Rethinking the Smart City

Interventions for a Post-Digital Age

by

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I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

ABSTRACT

The term Smart City is quickly gaining traction, as it spreads across global cities in a series of urban initiatives. When depicted in mass media, Smart City developments are often portrayed as idealistic technological initiatives with sensors, intelligent traffic signals, autonomous vehicles and interactive screens – an ambiguous extension of the personal digital tools our society relies on for daily convenience and connectivity. They hold the idealistic promise of efficiency, innovation, dependability, security and sustainability, and in the words of Google's Sidewalk Lab: an "[improved] quality of life" for all.

Architect Rem Koolhaas describes these technological trends as movements preoccupied with the improvements they bring, and often disregarding the experiences lost in the process. In reality, Smart City projects are much less concerned with user-experience and are driven instead by the potential for data collection and optimized consumerism. Historian Antoine Picon, argues that the engagement of large technology businesses in the Smart City discourse is motivated almost exclusively by the opportunity for collection and governance of data, and the resulting avenues for profit. By deploying city-wide digital infrastructures, companies like IBM, Cisco, Panasonic, Siemens and Google, are gaining the ability to commercially benefit from the data collected from our spending habits, social media use, means of transportation, energy consumption, etc.

The impact of digital tools on urban communities is engaging researchers in the fields of psychology and sociology, whose findings are leading to an increased concern with the way social media and personal media devices are depreciating the strength of our non-digital communities and relationships. Twentieth century sociologists such as Georg Simmel, Ray Oldenburg, and Lewis Mumford, argued half a century ago the challenges technology has and continues to impose on their development. In response to some of these challenges, contemporary architects and designers are encouraging us to rethink our relationship to the digital city.

Understanding this reality, my research questions the paradox and promised success of cities planned by profit seeking companies, versus city planners. The thesis seeks to examine a new form of reflective interpersonal engagement in the digital age, by shifting the exchange dynamic between technology companies and users. Through a series of design interventions, the thesis asks if one can create meaningful human interaction in digitally saturated environments. Leveraging Smart City technology, a series of interventions interrupt the absentminded, habitual use of digital technologies in order to augment the presence of individual agency within the public realm.

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TABLE OF CONTENTS

LIST OF FIGURES

PART 2

part 1
BACKGROUND

Introduction to the Smart City

The fields of digital technology and architecture have until recently been considered as opposites in a sense – one dematerialized, placeless, and organized in networks; the other material and place bound. However, with the age of ubiquitous digitization upon Western society, this relationship has been decidedly altered. The ongoing movement towards the Smart City is but one way that this relationship has flourished.

The term Smart City can be best defined as "a series of new urban uses [employing] information and communications technology".[1] Architectural historian Antoine Picon describes Smart City proposals as organized under two headings: the first a loosely defined vision of digital tools for the optimisation of above all, city infrastructure, and the second: a broader vision which in addition to the functional technologies of efficiency, proposes an exchange of knowledge and intelligence which will lead to a "better quality of life" in the modern city. Commonalities of both concepts include better economic city management and more sustainable city design.

efficient
future
smart
flexible
high-tech

Google
Audi
CISCO
Panasonic
IBM
SIEMENS

These proposals are frequently developed, and often funded and marketed, by large technological companies, such as IBM, Cisco, Panasonic, and Siemens. As extracted from the multitude of Smart City proposals and digital initiatives taking place (like IBM's Smarter Cities[2], Cisco's Smart City Framework[3], Panasonic's CityNOW[4], and Siemen's Pictures of the Fu-

fig. 1.01 Popular terminology most commonly used in Smart City proposals

1   Antoine Picon, Smart Cities: A Spatialized Intelligence (Chichester, West Sussex: Wiley, 2015), 9.
2   "Smarter Cities," IBM Cognitive Advantage Reports, August 03, 2016, accessed August 01, 2018, https://www.ibm.com/smarterplanet/us/en/smarter_cities/overview/.
3   "Cisco Smart Cities and Communities," Cisco, August 06, 2018, accessed August 01, 2018, https://www.cisco.com/c/en_ca/solutions/industries/smart-connected-communities.html#~stickynav=1.
4   "Smart City Solutions," Panasonic North America, 2018, accessed August 01, 2018, https://na.panasonic.com/us/smart-city-solutions-0.

ture[5]) the optimised digital infrastructure Picon describes most commonly includes: renewable and smart energy, autonomous and electric vehicles and associated parking solutions, intelligent traffic management, sensored LED street lights, public Wi-Fi, public safety monitoring, smart appliances and waste management, and home automation. Martijn de Waal, writer and researcher on digital media and urban culture, summarizes these ambitions as plans made by "leading computer multinationals such as IBM and Cisco [to develop] the infrastructure for the city of the future: they envisage a city crammed with sensors and rapid communication networks; all sorts of 'intelligent' technologies will monitor various processes in the city (...) and use the collected data to make improvements without human intervention."[6] Although there appear to be many benefits to be gained from Smart City initiatives, it is too early to tell how their effects will fully impact the cities of the future.

The arrival of Smart Cities has already begun. For instance, Rio de Janeiro has collaborated with IBM to develop Smart City initiatives. In Abu Dhabi, this has taken shape as Masdar City, a partially occupied planned city project. The Songdo International Business District in South Korea has it's infrastructure and services being developed by Cisco and ULife Solutions. The main themes among Smart City initiatives are "convenience and safety".[7] The example of Songdo demonstrates that by controlling city services from a central control centre, these projects are generally successful in delivering "clean and efficient" master planned communities.[8] Songdo's specific features include digitized public and government services, safety monitoring (including child-tracking wristbands and public safety cameras), automatic emergency service notification, smart traffic signals, and

5   Siemens, "Pictures of the Future," Siemens: Ingenuity for Life, 2018, accessed August 01, 2018, https://www.siemens.com/innovation/en/home/pictures-of-the-future.html.
6   Martijn De. Waal, The City as Interface: How New Media Are Changing the City (Rotterdam: NAI010 Publishers, 2014), 138.
7   Martijn De. Waal, The City as Interface: How New Media Are Changing the City (Rotterdam: NAI010 Publishers, 2014), 136.
8   Richard Sennett. "No one likes a city that's too Smart," The Guardian (2012).

monitored energy consumption.[9] The cities are well-functioning machines, which idealistically "will fully meet human needs automatically", but as a consequence may require little to no active decision making on the part of the user.[10] These proposals paint technology as the ideal solution to all city problems, focusing primarily on optimisation and the "efficient management" of cities, while ignoring the unpredictable everyday behaviours that define urban communities.[11]

As presently represented in mass media, Smart City proposals are further characterised by their nonspecific, idealistic language and visualisation techniques. The following are images are from the Sidewalk Labs Toronto Waterfront proposal. These cartoon-like, playful images focus the viewer's attention on an idealistic vision of community and urban life. They are not technical drawings and seem to avoid the subject of the very technology supporting these developments.

As extracted from the publicly available RFP (Request for Proposal) Submission, Sidewalk Lab's intent is summarised in ambiguous statements such as: "The chance to demonstrate how emerging technologies can make cities more affordable, easier to travel within, and more environmentally sustainable".[12] The proposal clothes the project in popular terminology like efficient, future, smart, flexible, and high-tech, and the way mass media is portraying it is no less vague.

