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Article

From Pixels to Pavements: 'Device Paradigm' to Lived Engagement in the Post-Digital City

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Abstract: In recent decades, cities and urban navigation have grown increasingly complex and technologically driven. In this evolving landscape, the emerging discourse of 'post-digital' can potentially redirect contemporary urban discussions toward human concerns and digital affordances. Despite this shift, city/urban planning, theory, and practice have largely overlooked the transformative digital-physical impact on city navigation, missing opportunities for grounded, user-driven methodologies that post-digital studies open up. Drawing on a grounded case study narrative, this article investigates the forefront of urban navigation and the impact of digital technology on wayfinding practices. The research centers on post-digital navigational experiences in the New York City neighbourhoods of Flushing and Cobble Hill. The study examines personalized and innovative urban wayfinding using an experimental multi-modal framework based on recombinant spatial methods, situated actions, and conceptualizations like embodied digitality and reconfigured sociability (via blogs and vlogs). It validates that the post-digital era is shifting toward a more interactive, self-organizing, interconnected planning paradigm. This necessitates re-examining approaches to perceiving legible and navigable urban places and reworking the concept of urban narratives to embrace better today's urban navigators' context-aware linked experiences and viewpoints. We distil four key aspects for experiencing post-digital city territories: user agency, recombinant methods, hybrid wayfinding and dynamic cognitive mapping.

Keywords: Walking in the City; everyday urbanism; wayfinding; lived experience; recombinant and situated actions; global-local territories

1. Introduction

Recent years have seen the emergence of 'post-digital' discourse. Nicholas Negroponte (1998) first introduced the term to describe an era where digital technologies, screens, and smart tools would become ubiquitous - 'like air and water, noticed only by its absence' (Negroponte, 1998). Scholars across fields have since applied this discourse in varied ways, situating it with and beyond Negroponte's original framing (Ghosh, 2018; Jacob, 2017; Sable, 2012; Spiller, 2009). Post-digital does not denote *life after digital*, but an opportunity to examine digital ramifications in our present technological culture. Characterized as "messy, unpredictable" (Jandrić et al., 2018), "ambiguous" (Cramer, 2015), and "paradoxical, contradictory" (Cox, 2014; Taffel, 2016), post-digital currently reflects blurred relationships between digital and non-digital, resisting singular definition amidst competing perspectives. While imperfect, it signals growing awareness of complex sociotechnical entanglement in everyday life.

In the contemporary situation, 'post-digital is not anti-digital' (Jenkins, 2011), nor is it indicative of a potentially catastrophic technological 'singularity'; instead, it amplifies the digital into unexplored potentialities – waiting to be interrogated and reconfigured. Expanding on Negroponte's concept of

'cultural compost' for newer ideas Blanco-Fernández (2022) redefines post-digital as a 'proanalogue turn'. This turn rejects techno-positivist discourse, presenting a meso-digital/intermediate continuum for strategies, adaptive tools, and digital embodiment in everyday contemporary life. Jenkins (2011) further guides the conceptualization/potentialities towards 'live experiences', while others have explored the nexus between digital mediation and embodiment (Benyon, 2014; Mallgrave, 2013; Verbeek, 2015). Today, ubiquitous digital technology signals the emergence of a hybrid scenario, providing a lens for critically examining the reciprocal influences and challenges posed by technology, space-time, and people (Andrea Resmini, 2021; Blanco-Fernández, 2022; Jandrić & Knox, 2022).

While the pervasive integration of digital technologies into daily life has sparked sociocultural shifts studied across education, geography, sociology, media studies, and computer science (R. Kitchin, 2021; Potts, 2020; Taffel, 2016), urban studies and city planning have yet to incorporate "post-digital" perspectives purposefully. Such a recalibration could enable a more nuanced understanding of the co-evolution of technology and society today. Currently, dominant "digital city" approaches like smart cities, the Internet of Things, AI, and big data, are critiqued for prioritizing technocratic concepts over everyday user agency and lived practices (De Waal & Dignum, 2017; Greenfield, 2013; Mattern, 2021; Rashid, 2024; Rijshouwer, Leclercq, & van Zoonen, 2022). By centering post-digital viewpoints, planning and urban studies can move beyond techno-utopian ideas and foreground grounded, user-centric methodologies informed by intertwined digital-physical urban realities.

This study interprets 'post-digital' as a shift towards a rekindled connection with the real world, adopting critical and reflective stances to investigate novel and unexpected intersections between the digital and the physical. We envision post-digital urban spaces as platforms for ongoing reinvention, where technology and urban users intersect to actively imbue place with evolving meaning. Here, we investigate the city to illustrate how digital can facilitate transformative post-digital experiences, addressing a methodological gap in the critical analysis of urban technological integration.

1.1. Affective Post-Digital City: Theoretical Underpinnings

Borgmann's (1984) 'device paradigm' underscores that excessive reliance on technology produces commodities instead of engaging experiences, leading to a hyper-real world detached from reality. While digital technologies offer convenience, Borgmann (2000) contends that they may fall short of providing meaning or value to postmodern society:

> …information technology is culturally parasitic: it necessarily is a representation of the real world, and this representation is always limited. (On Borgmann's fear, Verbeek, 2002)

Probing this argument, we raise crucial questions: Does digital technology erase contextual engagement in the city? Leading from this we have twofold queries: What is the evolving nature of context-aware, multimodal users' engagements today? And how are everyday place perceptions transformed in the emerging post-digital city wayfinding?

Despite apprehensions about the reductive impact of technology, Sassen (2002) observes that society, cities, technology, and digitality have continued to evolve in tandem. In "e-topia," Mitchell (1999) envisions a cyber-sustainable 'smart city' that is neither *digiphile* nor *digiphobe*; a future *topia* based on urban connectedness via cell-links, as well as humanized pedestrian circulation and auto-transportation systems. Considering this 'intersection' as a spatial phenomenon, Mitra and Schwartz (2001) claim that cyberspace embeds within physical worlds and *cybernetic* space examination solely through a digital lens is limiting. As digital entanglement deepens, urban changes arise not from causal links but from complex emergence. Mitchell's (2003) emerging urban frontier thus suggests the concept of a non-local 'community without propinquity', potentially redefining traditional urban patterns as well as temporal and social relationships.

