

Factors of the Digital Mobility Divide and Its Effects on Accessibility, Socio-Spatial Integration, and Equity

Amnon Frenkel* Ravid Luria* Yoram Shiftan**

* Faculty of Architecture and Town Planning, Technion-Israel Institute of Technology

** Faculty of Civil and Environmental Engineering, Technion-Israel Institute of Technology

Extended Abstract

Background

The rapid digitization of urban mobility has transformed how people plan, access, and experience transportation in cities. App-based public transport services, shared mobility modes, and real-time travel information are increasingly embedded in daily urban life. Cities invest heavily in these digital mobility solutions with the expectation that they will improve efficiency, sustainability, and accessibility. However, the benefits of digital mobility are not distributed evenly. While some groups gain increased flexibility and access to opportunities, others are left behind, reinforcing existing socio-spatial inequalities.

This research investigates how the digitization of mobility can deepen social and spatial disparities rather than mitigate them. Individuals who are unable or unwilling to use digital mobility tools may face reduced access to employment, education, healthcare, and social activities. As digital interfaces increasingly become the default—or even the only—way to access transport services, exclusion from digital mobility risks becoming a new dimension of urban inequality.

Most existing research on the digital mobility divide focuses on structural explanations, such as income, education, device ownership, or spatial proximity to services. While these factors are important, they do not fully explain observed patterns of adoption and use. This study argues that perceptual and behavioral factors play a crucial role in shaping digital mobility outcomes. Drawing on Pierre Bourdieu's concept of *habitus*, it examines how internalized dispositions—specifically attitudes toward digital mobility and self-perceived digital skills—mediate the relationship between socio-demographic characteristics and actual usage of digital mobility services.

The study addresses two interrelated challenges: understanding the mechanisms that generate the digital mobility divide, and assessing how this divide affects accessibility, socio-spatial integration, and equity in the city.

Theoretical Framework

The research develops an interdisciplinary conceptual framework at the intersection of three bodies of literature: digital divide research, urban mobility and accessibility studies, and theories of socio-spatial inequality. The digital mobility divide is conceptualized as the overlap between the digital divide—differences in access to and ability to use digital technologies—and transport inequality—unequal mobility and accessibility outcomes across social groups.

A key theoretical contribution of this study is the integration of *habitus* into the analysis of digital mobility. Following Bourdieu, habitus is defined as a system of internalized dispositions, perceptions, and schemes of action that are socially acquired and shared among members of a group or class. In this research, habitus is operationalized through individuals' self-assessed digital skills and attitudes toward digital mobility services. These perceptual dimensions reflect socially embedded dispositions that influence how people perceive, evaluate, and engage with digital mobility technologies.

The framework also incorporates the concept of perceived accessibility, referring to individuals' subjective assessments of their ability to reach desired destinations and opportunities, as well as socio-spatial integration, understood as the extent to which individuals feel integrated into urban space and activities. The model assumes that digital mobility use can enhance perceived accessibility, which in turn contributes to greater socio-spatial integration and perceived equity.

Research Questions and Conceptual Model

The study is guided by two overarching research questions:

1. What are the determinants of the digital divide in urban mobility?
2. How does the digital mobility divide affect accessibility to opportunities, socio-spatial integration, and equity?

To address these questions, the research formulates three main hypotheses. First, it hypothesizes that the digital mobility divide emerges through a habitus-based mechanism, whereby socio-demographic characteristics influence internalized perceptions and attitudes, which in turn shape actual usage of digital mobility services. Second, it assumes that limited access to and use of digital mobility tools acts as a barrier to reaching valuable destinations, thereby exacerbating disadvantage among marginalized groups. Third, it predicts a positive chain of effects in which increased perceived accessibility resulting from digital mobility use leads to higher levels of perceived socio-spatial integration and equity.

Methodology

The study employs a mixed-methods research design in the city of Tel Aviv-Jafa, the core of Tel Aviv metropolitan area.

Quantitative Component

A survey of 733 residents from diverse socio-demographic backgrounds was conducted. The questionnaire was developed based on preliminary focus group insights and included measures of:

- (a) digital mobility access (device ownership, proximity to shared mobility services, perceived affordability);
- (b) socio-demographic variables (age, gender, income, education);
- (c) self-perceived digital skills and attitudes toward digital mobility; and
- (d) self-reported impacts of digital mobility use on accessibility and integration.