As with the majority of Smart City proposals, the Sidewalk Labs development is being partially funded and led by Sidewalk Lab's parent company, Google. In the Innovation and Funding Partner Framework Agreement Summary of Key Terms For Public Disclosure released by Waterfront Toronto in November 2017, Waterfront Toronto lists "Sidewalk Labs as its

9   Martijn De. Waal, The City as Interface: How New Media Are Changing the City (Rotterdam: NAI010 Publishers, 2014), 136.
10   Martijn De. Waal, The City as Interface: How New Media Are Changing the City (Rotterdam: NAI010 Publishers, 2014), 136.
11   Martijn De. Waal, The City as Interface: How New Media Are Changing the City (Rotterdam: NAI010 Publishers, 2014), 137.
12   Google, Sidewalk Labs "Sidewalk Toronto." Welcome to Sidewalk Toronto, Google, 17 Oct. 2017, Accessed Nov 2, 2017, http://sidewalktoronto.ca/#documents.

fig. 1.02 Sidewalk Lab's visualization for Toronto Waterfront Quayside community. The "Mobility Vision" portrays Google's vision for the transportation networks proposed.

fig. 1.03 Sidewalk Lab's visualization for Toronto Waterfront Quayside community. This image portrays Google's "Vision" for the smart technology community they are proposing. The image focuses largely on a vibrant vision of nature and community, but does not address the details of the technology that is guiding this pursuit.

fig. 1.04 Sidewalk Lab's visualization for Toronto Waterfront Quayside community. Similarly to the previous image, the "Public Realm Vision" emphasizes an active, pleasant community to live in on the Toronto Waterfront, while not addressing the details of the technology that is guiding this pursuit.

"Why Toronto is the ideal place to build a neighbourhood of the future"
- GLOBE AND MAIL

"Google's Sidewalk Labs signs deal for 'smart city' makeover of Toronto's waterfront"
- GLOBE AND MAIL

"Alphabet's Sidewalk Labs to Create 'Smart' Neighborhood on Toronto Waterfront"
- WALL STREET JOURNAL

"What's not to love about a mix of 19th century planning mixed with 21st century technology?"
- TREEHUGGER

fig. 1.05 Mass media headlines in reaction to the Sidewalk Labs Toronto Waterfront Development, praising the proposal

Innovation and Funding Partner" for the project. It states that Sidewalk Labs "will commit up to US$50 million to fund [the project] that will occur over the next 12 months", the result of which will be a Master Innovation and Development Plan. The report describes the plan as one that "[combines] forward-thinking urban design and new digital technology to achieve precedent-setting levels of sustainability, affordability, mobility and economic opportunity".[13] Susan Crawford, law professor, criticizes the model in place for the Quayside Waterfront Development, stating that although "the planning process is being paid by Google, [Google] won't continue funding that process unless government authorities promise they'll reach a final agreement that aligns with Google's interests".[14] Crawford goes on to say that in addition to expanding past the originally agreed on 12-acre Quayside plot, Google is also driven by the priorities to "[gain] insights about urban life including energy use, transit effectiveness, climate mitigation strategies and social service delivery patterns - that it will then be able to resell to cities around the world" instead of being driven by the priorities of the city and its inhabitants.[15]

Although mass media tends to portray the utopian ideal of these Smart City proposals in a very positive light, the specifics of how these initiatives will be materialized remains on open question. Similarly to Crawford, Picon argues that the engagement of large businesses in the Smart City discourse is motivated almost exclusively by the opportunity for collection and governance of data, and the resulting avenues for profit.[16] By deploying city-wide digital infrastructures, these companies are gaining the

13   Innovation and Funding Partner Framework Agreement Summary of Key Terms For Public Disclosure. Report. WATERFRONToronto. November 01, 2017. Accessed August 01, 2018. https://sidewalktoronto.ca/wp-content/uploads/2017/10/Waterfront-Toronto-Agreement-Summary.pdf.
14   Susan Crawford, "Beware of Google's Intentions," Wired, February 01, 2018, accessed August 01, 2018, https://www.wired.com/story/sidewalk-labs-toronto-google-risks/.
15   Susan Crawford, "Beware of Google's Intentions," Wired, February 01, 2018, accessed August 01, 2018, https://www.wired.com/story/sidewalk-labs-toronto-google-risks/.
16.   Antoine Picon, Smart Cities: A Spatialized Intelligence (Chichester, West Sussex: Wiley, 2015).

ability to commercially benefit from the data collected from the spending habits, social media use, means of transportation, and energy consumption of city users. Rem Koolhaas further notes that in the age of the market economy, "architecture no longer expresses public values but instead the values of the private sector"[17] and criticizes the Smart City for "the perverse effect of impoverishing the very entity [the public], it is supposed to serve".[18]

Critics of the Smart City include technologists, sociologists, artists, and architects. They question issues of social interaction, data privacy protection, resource allocation, fabrication, political structures, and ghettoization, among others. I believe that these critiques are all extremely valid in the Smart City discourse, however, for the purpose of this thesis I am concerned with addressing the question of meaningful in-person interaction in the digital age. As Richard Sennett reflects, "The danger now is that this information-rich city may do nothing to help people think for themselves or communicate well with one another".[19]

fig. 1.06 Data collection opportunities for technological companies in Smart City initiatives

17   Rem Koolhaas. "My thoughts on the smart city," European Commission (2014).
18 Rem Koolhaas. "The Smart Landscape: Intelligent Architecture" Artforum.com (2015).
19   Richard Sennett. "No one likes a city that's too Smart," The Guardian (2012).

Technology in the City

Technological innovation has driven the evolution of community and city life since the existence of mankind. In the last century alone, the arrival of electrification drastically affected North American society, and the effects were mirrored in the architectural environment. Business and technology writer, Nicholas Carr describes the "commercial and social ramifications of the democratization of electricity [as] hard to overstate."[20] While at first novel, the introduction of electric utilities over the course of a few generations was so thorough, it became integral to the modern definition of North American society. Carr lists "the rise of the middle class, the expansion of public education, the flowering of mass culture, the movement of the population to the suburbs, [and] the shift from an industrial to a service economy" as changes all accredited to the arrival of electric utilities.[21] Likewise, he projects the ongoing technological innovation in the processing of information and digitization as a transformation of similar magnitude.

Comparatively, the challenges technological innovation poses on community life in the city have been discussed by sociologists and architects far preceding the digital age. In 1989, Ray Oldenburg wrote "The only predictable social consequence of technological advancement is that [the public] will grow ever more apart from one another".[22] Nineteenth century sociologist and philosopher, Georg Simmel observed concerning new social norms of disengagement on the part of transit users, regarding the arrival of busses, railroads and trams.[23]

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20   Nicholas G. Carr, The Big Switch: Rewiring the World, from Edison to Google (New York: W.W. Norton &, 2013), 11.
21   Nicholas G. Carr, The Big Switch: Rewiring the World, from Edison to Google (New York: W.W. Norton &, 2013), 24.
22   Ray Oldenburg, The Great Good Place: Cafés, Coffee Shops, Bookstores, Bars, Hair Salons, and other Hangouts at the Heart of a Community (Marlowe & Company, 1989), xxvii.
23   Georg Simmel, Soziologie: Untersuchungen Über Die Formen Der Vergesellschaftung (Berlin: Duncker & Humblot, 1958), 486.

In contrast, Carr ascertains that despite popular belief, many of the defining characteristics of the modern city are not "permanent features" but rather "the by-products of a particular set of economic trade-offs that [reflect], in large measure, the technologies of the time".[24] In accordance with this claim, shifts in the city brought on by technology cannot be withheld, foreseen, or retracted, but are naturally integral to the evolution of society. Carr disagrees with the notion that technology can be controlled and shaped, instead framing it as a neutral factor that must be responded to accordingly. Technological innovation has and continues to affect city growth, while also posing new design problems to community engagement. Just as the suburb became a new social and architectural problem arising alongside the industrialization of electric utilities, the digital age will bring forward a new set of architectural questions. In this way, the decline of social interaction in the public sphere is not a new problem, despite the growing trend that faults the digital movement for this phenomenon, but instead a question that should be asked and reconsidered with each wave of technological innovation.

To illustrate this point, the timeline in Figure 1.07 portrays significant technological developments leading up to the Smart City movement. The timeline begins in the 16th century and ends in present day. The most notable events are above the line, while events that are less significant to the Smart City specifically are below.

By treating the advance of technology, digital and otherwise, as a given factor in the trajectory of urban development, this thesis seeks to leverage Smart City technology, not oppose it, to design for stronger non-digital communities in the cities of the future.

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24   Nicholas G. Carr, The Big Switch: Rewiring the World, from Edison to Google (New York: W.W. Norton &, 2013), 24.