In the 'network society,' Castells (1989) outlines an 'informational city,' blending 'space of flows' (digitally linked hybrid spaces) and 'space of places' (locally embedded experiences). Horan (2000) and Mitchell (1999) advocate for "recombinant design," integrating digital technology into placemaking through co-designing smart places, as transitioning between the physical and virtual realms has become an everyday occurrence. However, these emerging concepts lack grounded operational methods and contexts. Couclelis (2004) explored city interfaces between physical and virtual, emphasizing bottom-up planning. Indeed, digital technology holds potential for participatory urban design (Ratti & Claudel, 2016; Ravetz, 2020), but engagement with citizens is often overlooked (Mulder, 2015; Smedley, 2013; Townsend, 2003). Others assert that a reflexive approach to post-digital urbanism should consider affective practices, citizen engagement, and social implications (De Waal, De Lange, & Bouw, 2020). In this context, a reflexive approach involves a critical and self-aware examination of the ongoing

interactions between digital technologies and the urban environment.

Given the 'post-digital' repercussions across these areas, questions around emerging urban spaces/places and everyday lived experiences remain vital to explore. Yet obstacles persist, such as the lack of multimodal/multimediated feedback from users. This knowledge gap is exacerbated by the methodological difficulty of viewing digital and physical spaces as interconnected and continuously evolving components that respond to city users' changing needs.

1.2. Study Area and Methodology

Our research approach centers on a case study narrative of two city territories. The post-digital context is explored through our travel and navigation experiences (via networking, walking, and transit riding) between and within Brooklyn Borough (A) and Flushing of Queens (B), New York City, during the summer of 2019 (Table 1). While the paper serves as a methodological showcase rather than a traditional empirical investigation aimed at addressing a knowledge gap, the narrative remains integral, capturing the storytelling aspect of our mode of presenting empirical findings. To address the methodological challenge effectively, we have structured this segment into three sub-sections (a. A priori grounding, b. Multi-modal navigational framework, c. Tools) each purposefully aligned with the study's objectives. Following the methodology section, we present the navigational narrative in two parts, informed by a priori information:

1. Situating Cobble Hill (A) and Flushing (B)
2. The drift from A (Cobble Hill) to B (Flushing): The Flâneur

Interlacing thematic threads from digital society, urban design theory, and socio-public spaces, we employ a methodological mash-up (narrative and field-based). This strategic combination allows us to use qualitative methods to explore complex and multi-layered processes within a specific place-based context. Ethnographic (ground truth and thick description from direct observation) and phenomenological approaches are well-suited to our research goals, as case study research is a valuable tool for gaining a deep understanding of real-world phenomena (Bjerre-Nielsen & Glavind, 2022; Feagin, Orum, & Sjoberg, 2016; Frechette, Bitzas, Aubry, Kilpatrick, & Lavoie-Tremblay, 2020; Seamon, 2023; Yin, 2018). Ethnography situated our experiences within a broader social and cultural landscape, while phenomenology complemented this by examining the lived experiences of the two places (A and B; Figure 1) and the subjective meanings and emotions they evoked. Together, these approaches allowed us to develop a comprehensive and nuanced understanding of our post-digital journey. Our approach exhibits some conceptual overlap with reassembled social science methods that highlight the digital/devices' lively, productive, and performative aspects and their effect on modern sociality (Hine, 2020; Ruppert, Law, & Savage, 2013). However, these studies have primarily remained suggestive without coalescing into substantive frameworks for the post-digital landscape.

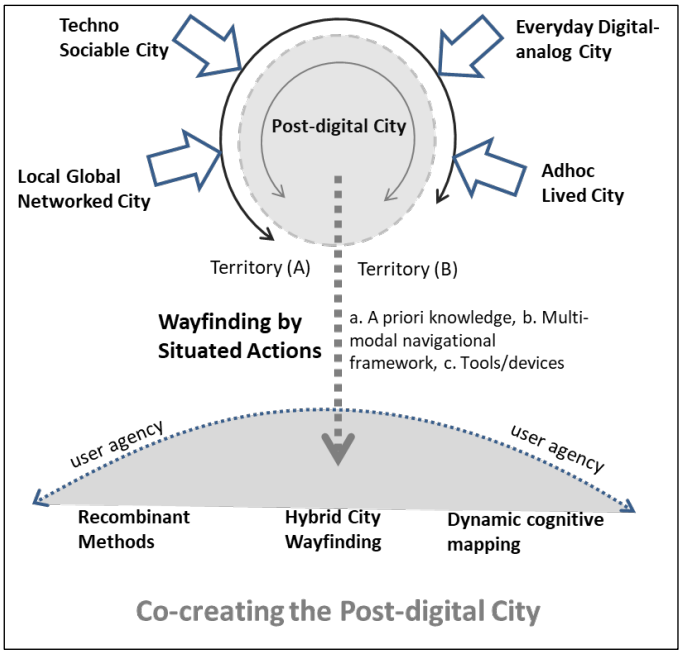

Figure 1. Framework for co-creating the post-digital city. Figure: Authors, 2024.

While the small-scale, case study approach is a key attribute and strength of our study, it presents a limitation, as it may restrict the broader applicability of the findings. The research is grounded in our experiences as researchers, which introduces potential bias, as our backgrounds, personal interactions, and perceptions shape the study's insights.

1.2.1. A Priori Grounding: Pre-emptive Web Dives

This has enabled us to engage with virtual communities, defined as communities of common interest rather than a common location. As Rheingold (1993) notes, these communities emerge from the internet when people engage in public discussions long enough to form personal relationships in cyberspace. Similar to real-world communities, virtual communities provide support, information, camaraderie, and acceptance to strangers, as Wellman (1999) observes. Castell's concept of a virtual community also highlights how far-flung networks of people can form new patterns and relationships of sociability without relying on 'electronic fantasy' (Castells, 2020). By interacting with these virtual communities (such as YouTube channels, Reddit, local Facebook groups, Instagram hashtag networks, neighborhood-specific platforms or City-Specific Forums), we can expand our understanding of the places we visit and gain valuable insights into the social fabric of the communities we encounter. Conversely, increased engagement with virtual networks could lead to detachment from immediate surroundings and erosion of place-based interactions.