The quantitative data were analyzed using structural equation modeling (SEM), which is well suited for estimating complex causal mechanisms involving both observed and latent variables.

Qualitative Component

Three focus group sessions were conducted with mobility planners and professionals from the Tel Aviv Municipality. These discussions provided interpretive depth, validated the quantitative findings, and offered insights into policy and implementation challenges related to digital mobility.

Quantitative Findings: The Habitus Mechanism

Exploratory and confirmatory factor analyses identified six latent constructs: self-concept as digitally skilled, attitudes toward digital mobility, use of shared mobility modes, use of public transport apps and digital services, perceived accessibility, and socio-spatial integration.

The SEM results strongly support the hypothesized habitus mechanism. Socio-demographic characteristics influence digital mobility usage primarily through the mediating effects of digital self-concept and attitudes. Older individuals, those with lower income or education, and residents of disadvantaged areas tend to report lower digital confidence and less positive attitudes, which significantly reduce their likelihood of using digital mobility services.

Importantly, perceptions and attitudes emerge as powerful mediators, indicating that usage differences cannot be explained by structural factors alone. Individuals who perceive themselves as digitally skilled and hold positive attitudes toward digital mobility are substantially more likely to use shared mobility modes and digital transit services, even when controlling for socio-demographic variables.

Digital Mobility Divide and Its Consequences

The analysis reveals a pronounced digital mobility divide in Tel Aviv. Marginalized groups—including lower-income residents, older adults, and residents of disadvantaged neighborhoods—use digital mobility services significantly less than younger, higher-income populations. This divide reflects both material constraints (limited access, affordability concerns, uneven spatial distribution of services) and perceptual barriers (lack of confidence, mistrust of technology, privacy concerns, and habitual reliance on traditional travel modes).

The results demonstrate that digital mobility use has a significant positive effect on perceived accessibility. Users report greater ease in reaching destinations and expanding their activity spaces. Improved accessibility is strongly associated with higher perceived socio-spatial integration, particularly in spatial terms. However, the impact on social integration is more limited, suggesting that improved mobility does not automatically translate into broader social networks.

Overall, the findings indicate a mediated pathway: digital mobility use enhances perceived accessibility, which in turn contributes to greater socio-spatial integration and equity. Conversely, exclusion from digital mobility can reinforce disadvantage, creating a negative feedback loop in which limited accessibility further marginalizes vulnerable groups.

Qualitative Insights

The focus group discussions corroborated the survey findings and provided important contextual insights. Municipal professionals widely recognized the existence of a digital mobility divide and identified it as a growing challenge for inclusive urban development. Participants emphasized that digital interfaces are increasingly unavoidable in everyday mobility, making digital exclusion particularly consequential.

Barriers discussed included limited digital literacy, economic constraints, psychological resistance to technology, and mistrust of digital payment systems. Gendered travel patterns and safety considerations were also noted as influencing adoption. Participants stressed that expanding physical infrastructure alone is insufficient; digital skills, trust, and usability must also be addressed.

Contributions and Implications

This study makes three key contributions. First, it advances digital mobility research by offering a habitus-centered explanation of the digital mobility divide, highlighting the importance of perceptions and attitudes alongside structural factors. Second, it contributes theoretically and methodologically by integrating habitus, digital divide, accessibility, and socio-spatial integration into a single empirical framework. Third, it provides practical guidance for policy and planning, emphasizing that inclusive digital mobility requires investment in digital confidence, trust, and user-centered design.

Policy Recommendations and Future Research

The findings suggest that reducing the digital mobility divide requires a holistic policy approach combining equitable service provision with capacity building. Recommended actions include digital literacy programs, affordable and reliable services, non-digital access channels, and equitable spatial regulation. Future research should incorporate objective accessibility measures and examine long-term outcomes, particularly for digitally excluded populations.

Conclusion

The study demonstrates that digital mobility can enhance accessibility and inclusion, but only if its benefits are broadly accessible. By showing how social background, perceptions, and attitudes jointly shape digital mobility use, the research underscores that addressing mobility inequality in the digital age requires attention to both material conditions and human dispositions.