1830-40:GAS STREET LIGHTS

1880-90:ELECTRIC LIGHTING IN CITIES

1882: TROLLEYBUS

1884: TELEVISION

1850: ELEVATOR

1872: ELECTRIC METER PATENTED

1876:FIRST PHONE CALL

1878: ELECTRIC LIGHTING PATENTED

1550s:HORSE-DRAWN COACH POPULARIZED

1830-60:STEAM ENGINES INDUSTRIALIZE THE CITY

1902: TRANSOCEANIC CABL

1908: FORD MODEL T

1863: FIRST SUBWAY

1868: FIRST TRAFFIC LIGHTS

1895: MOTOR CITY BUS

1775:FLUSH TOILETS

1854: DISEASE MAPPING

1903: WRIGHT BROTHERS FLYER

192

192

1600s:PAPER CURRENCY IN EUROPE

1885 : METALFRAME FIREPROOF BUILDING

1859: CITY SEWAGE SYSTEM IN LONDON, EN

1913:NITROGEN FERTILIZER

1915:GAS PUMP

1916:ZONING

fig. 1.07 A timeline of critical inventions leading up to the Smart City movement

1962: INSTANT MESSAGING

1963: AI RESEARCH GROUP FOUNDED AT MIT

1975: X10; FIRST GENERAL PURPOSE HOME AUTOMATION NETWORK

1990: WORLD WIDE WEB

1990s: BROADBAND INTERNET ACCESS

1991: 2G NETWORK; DIGITAL NETWORKS

1991: GERONTECHNOLOGY

2003: SKYPE

2004: FACEBOOK

2005: TRANSITORY CITY DATA

2005: YOUTUBE

2007: IPHONE

2007: WIRELESS ELECTRICITY

1950s: AIR-CONDITIONING

1954: FIRST PHOTOVOLTAIC CELL

1955: THE REMOTE CONTROL

1957: SPUTNIK 1; WORLD'S FIRST ARTIFICIAL SATELLITE LAUNCHED

1970s: AUTOMATIC METER READING DEVICES

1970s: RESISTIVE TOUCHSCREENS

1970s RECYCLING

1999: WIRELESS APPLICATION PROTOCOL (WAP)

1999: BLUETOOTH

2008: ADDITIVE MANUFACTURING

2008: GOOGLE ANDROID PHONE

2008: 4G NETWORKS

2008: INTERNET OF THINGS (IOT)

2010: FIRST AUTONOMOUS VEHICLE

2010: MEDICATION-MANAGEMENT MOBILE APPLICATIONS

1937: PULSE-CODE MODULATION

1977: APPLE HOME COMPUTER

1978: (GPS) GLOBAL POSITIONING SYSTEM

1979: 1G SYSTEM; WIRELESS CELLULAR TECHNOLOGY

1995: FIRST PUBLIC VIDEOCONFERENCE

1997: FIRST MASS-PRODUCED HYBRID VEHICLE

1998: 3G NETWORKS

2011: ARTIFICIAL ORGANS FOR HUMAN TRANSPLANT

2011: FIRST RIDESHARE PROGRAM

2013: SMART-METERS IN HOMES

2013: PRIMEAIR AMAZON DRONE DELIVER

1972: CALLER ID

1973: CELL PHONE

1984: DNA FINGERPRINTING

2000: FIRST DIGITAL CAMERA PHONE

2000: ROBOTIC SURGERY

TODAY: SMART CITY

1930: SKYSCRAPERS

27: REFRIGERATOR

28: PENICILLIN

1956: SHIPPING CONTAINER

12

part 1.3
Effects of Technology on Community

A trend unique to our current position in history is the disposition of digital technology to remove social nodes from the city fabric. It does so by dematerializing them into digital services. Examples of places that have previously grounded everyday social interactions include newsstands, shopping malls, and libraries. Many of these have now been made more efficient through digital tools, and by consequence become a private experience, as demonstrated in Figure 1.08.

digital readers

online streaming

cell-phones

online gaming

online shopping

digital newsfeed

fig. 1.08 The ongoing digitization of social chargers within the city fabric

Furthermore, while the digitization of these services may seem attractive on the merits of their convenience and efficiency, research scientist Margarita Angelidou offers the Smart City in Rio de Janeiro as an example of the potential social consequences of the digitization of common services. Specifically, she addresses the segregation of city communities, stating that: "[the] digitization of citizen services have splintering effects on the social cohesion of society, as social groups with limited access to digital resources may find themselves completely isolated by losing their access to their physical counterpart (think banks versus internet banking, city hall services versus online birth certificates, libraries versus e-books, voting centers versus e-voting, etc.)."[25] The thesis argues that systems built for

25   Margarita Angelidou, "Smart City Policies: A Spatial Approach," Cities 41 (July 16, 2014): 7, doi.org/10.1016/j.cities.2014.06.007.

optimization may undermine the social relevance of their less technologically advanced predecessors, unless integrated more mindfully into the social landscape of the city.

In addition to these changing services, the age of digitisation is also credited with the "on-going demise of urban public spaces such as town squares, multifunctional streets and public parks".[26] Social media networks and online forums are the new digital centers of public life. That being said, research indicates digital social networks to be an inadequate substitute to their spatial counterparts. Oxford University researchers, Dr. Igor Calzada and Cristobal Cobo, dismiss the widely made assumption that digital interactions only add to face-to-face interactions. They suggest that there is no positive correlation between an individual's online presence and their involvement in off-line networks. They go on to say, that the inverse is more likely to be true, as these individuals tend to decrease their social capital by referring more frequently to the inadequate substitute of the online realm, whose interactions are generally more surface-oriented and replace the need we all have for trusting human ties and a sense of place.[27]

In parallel, the immersive nature of these personal digital devices decreases our engagement while we are present in physical public spaces. Figure 1.09 visualizes a series of potential scenarios in which personal media devices are accessed to intentionally disconnect from banal everyday functions in the public realm. The diagram describes moments in which users are likely to turn to their phones in order to disconnect from their physical surroundings, often due to boredom and in times of waiting. Examples include waiting in a line at a coffee shop or grocery store, in a public waiting room, at the microwave or at a transit shelter.

26   de Waal, Martijn, "The Urban Culture of Sentient Cities: from an Internet of Things to a Public Sphere of Things," in Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space, ed. Mark Shepard (New York City: Architectural League of New York, 2011), 190.
27   Igor Calzada and Cristobal Cobo, "Unplugging: Deconstructing the Smart City" (The Society of Urban Technology, University of Oxford, England, 2015), 34 and 38.