Indeed, social networking services and online community platforms, such as chat rooms, blogs, vlogs, and e-books return us to a reconfigured pre-digital discourse of sociability, to De Certeau's interpretation of *stories* as 'organizer of space' (cited in Josgrilberg, 2000, p. 44) where narratives and personal stories shape social connections. De Certeau does not distinguish between oral and written narratives; rather, he argues that the discourses created by society derive from stories, and these discourses are only successful when they transform into relatable stories (Highmore, 2006; Josgrilberg, 2000). The emergence of virtual communities has enticed us to engage in post-digital-spatial storytelling by utilizing evolving digital platforms (Coyne, 2016; Jordan, 2019). In a networked society of 'flows' and 'places', individuals navigate their diverse, transactional, and interconnected paths, creating an adaptable and constantly evolving landscape, unlike the traditional, predetermined route-scapes set by formal plans. This approach, as described by Mitchell (1999), is referred to as an adaptive "recombinatorial landscape". In this context, the landscape represents the space in which recombination takes place, offering a metaphorical terrain or place where different combinations of elements can be explored and tested. By examining the city this way, the article provides a more comprehensive and nuanced perspective, where layers of information, connections, and technology intersect to shape the city.

1.2.2. Multi-modal Framework: Context Driven Recombinant Actions

"Recombinant Spatial Method" cribbed from recombinant design by Mitchell (1999) and Horan (2000) has proven to be highly effective in our study (Aurigi, 2021). This method, which emphasizes the importance of 'context' in navigation practice, everyday place, and interaction, is critically linked to "situated actions" (Robertson & Loke, 2009; Suchman, 1987). Both approaches acknowledge users' active role as agents in developing navigation practices as they interact with technology in complex ways shaped by their environment.

Situated cognition based on navigational 'objectives' (A and B; A to B), rather than relying on fixed 'plans' provides an essential framework for understanding the transactional and context-dependent nature of city navigation through empirical methods. On the other hand, the recombinant method in navigation involves combining and recombining actions (hybrid of digital and analog/physical) on an ad hoc basis as the situation unfolds. These context-driven approaches allow urban users and explorers to perceive places that are more responsive to their needs and desires and can evolve in unexpected ways and adapt over time. Rather than digitally inscribed fixed pre-sets or technology's default modes, these methods explore contingent narratives of how everyday urbanites mobilize and use technologies.

Additionally, we revisit seminal pre-digital urban concepts from a bottom-up and wayfinding perspective (Jacobs, 1961; Lynch, 1960/1975), as well as embodied navigation (flâneurl/dérive). The post-digital navigational narrative resonates with the pre-digital discursive excursions of Baudelaire and Walter Benjamin's flâneur (stroller/wanderer) on the sidewalks (De Certeau, 2011 /1984; Frisby, 2014; Josgrilberg, 2000; Livingstone & Gyarkye, 2017; Psarras, 2018; Seal, 2013; Tester, 1994). It also parallels the daily expeditions of today's smartphone-equipped city commuters on New York's Subways. In our view, these pre-digital concepts are still relevant in the post-digital era and have room to develop into recombined theoretical frameworks. Our aim is not only to restate these ideas but rather to reaffirm and update them.

1.2.3. Tools: In Context

Our urban exploration method combines both digital and analog tools (traditional paper maps, guidebooks, note-taking, and sketching). Reflective journal entries captured our personal experiences in New York, noting sensory perceptions, emotions, and thoughts as we navigated the city. This combinatory approach acknowledges the prevalence of digital technologies in our daily lives while addressing the yearning for richer and more engaging experiences and thick descriptions. The data collection methods are a 'hybrid' of online and field-based data and narrative, enabling us to immerse ourselves in the urban environment and capture on-demand experiences that bridge the virtual and physical worlds.

The wayfinding leverages navigation tools such as Google Earth, Google Maps, and Google Street View (GSV) on devices such as smartphones, wearable, and laptops. These tools offer immersive visual and spatial resources for enhancing urban navigation. For example, Google Maps' AR mode allows users to overlay digital information onto the physical world using their smartphone camera and GPS. GSV is an efficient and reliable companion and alternative for exploring neighbourhoods, especially when assessing walkability (Cinnamon & Gaffney, 2021; Gubrium & Harper, 2016). These technologies are valuable in social science research, contributing to participatory and public-engaged ethnography. Additionally, we utilize digital signage, including interactive kiosks and wayfinding displays, for city-related information such as maps and directions.

Annotated photographs, maps, and images are visual analytical content in the empirical process. We gather information at points A and B and during transit, incorporating digital (live data, on-demand maps, GSV, and digital photos) and sensory or embodied (tactile, olfactory, visual, sonic, and gustatory) cues. This re-combination mode creates a multifaceted process of comprehending, analysing, connecting, and immersing in different aspects of New York City neighbourhoods.

2. Section 1: Situating Cobble Hill (Territory A) and Flushing (Territory B)

2.1. Cobble Hill (A)

Driving distance from Cobble Hill to Flushing is only about 24 minutes (13.3 mi) via I-278 E and I-495 E (on a regular day without construction, traffic delay or other events). Cobble Hill and Flushing, however, are worlds apart in terms of urban spatial atmosphere and ethnic culture.

Cobble Hill is a small Brooklyn neighbourhood and represents a slice of 'old world' Brooklyn. Brownstone Brooklyn was formerly one of the city's most infamous industrial slums in the 1940s and 1950s, but by the 1980s, it had transformed into a post-industrial landscape of fashionable bars, yoga studios, and deftly refurbished, exorbitantly priced townhouses. Suleiman Osman's book, 'The Invention of Brownstone Brooklyn', tells the narrative of this unforeseen transition (Osman, 2011). We were unable to retrieve the pre-industrial notoriety feel of Osman's narrative of Brooklyn in the web search and later in-situ.

Figure 2. A non-repetitive and one-of-a-kind piece of street furniture is seen along the walkable sidewalk of Court Street, which is maintained by Cobble Hill locals. Photo source: Authors' Google photos with Geo tagged data (location, date and time).

