities and advanced sensors to enhance user engagement and data collection for a richer assessment of urban open spaces. Integrating Artificial Intelligence (AI) can facilitate advanced data analysis, allowing for the identification of patterns and trends that may not be immediately apparent, leading to more informed urban planning decisions. Moreover, fostering collaborations with municipal authorities can help ensure that the data collected through these applications are effectively translated into policy and action, aligning with broader urban development goals. These advancements and collaborations will help in harnessing the full potential of mobile applications in creating urban spaces that are responsive to the needs and aspirations of all city residents.

7. Lasting Impacts: The Future of Urban Space Sustainability

In conclusion, the integration of mobile technology into the assessment of urban open spaces is pivotal to developing sustainable urban environments. Such tools, exemplified by YouWalk-UOS as an innovative example, provide a platform for inclusive, multifaceted urban analysis, incorporating real-time feedback and advanced spatial data. These technologies align with the European Journal of Geography's innovative perspective and offer new avenues for participatory, data-driven urban design and planning. Addressing challenges such as data representativeness and the digital divide is essential for future advancements in order to ensure equitable and comprehensive urban development processes.

As technology continues to evolve, it promises to enhance our ability to assess and create resilient urban spaces that reflect the needs of a diverse population. These advancements not only foster communities that are liveable but also adaptable to the changing urban and environmental landscapes. The ongoing evolution of assessment methodologies driven by technological innovation and geographic insights will play a central role in shaping the urban environments of tomorrow, where sustainability, inclusivity, and adaptability are at the forefront of urban planning and design.

Conflicts of Interest: The author declares no conflict of interest.

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