WAITING FOR
COFFEE

WAITING FOR THE
BATHROOM

WAITING IN LINE
AT STORE

WAITING FOR AN
APPOINTMENT OR
MEETING

5MINUTES

5MINUTES

5MINUTES

15MINUTES

WAITING FOR FOOD
TO COOK

WAITING FOR A
MEETING OR
PRESENTATION TO
END

AVERAGE TORONTO
COMMUTE IS 24
MINUTES ONE WAY

20MINUTES

30MINUTES

48MINUTES

fig. 1.09 This diagram visualizes a series of potential scenarios in which personal media devices are accessed to intentionally disconnect from banal everyday functions in the public realm
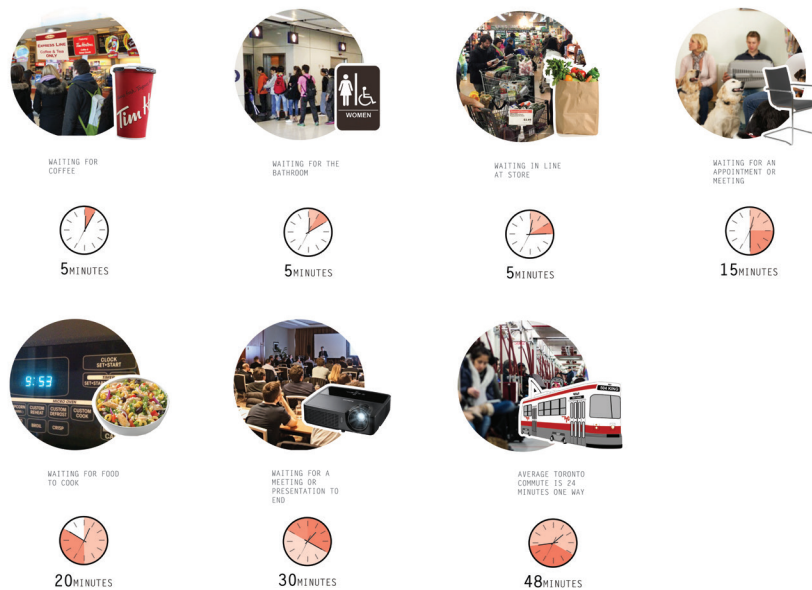
Although the same claim could be made against the antisocial habits preceding digital technologies, such as reading a newspaper while riding the subway, architect and researcher Mark Shepard argues that digital devices further separate us from our social and physical surroundings. He explains that this occurs because digital devices create dissociated spatial environments and "[become] a tool for organizing space, time, and the boundaries around the body in public space."[28] In support of his argument, Shepard describes research on the use of the iPod to "mitigate the contingencies of daily life".[29] He credits the device for creating new norms of privacy in the public sphere, which would otherwise seem unconventional to customary social interaction. Shepard goes on to say that "[donning] a pair of earbuds grants the wearer a certain amount of social license, enabling one to move

28   Mark Shepard, Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space (New York City: Architectural League of New York, 2011), 25.

29   Mark Shepard, Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space (New York City: Architectural League of New York, 2011), 24.

through the city without necessarily getting too involved, and to some extent, absolving one from responsibility to respond to what is happening around him or her," thereby demonstrating the potentially isolating effects of a growing dependence on personal digital devices.[30] This differs from simply reading a paper at a bus stop, as one's auditory senses were still free to help one engage with their environment; an opportunity that is no longer available with earphones.

Increasingly, our attention is moving towards the digital, whether productive and intentional or not. The continuation of this trend may lead us to what Richard Sennett describes as a culture of voyeurism.[31] Sennett describes a culture in which the smart phone leads us to observe and consume rather than engage with our physical environments in the public realm. For example, scrolling through the contents of a social media newsfeed, rather than engaging with members of the office break room. Architectural historian and theorist, Kazys Varnelis, argues a similar point in outlining the difference between domestic devices such as the radio and television and the piano and fireplace, with the former replacing the latter as centres of the home in the last century. While the latter viewed the user as an individual producer, its replacement targeted a mass audience of consumers, resulting in weaker interactive experiences.[32]

30   Mark Shepard, Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space (New York City: Architectural League of New York, 2011), 24.
31   Richard Sennett, The Fall of Public Man (New York: W.W. Norton & Company, 2017), 27.
32   Varnelis, Kazys "Space, Finance, and New Technologies," in Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space, ed. Mark Shepard (New York City: Architectural League of New York, 2011), 198.

part 1.4
Changing the Relationship
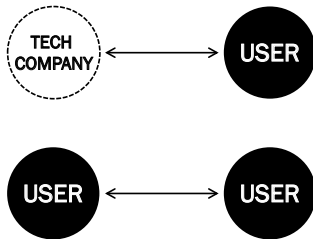
fig. 1.10 Changing the exchange relationship from technology company and user, to user and user instead

In response to these technological shifts, this thesis seeks to examine a new form of reflective interaction in the digital age. It aims to do so by shifting the exchange dynamic between technology companies and users. As described earlier, the present exchange dynamic cultivated by digital technologies is one of information and data between users and supplying technology companies. Carr states that the average consumer is unaware of their contribution to the labor and economic benefit of the digital services they use. He provides the example of the Google search engine, which "[tracks] people's everyday behavior online and [distills] valuable intelligence from the patterns the behavior reveals" while "no one minds because the resulting products, like search results, are useful".[33] Meanwhile, the company's ambition is to collect and store all user data, in order to then cater an algorithmically personalized product designed to appeal especially to each individual consumer.[34] As Carr summarizes, "the internet turns everything, from news-gathering to community-building, into a series of tiny transactions - expressed mainly through clicks on links (...) some deliberately, some impulsively" which combined "will shape our economy, our culture, and our society".[35]

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33   Nicholas G. Carr, The Big Switch: Rewiring the World, from Edison to Google (New York: W.W. Norton &, 2013), 138-139.
34   Nicholas G. Carr, The Big Switch: Rewiring the World, from Edison to Google (New York: W.W. Norton &, 2013), 161.
35   Nicholas G. Carr, The Big Switch: Rewiring the World, from Edison to Google (New York: W.W. Norton &, 2013), 166.

Similarly, Picon states that many of the Smart City projects under the development of large technological companies are "based on an ideal of the hierarchical control of information and of the behavior that results from it".[36] This problem becomes an increasingly present issue as our "buildings and cities are being transformed, imbued with the capacity to sense, record, process, transmit, and respond to information and activity taking place within and around them."[37] At the exchange value of providing more efficient services, companies are gathering information that allows them to cater more effective products, and "[reduce the city] to a series of convenient services for consumers", as described by de Waal.[38] In the wake of these changes towards a city founded on digital infrastructure, we must ask " who will benefit from it?".[39]

The thesis, in turn, proposes to challenge the consumerism-driven agenda of technology companies and use digital tools to create a new exchange dynamic: between users and other users as well as users and their environment. The digital network is fundamentally neutral. While it is an attractive opportunity for large corporations to capitalize on the exchange of data, the services provided by this network also undeniably benefit individuals and societies. Therefore, the ambition of this thesis is to challenge the driving forces of business and efficiency in the digital network by emphasizing instead the cultural and personal benefits these tools are capable of providing. Furthermore, as described in the previous sections of the thesis, the immersive qualities of digital tools also affect our experience of the city by encouraging a culture of voyeurism and consumerism over active participation and interaction. This thesis proposes a shift in this relationship, towards one of more active agency and renewed participation

36   Antoine Picon, Smart Cities: A Spatialized Intelligence (Chichester, West Sussex: Wiley, 2015), 016.
37   Wessner, Gregory "Preface," in Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space, ed. Mark Shepard (New York City: Architectural League of New York, 2011), 8.
38   Martijn De. Waal, The City as Interface: How New Media Are Changing the City (Rotterdam: NAI010 Publishers, 2014), 138.
39   Wessner, Gregory "Preface," in Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space, ed. Mark Shepard (New York City: Architectural League of New York, 2011), 9.

in the public realm. If this relationship is not altered and continues to progress as proposed, Smart Cities may become prescribed optimized communities with technological solutions to urban problems that value efficient management over opportunities for organic urban life. With no historical precedent upon which to build, it is unknown whether or not these novel technologies will succeed or fail. As discussed in the previous section, failure could result in isolation and a lack of successful public space for authentic community participation.

Whereas the majority of Smart City proposals perceive the individual as a user of services within the city, this thesis maintains that "city dwellers are first and foremost citizens who can act of their own accord" not users that consume the most efficient route prescribed by a system.[40] Active citizens are key components that make-up the city, and not simply passive users that just make use of (smart) city services. As de Waal echoes, the tendencies in current Smart City proposals are problematic as they point towards the possibility of a future in which "citizens will no longer have any agency: companies and the state establish the protocols that determine what is and is not permitted, [which becomes] increasingly true for both the physical environment and for the software interfaces that guide us through the city".[41] As these technologies enter the realm of public place, this becomes a problem important not only to individuals, but architects and city planners in deciding how the digital network will shape the cities of the future and re-engage users as active participants in the public realm. If this relationship is not altered, we run the risk of producing more smart cities like Songdo, planned by Cisco, in which economy is the primary factor, producing a city which although safe, efficient, and convenient, results in a "neat and tidy 'master-planned community' (...) [but] is sometimes rather dull" and "suburban" in character.[42] Therefore, in order to maintain the identity and specific characteristics of a city, we need engaged and active individuals that are immersed in their physical environments and communities as much, if not more so, than in digital ones.