On the popular website, Cobble Hill is pinned as a laid-back neighbourhood in Brooklyn, lined with row houses, stoops, tree-lined streets, 19th-century brownstones, hip cafes, relaxed bars, bike shops, and cinemas. A quick navigation through Google Earth, Maps, or Street View will entice any potential tourist with the neighborhood's contained, nestled character; its charming, walkable side streets (Figure 2); casual restaurants; exposed wrought-iron fire-escape stairs; mid-rise residential buildings; and the earthy, warm tones of its buildings and landscapes. Browsing big data and virtual scans also centre it as a bustling community with a majority of Italian and French immigrants, close to Manhattan and Brooklyn bridges, urban renovation projects and iconic places such as Highline, Vessel and Dumbo. On the web, it is also a highly ranked dense urban A+ neighbourhood in New York, ideal for family, diversity, outdoor activities, and commuting options (Niche.com, 2021). The neighbourhood is just 40 blocks long, yet it offers plenty to charm any visitor. Indeed, Cobble Hill emits a strong sense of space and place on-line and off-line due to pedestrian-friendly urban fabric studded with diverse activities and quirky stores, many of which have aged gracefully resonating with the historical legacies of the place.

> A short stroll down Court Street, between Cobble Hill and Carroll Gardens in Brooklyn, is like walking down memory lane. You can't help but notice the signs: Staubitz Markets, est. 1917; D'Amico Coffee, est. 1948; G. Esposito & Sons Pork Store, est. 1922; Sam's Restaurant, est. 1930; Marietta, est. 1940. It's an unusual cluster: some fifteen mom-and-pop stores that have survived more than fifty years. (Suarez, 2015)

Cobble Hill also has presence of big brands like Buffalo Exchange, Urban Outfitters, and Starbucks. However, in the digital matrix the iconic stores now must compete against their much smaller scaled local rivals. Take the case of Coffee in Cobble Hill. Despite the presence of Starbucks in the community, the popular web strongly endorses local shops for a legitimate Cobble Hill Coffee culture – sometimes with clear signs for detours from Starbucks to spots like Bien Cuit and Cobble Hill Coffee Shop (Kaler, 2020). 'Great coffee on Court Street (just past Degraw south of Douglass) at D'Amico's. We like House Blend Dark'; read the flier we received from the Airbnb host when we first arrived in Cobble Hill.

Indeed New York is a global city – a city of financial networks, brands, advertising, and media industry (Castells, 2002), NY is also local because most of the city is engaged in a very local life. Everyday work, private life, cultural identity is indeed essentially 'local'. And the same holds true when NY is viewed through a post-digital lens. New York's aura of locality is teeming in blogs, vlogs, and on-site navigation records (See also, A to B).

The presence of the 'local' in the global networks in Cobble Hill returns us to the new urban space where power is no longer solely concentrated in state, organizations or corporate media, (Castells, 2002). Similarly, it returns us to Flusty's venturing on 'De-Coca-Colonization', which is a progressive look at globalization as it grows at the local micro level (Flusty, 2003). With Flusty's (2003) 'quotidian minutiae', everyday globalities - one can easily explore the globalization-forming effects of local-daily life in Cobble Hill. This understanding also underpins that local community and their involvement in commerce and urban fabric, thus infrastructure and design-planning decisions can indeed build a more robust neighbourhood and planning coalitions and empower the locals in a globalized world (Castells, 2002; Patterson, Scott, & Uncles, 2010) (See Figure 2). It was around everyday globalities — people, places, relics and practices of everyday life —that constitute their relationship, Cobble Hill was imaged in our mind, on the net and off the net. While our bias/preference was for local destinations in NY, how we reached those were both global and local and issued out of their relationship.

2.2. Flushing (B)

Very different from Cobble Hill, Flushing, located in Queens, is predominantly an East Asian neighbourhood. Flushing, Queens' main urban hub, is also home to NY city's second-largest Chinatown. Most of the neighbourhood is residential, although downtown Flushing is bustling with commercial/retail enterprises. Distinctly ethnic in its sights, sounds and flavors, Flushing is indeed crowded:

> In a relatively small area: residents walk a lot, bump into one another, and ride a sprawling yet efficient mass transit system that puts them in literal contact when packed into subway cars.(Hanson, 2016, p. 156)

Although the ethnic composition of the area might initially appear homogeneous, a closer look reveals a rich diversity and intricate local dynamics within the community. R. Scott Hanson's Flushing as 'City of Gods' (accessed in a digital library) resonates with the descriptions of a plural place closely dotted

with Jews, Muslims, Buddhists, Hindus, Sikhs, Asians and Latino Christians (Hanson, 2016). Flushing, according to Hanson, is arguably the most notable example of religious and ethnic diversity in the world. Hanson maintains that the lack of widespread religious strife in such a tightly packed neighbourhood demonstrates a pluralistic society can sustain an unlimited degree of diversity. A Tripsavy.com invitation to Flushing echoed Hanson's comment, albeit in a more upbeat tone. All of this led us to an affordable and bizarre heterogeneous Chinese-American-South Asian retail site in New York, with offerings ranging from the Old Navy clothing brand to upmarket Benetton, to Chinese booksellers, natural medicines and music businesses selling the newest tunes from Shanghai. Mapped in the net:

> The commercial heart of the area is the intersection of Main Street and Roosevelt Avenue, and it extends for several blocks in all directions. Further south on Main Street the majority of stores cater to South Asians: the Pakistanis, Indians, Sikhs, and Afghans who also call Flushing home. (Roleke, 2019)

Access to several blogs and New York-centred online articles socialized us with Flushing long before our corporeal encounters. Indeed Castells (2020) points out it is a mere fantasy to think about virtual communities and physical communities as different in a world where the internet has become a key communication mode. We have both on-line and off-line social interactions. Virtual communities, in particular, offer a new form of sociability, built around shared interests and values. As networks of individuals, these communities reshape relationships between locals and global visitors, providing deeper insights into the locale through a collective lens. These networked communities are eager to engage with global audiences, transcending national boundaries and geographically scattered cities. In an ever-shifting, often contested, cultural landscape, they remain on standby to provide customized recommendations tailored to web surfers' on-demand searches for personalized experiences. Take for example 'What Should We Do', one Google prompt on 'Flushing' search. The online platform introduces itself:

> What Should We Do was founded to make arts and culture accessible to all. Through our technology platform, we offer personalized recommendations from our highly curated database. (Tepper, 2017a)

Arielle Tepper, native New Yorker and culture insider, Tony Award-winning Broadway producer, founded the site with the goal to 'share with the globe the suggestions she's (Tepper) been offering her friends for years'. Her tips on Flushing "the Chinese Manhattan" – a sort of hybrid city-place:

> You haven't experienced Asian culture in NYC until you've been to Flushing. The neighborhood on the end of the 7 line feels like an entirely different world: The jam-packed streets appear three times busier than they do in Times Square; 24-7 bodegas and newspaper stands are replaced with Chinese medicine shops and Korean beauty boutiques; and pizza is topped with the notoriously pungent durian instead of your typical pepperoni…I still manage to stumble upon hidden gems every time I step out of the Flushing-Main Street subway station. (Tepper, 2017b)

Flushing is well known for its cuisine-culture and its distinct flavor (Figure 3). Immigrants' stories are upbeat with culinary memory and fondness for Flushing community.