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40   Martijn De. Waal, The City as Interface: How New Media Are Changing the City (Rotterdam: NAI010 Publishers, 2014), 170.
41   Martijn De. Waal, The City as Interface: How New Media Are Changing the City (Rotterdam: NAI010 Publishers, 2014), 173.
42   Martijn De. Waal, The City as Interface: How New Media Are Changing the City (Rotterdam: NAI010 Publishers, 2014), 138.

The thesis approach is twofold: firstly to reverse the exchange relationship of data to the benefit of the user; and secondly to propose a new typology of urban design which synthesizes the immersive qualities of digital tools and materiality in order to reactivate the public realm. This thesis does not seek to re-engage public interaction by antagonising the digital realm, but rather it embraces a future outlook on urban design in which "these devices and the ways in which we use them have perhaps become as important as - if not more important than - architecture in shaping our experiences of urban space."[43] Leveraging Smart City technology, this thesis proposes a series of interventions that are developed to interrupt the excessive, habitual use of digital technologies in order to augment the presence of individual agency within the public realm. As opposed to being consciously or subconsciously controlled through digital devices and media, this thesis proposes an increase in user agency.

Relevant Case Studies of Interventions

Many artists and architects have grappled with the question of Smart City technologies and their effects on public engagement. David Jimison and JoYoun Paek are among a group of designers responding to the digital age with a similar aim towards more mindful re-engagement of users with their digital tools. Their project "Too Smart City", integrates artificial intelligence into common street furniture, like the trashcan, bench or sign, and uses it to render an opposite-than-expected result. For example, the Smart Trashcan shoots back trash at the user if sorted incorrectly.[44] Smart technology is used in a novel way that does not increase efficiency, but instead probes users to question the technology embedded in their cities.

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43   Mark Shepard, Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space (New York City: Architectural League of New York, 2011), 25.
44   Jimison, David & Joo Youn Paek, "An Intentional Failure for the Near-Future: Too Smart City," in Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space, ed. Mark Shepard (New York City: Architectural League of New York, 2011), 110-115.

The approach taken in the Too Smart City project parallels the ambitions of this thesis, by both encouraging users to reexamine their relationship with embedded digital technologies, while also altering the relationship that generally benefits only large technology companies. In this case, the technology does not benefit companies with optimized consumerism, but acts as a social experiment that is meant to intellectually benefit and enact the agency of the user.

fig. 1.11 Too Smart City gallery installation

fig. 1.12 Too Smart City Smart Trash Can

Happy Maps is another example of a project that uses advanced digital tools for uses other than efficiency and heightened consumerism. The web mapping service consists of a series of maps of London, which lead users on a route identified as most beautiful by the city's inhabitants through crowd-sourcing data. The map series includes routes featuring aesthetics, smells, and memories.[45]

45   Rossano Schifanella, GoodCityLife, accessed July 24, 2018, http://goodcitylife.org/.
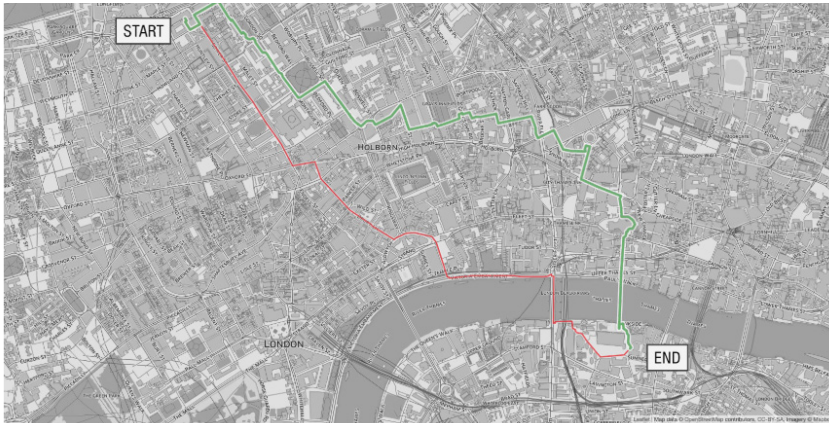
Fast route: 4.0 kilometers (46 minutes)
Happy route: 4.5 kilometers (53 minutes)
Why this'll make you happy: The shortest path from the Euston Square Underground station to the Tate Modern gallery starts by taking you along busy Gower Street. But add six minutes to your route, and you can wend your way to the modern art on a quieter path: Saunter along the parallel, less busy Gordon Street and walk past Gordon and Russell Squares. Instead of taking the Strand, full of people and cars, walk along historic and beautiful Fleet Street, the storied former home of London's newspaper industry.

fig. 1.13 Image of Happy Maps interface from Good-CityLife

fig. 1.14 Image of Happy Maps interface, providing the shortest, most beautiful, quiet, and happy route options

Similarly to these projects, the thesis seeks to resist the passive relationship between device and user, presently cultivated in North American digital culture. In light of Sennett's observation of a culture of consumption-driven voyeurism, the interventions proposed aim to recondition this tech-driven relationship as one of authentic re-engagement of the user with the urban experience. The comparison of the web-mapping service Google Maps and the Happy Maps project are an example of the the change in relationship proposed. Whereas Google Maps is used and evaluated by users based on its ability to provide the most time efficient route planning service, Happy Maps is based and judged on how it "maximizes the [user's] emotional gain" by providing a route based on an "alternative cartography of a city weighted for human emotions".[46] Both web mapping services are accessed and created digitally, and share a common fundamental purpose of planning a route between destinations. However, Google Maps is foremost guided by the object of maximized efficiency, and by consequence does not engage the senses or emotions of the user.

Comparatively, the primary ambition of this thesis is not one of separating users from their devices or the drastic decrease of smartphone usage trends. It seeks instead to reframe the role of smartphones in urban interactions, and make their usage more intentional and socially effective. Figure 1.15 displays trends in smartphone use over the last decade. In North America, the average daily use has increased from a half-hour to nearly four hours a day in the last five years.[47,48] Furthermore, most users spend double the amount of time on their phones than they report doing; an arguably more concerning aspect.[49]

46   Rossano Schifanella, GoodCityLife, accessed July 24, 2018, http://goodcitylife.org/.
47   N/A, "How Much Time Do People Spend on Their Mobile Phones in 2017?" Hacker Noon, May 09, 2017, accessed January 04, 2018, https://hackernoon.com/how-much-time-do-people-spend-on-their-mobile-phones-in-2017-e5f90a0b10a6.
48   Catherine Price, "Smartphone Addiction: Steps to Use Phone Less," Time, February 08, 2018, accessed July 24, 2018, http://time.com/5139859/smartphone-addiction-solutions/.
49   Eric Andrew-Gee, "Your Smartphone Is Making You Stupid, Antisocial and Unhealthy. So Why Can't You Put It down?" The Globe and Mail, April 10, 2018, accessed May 14, 2018, https://www.theglobeandmail.com/technology/your-smartphone-is-making-you-stupid/article37511900/.

4HRS EACH DAY

60% PEOPLE OWNED SMARTPHONES

165%

1,460 HRS/YEAR
60 DAYS/YEAR

TODAY
A CHANGING POINT

HOURS/DAY

4
3.5
3
2.5
2
1.5
1
0.5
0

1973   1983   1992   2001   2005 2008 2011 2013 2015 2018

2010:
BLOCKBUSTER GOES BANKRUPT

BLOCKBUSTER

2010:
NETFLIX EXPANDS INTERNATIONALLY (CANDA)

NETFLIX

1992:
BLOCKBUST-ER IS THE UNDISPUTED VIDEO RENTAL LEADER

2002:
SMARTPHONE BLACKBERRY RE-LEASED - SUP-PORTS EMAIL, TEXTING,INTERNET FAXING, WEB BROWSING

2002:
AMAZON INCREAS-ES PRODUCT SER-VICES

amazon

2006:
FACEBOOK PRIVATE ACCOUNTS

2007:
FIRST IPHONE

fig. 1.15 Diagram of trends observed in mobile use among North Americans

24

Digital technologies are undeniably powerful tools in our urban and social existence. So much so, that individuals seem to lose track of the time they spend immersed in them. The question becomes how much of this increased use is aimless and voyeuristic, and how much of it is intentional and actively benefiting the user. This thesis proposes a series of interventions that question the agency of the user in relationship to these technologies, and their impact on public life in the cities of the future. They do so in various ways, depending on the location and context of each intervention. Examples of these approaches include using familiar digital tools in novel ways, attaching public visual cues to the use of personal media devices, or synthesizing media use with a physical response in the built environment, among others. Each of these methods will be expanded upon in Part 2.2: The Exchange Place.