> "I came to Flushing and fell in love with the community," he said. For Dr. Huang…it is "the best of both worlds — foods of her childhood and freedoms of America." (Haller, 2014)

The Airbnb Garden apartment in Cobble Hill, a temporary home for our NY 'timeout', was scoured through big data about its convenient location (to public transportation), classic Brooklyn vibe, decent Airbnb rate, private backyard in the property, as well as host ratings. Oddly though, we first pre-arrived in Flushing (which is further north of Cobble Hill) after watching a YouTube foodie vlog on the New World Mall in September 2018; all in the comfort of our living room couch on the other side of the world. On the internet, New World Mall - a sprawling basement food court - animates with the sights and sounds of one of the famous dining destinations for authentic Chinese and Taiwanese foods in the area (Barr, 2017; Taste of Trini, 2018). When we arrived in Flushing in July 2019, we found that despite never

having visited the area, we were already familiar with the New World Mall and its surroundings. This near-local familiarity emerged through a digitally primed cognitive mapping—navigational memories rehearsed through online web dives. Pre-browsing reconfigured our spatial grounding, as apps like Google Maps and Uber transformed our perception of distance, space, and time into an elusive matrix. While algorithms may pre-plot travel and mundane tasks, reducing serendipity, post-digital navigation also expands opportunities for the unexpected. By opening wayfinding to spontaneity and place-based discovery, we reclaim unmapped possibilities. Space unfolds through contextual engagement as pre-set directives give way to improvisational wandering.

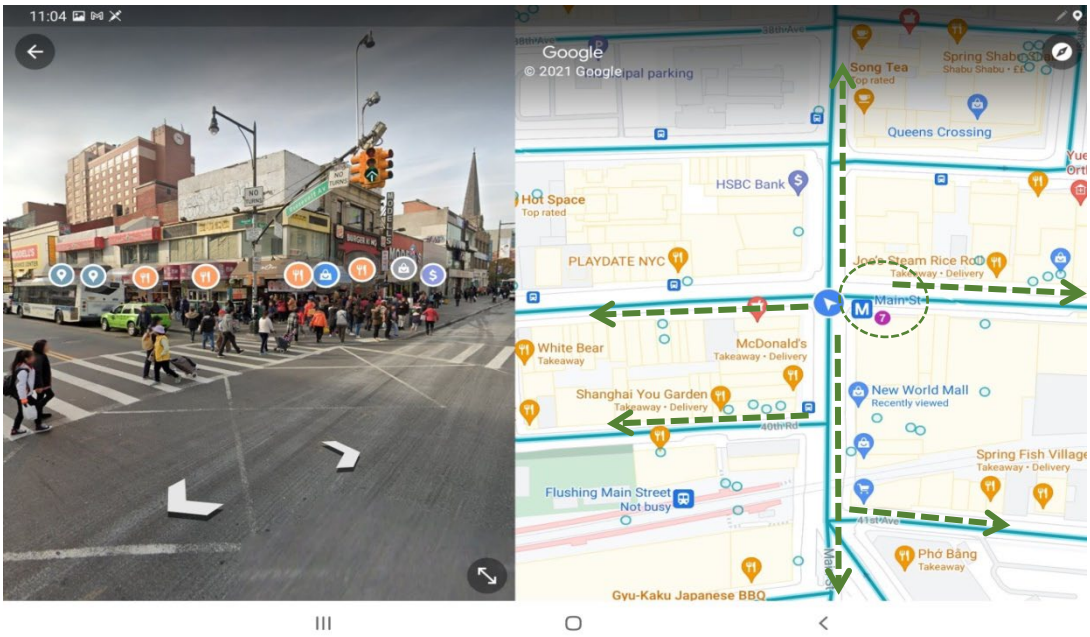

Figure 3. A tablet screenshot of Google Street View (GSV) captures the junction by Flushing's Roosevelt Ave-Main St metro station. Global chain Burger King vies for spot amid local shops like Hong Kong's New Flushing Bakery, CoCo Fresh Tea & Juice, and more - their vibrant ballet spilling onto lively streets. On the far right, the spire of St George church landmark can be seen, where on-street activity has died down. From blogs and vlogs, a mental map of the locality was sketched, extending from the Metro station to the main street and several blocks in all directions. Photo source: Authors.

Our projections of the neighborhood through Google Street View (GSV), citizen-uploaded photos, and YouTube videos closely matched in-situ reality, although there were discrepancies in finer details, such as olfactory, tactile input and scalar parameters. The corporeal encounters on-site made up for these nuances absent online. Indeed, shop signs are more noticeable here (in-situ and on the web) in Chinese than in English. Touristic navigation is guided by signs, postures and gestures, redirects, non-verbal cues (watching the passers-by and following the crowd), as well as real-time Google App searches for the nearest best hot pot or hand-pulled noodle shops. We eventually found the culinary locations by marking favourites on Google Maps and using Google directions to make our way there. Despite limited means of verbal communication, pre-orientation through web dives made Flushing feel safe and yet surprisingly familiar. It was a paradoxical experience filled with surprises—sights, texture, color, sounds, and smells— directly encountered by unplanned on-site wanderings (Figure 3). In this way, phenomenology enabled us to explore the subjective meanings of our lived wanderings through an introspective process, reflecting on how these experiences affected us and the emotions they evoked.