Defining Public Interaction

The fundamental aim of this thesis is to increase interaction between users as well as users with their physical environments in the city of the future. Therefore, it is essential to first define the elements that constitute 'meaningful public interaction'. This thesis uses a three-part definition, derived from the research presented in the following section.

Firstly, interaction happens in moments of shared synchronicity, of space and time, between individuals. Architect and educator, William J. Mitchell defines the basic form of engaged interaction, a face-to-face human conversation, as a "spatially coherent, corporeal, and strictly synchronous event".[50] These factors lead to an action that is heard, received and responded to immediately. While the digital counterpart exists in such forms as answering machines, inboxes, and social media messengers, the asynchronicity of when and where the message is spoken and heard renders the "conversation fractured both spatially and temporally", thereby diminishing the effect of engagement on the part of the involved parties.

Secondly, urban communities are most successful when the public realm is an avenue for interactions between antithetical individuals. De Waal notes that the problem with current social communication technologies is that they are "[organized around] publics of particular issues of concern" and "are no longer based on bringing people with different backgrounds and opinions spatially together (as in coffeehouses or town square)".[51] Mitchell similarly argues that meaningful public interaction does not have to originate from the interactions of like minded individuals, but plays an

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50   William John Mitchell, City of Bits: Space, Place, and the Infobahn(Cambridge, Mass: MIT Press, 2010), 15.
51   de Waal, Martijn, "The Urban Culture of Sentient Cities: from an Internet of Things to a Public Sphere of Things," in Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space, ed. Mark Shepard (New York City: Architectural League of New York, 2011), 190.

even more important role in pushing together people who would otherwise remain strangers, and confronting members of a community (geographical or networked) with one another - in this way creating a rich, diverse, community.[52]

Lastly, interaction must include an action on the part of the user, or an opportunity for the user to enact their own agency in the public realm. Architect and educator, Omar Khan states, "as our devices, buildings and cities become interactive, we will need to address the possibility that they may require little or no involvement from us to carry out their functions".[53] As technological devices assume our agency, the role of the architect in the digital age should involve the reconfiguration of new scenarios for interaction in the public realm where the main actor is the user.

52   William John Mitchell, City of Bits: Space, Place, and the Infobahn (Cambridge, Mass: MIT Press, 2010), 112-128.
53   Khan, Omar, "Interaction Anxieties," in Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space, ed. Mark Shepard (New York City: Architectural League of New York, 2011), 164.

1.   SYNCHRONICITY OF SPACE AND TIME
2.   CONFRONT ANTITHETICAL INDIVIDUALS
3.   OPPORTUNITY FOR USER AGENCY

fig. 1.16 Three-part definition of Interaction (for the purposes of the thesis)

This definition will act as a set of guidelines upon which the interventions are designed and evaluated, in order to determine whether or not they are successful at achieving meaningful interaction. The initial aim of the thesis: to examine a new form of reflective interaction in the digital age, is being approached in a twofold manner. Firstly, by reversing the exchange relationship of data to the benefit of the user; and secondly, by proposing a new typology of urban design that synthesizes digital tools with materiality of physical architecture. This twofold approach makes-up a secondary set of conditions upon which these interventions are based. All four interventions seek to fulfill the aim of the thesis by critically addressing the role of digital technology in ways that oppose the efficiency-driven consumerism proposed by technology companies in order to increase user agency. At the same time, this is done through utilizing digital and physical design tools in the creation of places for successful interaction as outlined in the aforementioned three-part definition.

The definition of interaction proposed seeks to be a comprehensive interpretation of the elements that constitute interaction based on commonalities between repeating and reputable theories in the architectural discourse. That being said, the thesis acknowledges that it is only a theory and not an indisputable equation to the solution of interaction in urban environments. The definition is not all-encompassing and still poses questions in how it should be approached. One such issue, is whether the same principles are applicable to both the physical and digital domain. Additionally, there is the question of whether the resulting interventions must be site specific (art-like) installations, or if the same theories can be translated to produce equally successful, repeatable urban infrastructural elements. For the purposes of this experiment, the thesis proposes a series of four interventions that are site specific, permanent structures, but which vary in size and substance based on the conditions and needs of each site. The focus of the projects is to primarily address the three conditions necessary for successful interaction as a design experiment. Notwithstanding, the practicalities of the interventions are a secondary consideration, and as a result the interventions do not fall directly into either category of art-project or

infrastructure. The thesis also presupposes that these three conditions can be achieved by synthesizing both digital, and material tactics based on the demands of the site and its circumstances. In advocating for a merge between the two disciplines, as stated in the thesis aim, they will augment each other towards an enriched experience of public space, rather than detract from one another. Lastly, the success of the resulting design asks the fundamental question of whether interaction can be designed, and in a way forced into existence, or whether it is an entirely organic and spontaneous process. While the design experiments in this thesis are built on the theory that architecture can unite the elements of materiality, environment, technology, and human activity through design,[54] and therefore design for public interaction, the success of this ambition and the other questions posed will be addressed as part of the evaluation of the interventions in the following sections of the thesis.

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54   Mark Shepard, Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space (New York City: Architectural League of New York, 2011), 36.

part 2
THE INTERVENTION

part 2.1
The Yonge Street Axis

By combining the asynchronous nature of digital networks and synchronicity necessary for engaged interaction, the interventions proposed utilizes the real-time coordination made possible by city-wide digital infrastructure, in order to choreograph specific moments of place-bound engagement.

While conceptualizing a framework for the interventions in this design thesis, the bus stop appeared as an ideal opportunity. A system of bus stops offer a varied transect through the city of Toronto, are highly democratic, and are applicable to the Smart City evolution as service infrastructure under the process of optimization. As the project evolved, the bus stop became less critical as a physical infrastructural component, but remained relevant as a grounding network for the intervention and offered nodes of social contexts within the city. Thus, the bus stop remained crucial to the theoretical conception of the project; despite its design involvement becoming secondary to the development of interactive interventions. The evolving role of the bus stop in the design process is discussed further in Part 3: Conclusion.

The thesis uses the bus stop as an unharvested opportunity of a new social typology in the digital city. Referencing sociologist Castell's abstraction of urban social networks as a series of curves with nodes at their intersection, this thesis conceptualizes a system in which transit routes are curves, and the socially engaging interventions (replacing the present-day bus stop) are nodes placed at their intersection.[55] The interventions designed represent a series of nodes placed at intersections in the functional flow of the future city, at which synchronous, place-bound interactions takes place. These nodes will be called Exchange Places.

55   Manuel Castells, The Rise of the Network Society (Malden, MA: Wiley-Blackwell, 2012), 501.

The transit stop is a social anomaly of the city fabric. Bus stops are generic, non-place-specific shelters, at which it is socially acceptable to disengage completely from one's spatial surroundings. They are a place in-between, where users wait for shorter or longer periods of time, and are especially likely to impulsively consume digital media. The waiting times associated with bus stops are also an architectural opportunity in the city fabric, in which users are captivated in a specific time and place. As more public services become digitized, this scenario increasingly becomes less likely to occur in the cities of the future. Therefore, this thesis seeks to capitalize on the bus stop as a remaining physical node of public life, that will likely remain physically present in some form in the Smart City, by reprogramming it as a new social typology.