3. Section 2: The Drift from Territory A (Cobble Hill) to Territory B (Flushing): The Flâneur

> This is 'wayfinding', moving around within a world, a process of constant engagement and readjustment in relation to the environment … The opposite of this is the kind of walking through spaces that are signposted, organized, and highly predictable.(Urry, 2007)

Walking, a pleasurable drift or *dérive* as we see it, has long been regarded as one of the most effective

means to investigate and engage with the city, forming a crucial aspect of mobile urban ethnography. While walking offers an intimate, up-close perspective of the immediate surroundings, it is also a kinetic feat; its scope is thus finite and liminal with sensory and emotional repositories. We chose more 'on-demand' hybrid travel modes in New York City by combining pedestrian (one that is slow and corporeal mode) with automobiles/mass transit ones (thus fast and flickering). Indeed, in this post-digital age tourists/travellers can conveniently side-track 'driving' options and choose walking and riding options by clicking the 'transit' button on the Google map (clicking this unlocks additional customizable routes). To avoid redacted urban encounters, our customized travel routes unchecked the 'less-walking' option (See map routing in Figure 4). Clicking that option and opting for reduced walking, would have unfolded another likely set of urban encounters through different routes/mobility modes on Google Maps.

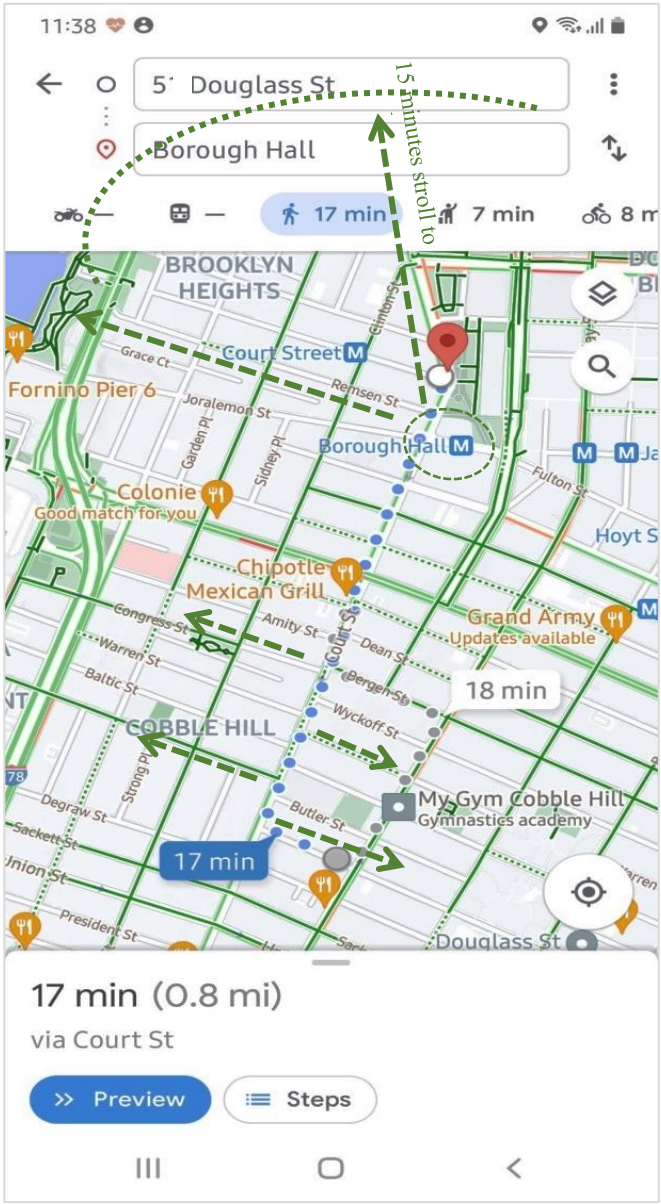

Figure 4. Smartphone screenshot of Google Maps with annotations: Walking the exploratory route from Cobble Hill to Borough Hall station. Two alternative NYC Subway stations (Bergen St. and Carroll St.) with shorter distances were not preferred. 'Pre-emptive Web Dives,' involving vlogs and blogs, provided a mental image of the Borough Hall station surroundings and the neighbourhood blocks along Court Street. In-situ intentional dérives, customized routes and station choices, showcase user agency. Image source: Authors.

Besides, walking on the sidewalks in a physical environment offers a unique perspective of everyday urban life that is never framed by a panoptic grid of predetermined streets. The pedestrian, while walking through a planned city, follows a different spatiality than the one envisioned in the blueprint. This act of

walking or strolling evokes Baudelaire' *flâneur*, the casual wanderer-observer-reporter of street-life, who looks at and listens to the kaleidoscopic displays of the city-life (Tester, 1994). In "Walking in the City," De Certeau (1984) discusses the practice of the *flâneur*, who astutely reflects on urban life as it occurs in random places and situations (De Certeau, 2011 /1984). In De Certeau's view, moving and wandering in the city alters the history and meaning of the urban fabric, giving the possibility for places that are yet to be discovered. Similarly, Guy Debord and the Situationists sought to reimagine the experience of movement in the city as 'psychogeographic drift' or *dérive* to study how urban places' influence moods and behaviours (Debord, 1994/1967; O'Rourke, 2021). Debord's modern explorer is free from the confines of predictability, routine, and pattern; one who ambles through city streets while actively seeking adventure and fulfilment, tapping into the myriad lived experiences of the city in the process.

Walking and encounters with urban life also evoke the ideas of urbanists Jane Jacobs (1961) and Kevin Lynch (1960). Jacobs elucidates 'citiness' (the city's experience) by highlighting small-scale functional and physical diversity that creates and is nurtured by what she calls the street ballet — a liveliness of place and sidewalk life. This lively and synchronized atmosphere arises from the routine comings and goings of individuals engaged in everyday tasks and habitual activities (Hirt & Zahm, 2012; Jacobs, 1961; Scepanovic, Joglekar, Law, & Quercia, 2021). From a slightly applied focus, Lynch elucidates paths (including sidewalks, streets and transit routes) as one of the five key urban elements that contribute to the formation of a city's mental maps or cognitive maps in his work "The Image of the City" (Lynch 1960). Lynchian discourse also describes 'landmarks' as external points acting as point-references for navigation (the navigators do not necessarily enter it). His "wayfinding" or navigation in the city also resonates with the notion of coherent place, memorability and legibility (built elements that allow us to navigate successfully). At the same time, Lynch warned that problems could arise:

> … edges could be too weak to delineate a place…; a landmark could be too great or too alien to the character of a district; paths might lead towards but not to a node; or parts within a district might be loosely connected…. (as noted in Boyer, 1996, p. 141)

Not dismissing Lynch's cognitive elements, but by extending and incorporating navigation within a broader context, Paul Symonds has further reframed wayfinding as the cognitive, social, and bodily process and experience of finding, following, or discovering a route through and to a particular location (Symonds, 2017; Symonds, Brown, & Lo Iacono, 2017).