Figure 2.03 is a diagram of Toronto's transit network, along Yonge Street between King and St. Clair stations. The Yonge subway line in Toronto was selected to site the interventions due to the large variation of characteristics and programming along this North to South axis of the city. This transit line provided the four interventions proposed with varying sites on which to demonstrate the same principles in very different applications and contexts. The diagram displays an overlay of information in

fig. 2.02 The current experience of travelling by bus, in which the user often has to wait and reverts to checking their phone

DEER PARK & FOREST HILL

DELISLE - ST. CLAIR PARKETTE

St. Cla

ST. MICHAEL'S CEMETERY

512 ST CLAIR WEST

Summ

RESIDENTIAL

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UNIVERSITY 142

LUXURY SHOPPING & FOOD

BAY 6

UNIVERSITY OF TORONTO

LUXURY SHOPP

Nearest Subway
Station

⬡ Transportation

🟦 Education & Cultural

🟦 Professional & Civic

🔺 F&B

🔺 Entertainment

🔺 Commercial

⚫ Residential

🟢 Greenspace

506 COLLEGE ST

510 SPADINA

TORONTO BUS TE

LITTLE TOKY

NATHAN PH

35

501 QUEEN

504 KING

DAVID A. BALFOUR PARK

air

merhill

Rosedale

ROSEDALE

TORONTO REF. LIBRARY

Bloor-Yonge

TRANSFER STATION

YONGE 97

HIGHER-END HOTELS & RESTAURANTS

YONGE 302

GROUND ZERO FOR PRIDE PARADE

Wellesley

MAPLE LEAF GARDENS

ING & FOOD

College

MCGILL PARKETTE

YOUTH SHELTER

RYERSON UNIVERSITY

Dundas

ERMINAL

505 DUNDAS

O

EATON CENTRE

ED MIRVISH THEATRE

MASSEY HALL

ELGIN & WINTER GARDENS THEATRE

HILLIPS SQUARE

Queen

TORONTO CITY HALL

AFFORDABLE FOOD & DRINK

INANCIAL DISTRICT

COMMERCE COURT

ST. LAWRENCE MARKET

King

THE OMNI KING EDWARD HOTEL

36

the categories of transportation, education, culture, professional and civic services, food and beverage, entertainment, commercial, residential, and greenspace nodes that characterize areas along this transit line.

Instead of operating on a set schedule, the transit system proposed will enable a real-time transportation network made possible by an internet platform (accessed on a mobile application or city-wide public stations), creating and recalibrating transportation routes based on current user demands. The system leverages similar data mining technologies to the Bridj bus experiment in Boston, which "using real-time traffic data and passenger inputs" creates on-demand bus routes with only select pick-up and drop-off locations.[56,57]

fig. 2.04 Explanatory diagram of the Bridj Bus Experiment

In these interventions, public transit vehicles will arrive at transit stops more frequently, and allow users to access the most efficient pick-up and drop-off locations, breaking the monotonous routine of public transit systems. In this way, the intervention utilizes personal digital technologies, specifically by using the phone as the device through which this on-demand transportation network is created. The specific design of each intervention, presented in the following section, also attracts phone users by providing data nodes or charging ports, in hopes of encouraging users to meet in a common location. However, through the immersive architectural qualities of each intervention, the Exchange Places are designed to then entice users to remove themselves from the digital and interact with their physical surroundings.

Although this thesis questions the driving forces of efficiency and consumerism of developing technologies, it does not oppose, but rather seeks to take advantage of Smart City technologies through the logistical framework of the project. Firstly, the use of Bridj-type data-mining technologies to create on-demand bus routes, parallels strongly with Smart City ambitions to provide both users and transit networks with the most efficient

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56   "How It Works," BRIDJ, N/A , accessed August 01, 2018, https://www.bridj.com/how-it-works/.
57   Antoine Picon, Smart Cities: A Spatialized Intelligence (Chichester, West Sussex: Wiley, 2015), 123.

routes in terms of time and energy consumption. Secondly, this proposal relies on autonomous vehicles and smart traffic signals as proposed in Smart City developments such as Audi's Urban Future Initiative. These technologies would make this system possible and more efficient by providing reduced traffic congestion, optimized road use, and more frequent vehicular servicing.[58] Thus, there are certain scenarios in which the proposed interventions align with the aforementioned optimization goals of the Smart City. At the same time, the Exchange Places will also aim to invite people to pull away from their digital media in order to experience their physical surroundings. In this way, a user's time might be considered to not be 'optimized' as it would be spent on an activity not typically associated with efficiency.

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58   David Douglass-Jaimes et al., "Audi Urban Future Award: How Driverless Cars Could, Should - and Shouldn't - Reshape Our Cities," ArchDaily, January 22, 2016, accessed July 24, 2018, https://www.archdaily.com/tag/audi-urban-future-award.

part 2.2
The Exchange Place

Through the Exchange Place, this thesis proposes an experiment that addresses the question of in-person interaction in the digital city. The Exchange Place is not the ideal solution to this problem, but rather an explorative exercise. Most importantly, it is meant to provoke a new understanding of design for social spaces of the future city, by combining software design and traditional architecture. The ambition of this thesis is that the interventions proposed help work out techniques that do and do not successfully increase authentic social interaction in the digital age; and that through similar experiments, architects can begin to refine a new typology for the digital city.

The proposed nodes, or Exchange Places, will reflect the needs, attractors, and agencies of their spatial context. In return for user's time, the Exchange Place will provide the user with an exchange value in the form of a service, information, or social engagement. The end goal of each intervention is to lead users to interact with their environments or other users in a more meaningful way.

Figure 2.05 shows four examples of Exchange Places, developed for this thesis. The Data Forest, Digital Readers, Community Garden, and Projected Agora are places where the digital can be used for re-engagement, respectively with the city's nature, culture, economy, and politics. The following section presents these interventions moving from North to South along the Yonge Street axis.

Summ

RESIDENTIAL ⬤

LUXURY SHOPPING & FOOD ▲

LUXURY SHOPPING & FOOD ▲

UNIVERSITY OF TORONTO ■

LUXURY SHOPP

NATHAN PH

- - - → Nearest Subway
Station

⬡ Transportation

■ Education & Cultural

■ Professional & Civic

▲ F&B

▲ Entertainment

▲ Commercial

⬤ Residential

⬤ Greenspace
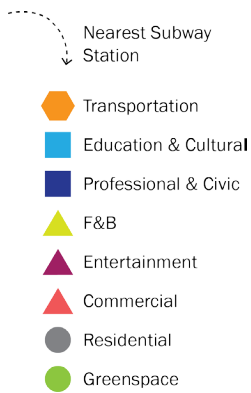
fig. 2.05 The four examples of Exchange Places, developed for this thesis: The Data Forest, Digital Readers, Community Garden, and Projected Agora

DAVID A. BALFOUR PARK

merhill

Digital as Nature
DATA FOREST
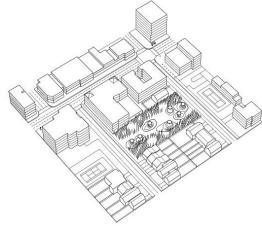
+ COMFORTABLE WAITING
SAFETY LIGHTING
DEVICE CHARGING
DATA VOIDS

TORONTO REF. LIBRARY

Bloor-Yonge

TRANSFER STATION
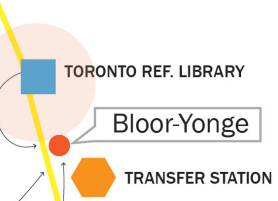
Digital as Culture
DIGITAL READERS
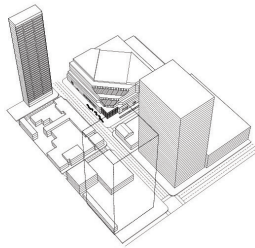
+ RESOURCE ACCESS
DEVICE CHARGING
COMFORTABLE WAITING
GROUP SEATING