It is crucial to bear in mind that the mental mapping approach, which Lynch introduced in the 1960s (Lynch, 1960/1975), predates the advent of digital technologies such as GPS, the internet, smartphones, and Google Maps. Recent researches have demonstrated an interest in revisiting these ideas and showing how the use of virtual mapping settings can help planners in undertaking Lynch's analysis and finding city elements (Meenar, Afzalan, & Hajrasouliha, 2019; Park & Evans, 2018; Wessel, Karduni, & Sauda, 2018). However, these studies are limited in scope because they mostly use stand-alone comparisons, such as physical vs. digital environments. Because the physical elements and space of the city are dematerializing or disappearing, Christine Boyer further points out that building a clear and coherent image of the city is a challenge in a visual saturation age (See section Imaging the city, Boyer, 1996, p. 140). The post-digital landscape compels reimagining fixed urban images. As technology embeds in daily life, knowledge derives fluidly from both physical and digital realms. Consequently, cognitive mappings of cities become more dynamic, shaped by interplay between physical wandering (drift/flâneur) and digital mediation. Urban conceptualizations must adapt to the shifts in digitally-infused cognitive schemata, opening up the possibility of recalibrating Kitchin's (1994) posit in today's hybrid context:

> By combining different knowledge structures and information using cognitive processes relating to perception, storage, retrieval and reorganization that interact with memory structures a cognitive map is formed for specific tasks… In this respect cognitive maps are dynamic. (Kitchin, 1994)

Returning to NY in real-time, we were eager to be *flâneur* while balancing slow-kinetic movement with fast transit mobility (NYC Subway). Indeed, in today's contemporary world of flows and places, the classic stroller has the affordance/agency to evolve into a hybrid local explorer. The city is no longer formed and sensed solely through the dominant and hegemonic role of vision. It is in the 'process of becoming', which necessitates a reconsideration of other threats and other senses in two interconnected worlds, as eloquently captured by Bill Psarras:

> Mobile devices with sound and locative applications (i.e., GPS) have created a hybrid interplay between the actual and the virtual. Walkers find themselves part of a wider 'urban symphony' of stimuli and devices. Such pervasiveness and interconnectedness reveals a wider "tuning" of practices, sensory encounters and technologies that contribute to a constantly changing urban sensorium.(Psarras, 2018)

On the other hand, if the users are always tethered to their smart devices, they miss the surprises of the urban symphony around them. The algorithmic push may overrule user agencies, and users may only see what the device deems "interesting," "cool," or "necessary". One caveat is that overtly digitally mediated exploration may undermine the pleasure of unscripted discovery.

While adventuring across the grid utilizing Certeau's embodied tactics, 'transgressing and leaping across boundaries'(De Certeau, 2011 /1984), a few navigational elements turned as emergent rather than incidental to us. From Douglass Street to Borough Hall is about 0.8 miles and 17 minutes' walk (Figure 4). This relatively long walk (Bergen Station could have been reached with a shorter walk of .2 mile/4 min) was deliberately selected since it goes past Court Street (checked on Google Maps, while to point B), a lively street well marked for Brooklyn vibe. From the second day of our stay in Brooklyn, Cobble Hill Cinemas—a preferred spot for veterans—on Court Street began fading as a landmark in our cognitive map. In its stead, a flat (2D) colourful graffiti art (missed and un-marked on Google Maps, was what gave us a sense of spatial turning, entering and leaving our temporary home-neighbourhood in Brooklyn. This shift in cognitive perception—from conventional permanent structures to impromptu artworks—is intriguing. A flat wall graffiti, in most cases, wouldn't conventionally qualify as a landmark, especially when there's an officially promoted 3D landmark like the Cobble Hill Cinema building in the city's official plan.

With smartphones with mobile data switched on, we were able to access Google Maps or Street View on-demand while strolling. Aside from limited 2D map instructions to a destination, we received rich visual information in full colour, overlaid with 3D urban texture of the locality along the paths. Because of seamless communication between the physical and virtual worlds, more possibilities for adventure and movement were created - to move, pause, rest, skip, explore, detour or run fast to catch the next bus on time.

Overall, by using the recombinant spatial method, we created a loose spatial link between physical and online worlds while we moved corporeally, staying on-off connected to the Internet (Google Maps, database search engines). We also recombined movement techniques (along with hybrid navigation) as our needs changed and space unfolded (see Figures 2–4). For us, 'citiness' did not unfold through walking only. Though walking introduced a more corporeal and direct type of urban encounter, New York Subways also offered an alternate version of Jacobs' 'citiness' (in place of side streets). This narrative is poignantly captured in a New Yorker's travel blog invitation:

> 'The subway is the most iconic, accessible attraction we have… And you haven't really experienced New York City unless you've swiped a MetroCard… The subway is a memory-making machine. ' (Sutherland-Namako, 2019)

With a call to intercept the hidden urban gems/spots – the forgotten, discarded, or marginalised aspects of the urban environment:

> The elevated Smith-9th Street stop on the F/G has one of the best views of the city. If you take the downtown-bound 6 beyond Brooklyn Bridge/City Hall, you'll pass through a beautiful, abandoned station. And Hoyt-Schermerhorn, which hosts the A, C, and G trains, is just kind of fun to say.(Sutherland-Namako, 2019)

Instead of driving around in an Uber and visiting, say, the iconic Empire State Building (a popular algorithmic suggestion of a 'cool' NY spot), this pre-visit blog (virtual) invitation enticed us to take a real-time Subway ride. Indeed, subways are not merely routes to reach a destination—such as a building, museum, park, or city center—from point A to point B. Subways are now movable landmarks, a dynamic fleet that autonomously generates time-lapse memories of urban stories and spaces. This type of landmark differs from Lynch's formal, externalized points of reference, offering a more fluid, immersive experience of the city's layers and narratives.

More interestingly, ad hoc memory in Subway is not just image-centric or out-wards (overlooking the windowpanes); it is also on-board and embodied. Any rider is aware that NYC Subway fleet is a

"city" in and of itself, packed with sights, sounds, and the tactility of real-life activity (by the hop-on-off performers, violin players, gravity-defiant dancers, health-cereal bar sellers...). It is an animated stage of urban symphony, both in virtual and real-time, featuring many snapshots of myriad urban stories from everyday urban life. Viewed as part of a continuous wandering or flâneur experience (our personalized walking paths to Subway stations; see Figure 4), Subway is not a concluded entity. It represents an ongoing series of encounters and experiences highlighting contemporary post-digital navigation's interconnected nature. Instead of treating the Subway in isolation, we see it as a dynamic component woven into urban experiences, forming a seamless continuum.

Indeed, not only have the physical infrastructures (of nuts, bolts and subway) of cities become programmable today (R. Kitchin & Dodge, 2014; R. Kitchin & Perng, 2016; Mattern, 2017), but city dwellers now relate to urban environments in new ways which in turn has transformed the nature of urban infrastructural power, making it fundamentally a process of hybrid engagement and discovery. Devices and code now mediate how people work, travel, and play. Notably, urban explorers equipped with increasingly sophisticated devices and digitized memory (e.g., shared virtually) are now locked into an integrated spatial process. Their curation and dissemination of information are central to the cybernetic performance of the hybrid physical-digital environment. This technologically mediated interconnectedness enables collaborative discovery and meaning creation. However, risks remain regarding users' overdependence on technology and loss of contextual engagement from prescriptive digital directives. After all, the essence of drifting (*dérive*) or being a *flâneur* lies in the intention to be surprised, resisting control by ubiquitous digital forces.

4. Conclusion: 'Device Paradigm' to Lived Engagement

This study contests Borgmann's (2000) claim that technology erases contextual engagement, reducing places to mere coordinates or algorithms. While technology can indeed lead to disengagement, our findings propose a more nuanced perspective. Technology, rather than erasing engagement, can serve as a tool to enhance our interaction with the physical environment and foster sociability. In our technological culture, these advancements become quintessential means for individuals to grasp reality, acting as vital links between humans and their world.

As cities evolve, driven by the dynamic interplay of flows, localities, and relationships, a transformative process unfolds. In this context, post-digital navigation becomes a dynamic frontier, challenging conventional expectations and the objectives of 'everyday' wayfinding. The fluid integration of the digital with the physical world fosters innovative urban interactions and a reimagining of the placemaking process in the city. Our methodology illuminates these lived negotiations, where place or location acquires meaning through intention and situated practice. We, as local commuters, now have the chance to become urban place explorers, going beyond prescriptive speed-walking or seeking the shortest route from point A to point B to engage in more nuanced and experiential exchanges. Our methodological insights, derived from wayfinding actions and encounters, have coalesced into four essential components for an emergent city experience:

I. *User Agency:* Everyday users leverage digital tools to selectively explore, alter, and influence places, reshaping predetermined plans and algorithmic suggestions . On-site technology connects but risks replacing serendipity if not balanced, making agency important. Flushing (B): Pre-arrival web research familiarized us with New World Mall, and on-site serendipity led to street vendors.

II. *Recombinant methods*: Innovative urban exploration requires *openness* to creatively combine or recombine ideas, elements, and components in novel ways. The focus lies in synthesizing concepts, methods, etc. from different domains or situations to generate fresh insights. When navigating between A and B, the recombinant method (discussed in Section B: Multimodal Framework) becomes essential and context driven. For another instance, the framework combines pre-digital flâneur's discourse with post-digital embodied wandering.

III. *Hybrid wayfinding in a city territory*: Blends traditional physical wayfinding and exploration modes with emerging digital modes for navigation and meaningful spatial understanding. For example, it utilizes technology such as GPS, live data, on-demand maps, and digital interfaces in conjunction with sensory (corporeal) modalities. It combines walking with digital tools like Google Street View/ GSV, or pedestrian (slow and corporeal mode) with automobiles/mass transit ones (fast and flickering) (see Section 2: The Drift from A to B).

IV. *Dynamic Cognitive Mapping*: Cognitive maps in the post-digital landscape form ad hoc, adapting in real-time per user context—a shift from Lynchian legibility. In Section 2, The Drift from A to B, the cognitive perception of a landmark transforms from a building to an impromptu artwork. Post-digital navigation thus disrupts conventional urban space notions, encouraging exploration; space transforms from predefined paths to unfoldings seeded by chance public encounters.

Users/navigators discover hidden gems as artworks reshape mental maps amid wandering (see Figure 4.

Post-digital affordances of bottom-up involvement foster more vibrant, inclusive urban spaces. The urban context comes alive through users' digitally mediated and embodied practices, situating communities both local and global as co-creators. Collaborative creation generates lively, economically vibrant locales (see 'Starbucks to spots like Bien Cuit and Cobble Hill Coffee Shop', Section 1). However, there is always a danger of erosion of local social fabric in city territories. Digital technologies may inadvertently contribute to community fragmentation; as connections shift online, individuals risk losing agency and becoming disconnected from local ties.

Post-digital navigation can contribute to broader discussions around urban planning discourse and education about issues, including the role of technology and the evolving nature of city life. Notably, while post-digital and smart city discourses intersect, the primary goal of cities should be to create equitable, sustainable locales. By balancing technology with users' viewpoints, cities can ensure that "smartness" meaningfully reconfigures lived practices. Thus, post-digital insights can inform reflexive smart city development, focusing more on self-aware users' needs and emergent locale. Post-digital city wayfinding also poses challenges requiring critical reflection. These challenges entail examining the multifaceted impacts of digital technologies on urban spaces, recognizing both positive potentials and unintended consequences. Additionally, we focus on only two urban territories in a single city, which restricts the ability to generalize to other contexts or cities. Despite these limitations, we contend that our study provides valuable insights into the post-digital urban experience and lays the groundwork for further research that could expand the scope and sample size, both locally and globally.

Researchers can build upon the foundation laid in this paper by further exploring the nuanced understanding of how technology impacts interconnected lived experiences in city territories. Beyond this paper's scope, future studies in the evolving urban context should consider social inequality, marginalization, gentrification, and place authenticity when evaluating the integration of digital tools within the complex social and physical city fabric.

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