ING & FOOD

College

MCGILL PARKETTE

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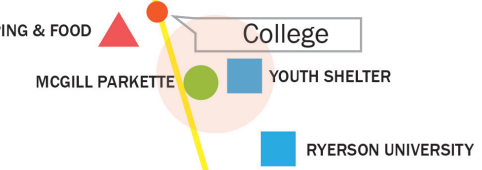
Digital as Economy
COMMUNITY GARDEN
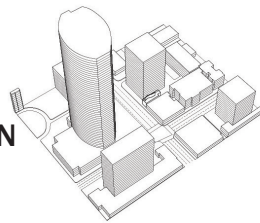
+ AWARENESS
GROUP SEATING
DATA ACCESS

EATON CENTRE

HILLIPS SQUARE

TORONTO CITY HALL

Queen

INANCIAL DISTRICT

AFFORDABLE FOOD & DRINK
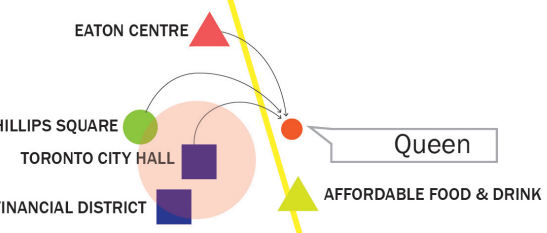
Digital as Politics
PROJECTED AGORA
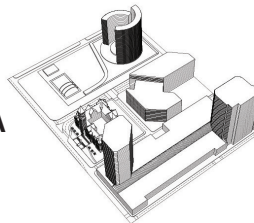
+ POLITICAL ENGAGEMENT
DATA AWARENESS
MONUMENT INTERACTION

42

DATA FOREST

The Data Forest is the first intervention, located at Yonge Street and Summerhill Avenue, near the Summerhill subway station and along the 97 and 320 bus routes. Existing factors affecting the site include the park setting and surrounding residential area. The Data Forest is spatially the largest and most substantial intervention of the four Exchange Places proposed, as its design capitalizes on the larger open areas available further north along the city transect. Its site is an unused green space, just off Yonge Street, located between mixed density residential and commercial areas.
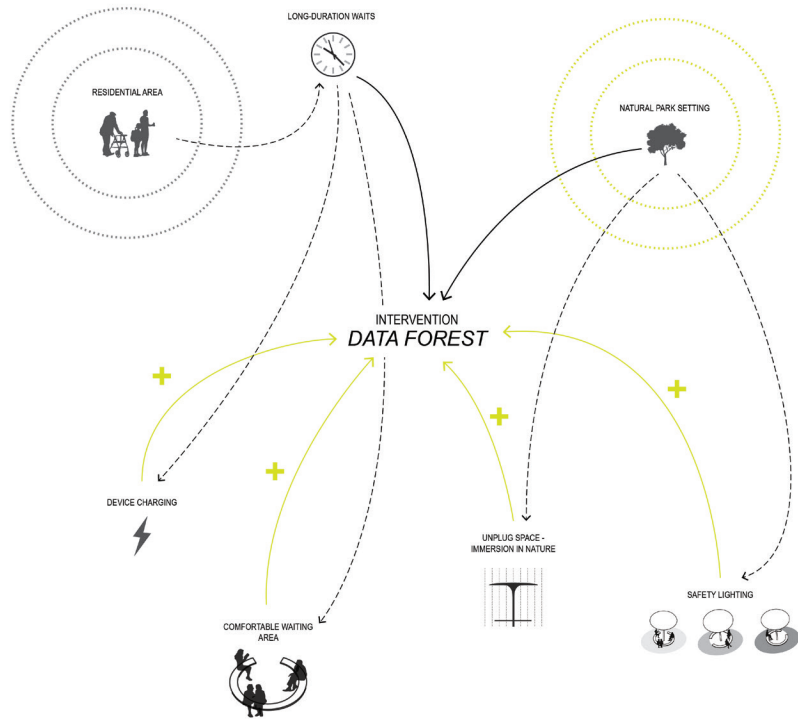
fig. 2.06 Diagram of factors affecting the site, and corresponding programs introduced

The intervention seeks to reanimate this public open area, by implementing new programs that foremost encourage users to experience the natural park setting and interact with one another while waiting for their bus. As the area is located further away from the city core, public transportation is less frequent and users will be at the site for longer periods, with potentially lower user density. In response to these factors, this Exchange Place also proposes device charging, comfortable waiting areas, 'unplugged' spaces, and safety lighting, as illustrated in Figure 2.06. For the purposes of this thesis, the term 'unplug' will be used to describe zero digital connectivity, ie. no Wi-Fi and cellular signal.

Responsive data posts populate the forested periphery of the site, and unplug canopies are placed throughout the open field. This juxtaposition of nature and data aims to provide the user with a sense of agency on when and how they use their digital tools. Users are given the opportunity to disconnect from the digital network, through the use of technologies that create a Faraday cage scenario. By disconnecting, users are more likely to better engage with the surrounding natural environment and other users.

There are two types of unplug canopies; one of which is placed on mounds and the other in suppressions. The canopies on mounds cool users with mist, and project bus arrivals onto a water curtain. The canopies in suppressions offer seating as well as heating and lighting, which increase with the number of users detected. This feature encourages users to sit under canopies occupied by other users, thereby increasing the opportunity for social interaction.

A reference project for the site is the Blur Building by Diller Scofidio + Renfro, which similarly provides users with an experience in which their environments are partially "whited out", in this case visually and acoustically. [59]

fig. 2.07 Blur Building, Aerial View by Diller Scofidio + Renfro

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59   "Blur Building," DS R, N/A, accessed July 24, 2018, https://dsrny.com/project/blur-building.

The data posts are user-responsive data nodes, who's heights are proportional to the strength of the signal provided at their location. For example, taller posts indicate better connection to the digital network, which surround clearings in which users can gather. The responsive data posts can be related to the White Noise White Light project by Höweler + Yoon. The "interactive sound and light field" marks pedestrian interaction by lighting up stalks and transmitting white noise when movement is detected.[60] Similarly to this project, the posts in the Data Forest mark user interaction by integrating data-responsive lighting. These are activated by user frequency, which creates a visual representation of user activity in the Data Forest. While the Howeler + Yoon project responds to user movement and tactile interaction, the data posts proposed respond to invisible network signals from user devices. The visual representation created by the data posts is meant to mark user density, thereby creating a sense of security through numbers among nighttime users. Users wishing to use their data in a more public setting will easily find the clearings in the Data Forest by using lit up posts as a visual cue. The posts also act as visual markers of device use, as each time a user unlocks their phone the post nearest them will light up. This bright, visual signal will hopefully provide a vivid and noticeable prompt to the user that they are yet again accessing their device. The goal is that this novel prompt will awaken an individual from a mindless and often subconscious usage of their device, and in doing so contribute to a more aware use of digital devices in the Data Forest.

60   Kyle Steinfield, Lisa Smith, and Naomi Munro, "White Noise White Light," Höweler Yoon Architecture, N/A, accessed July 31, 2018, http://www.howeleryoon.com/projects/white-noise-white-light.
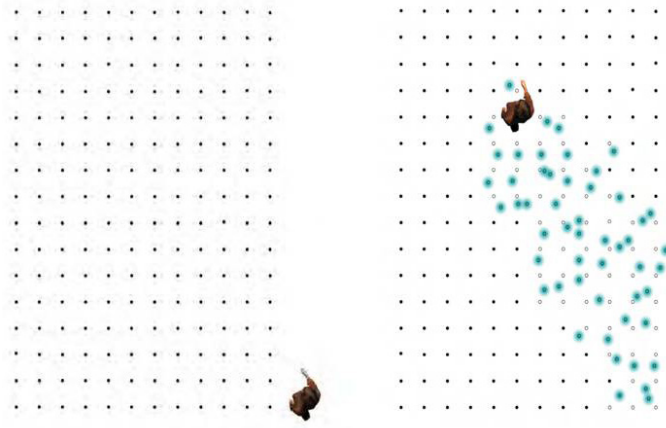
fig. 2.08 White Noise White Light project by Höweler and Yoon Architecture
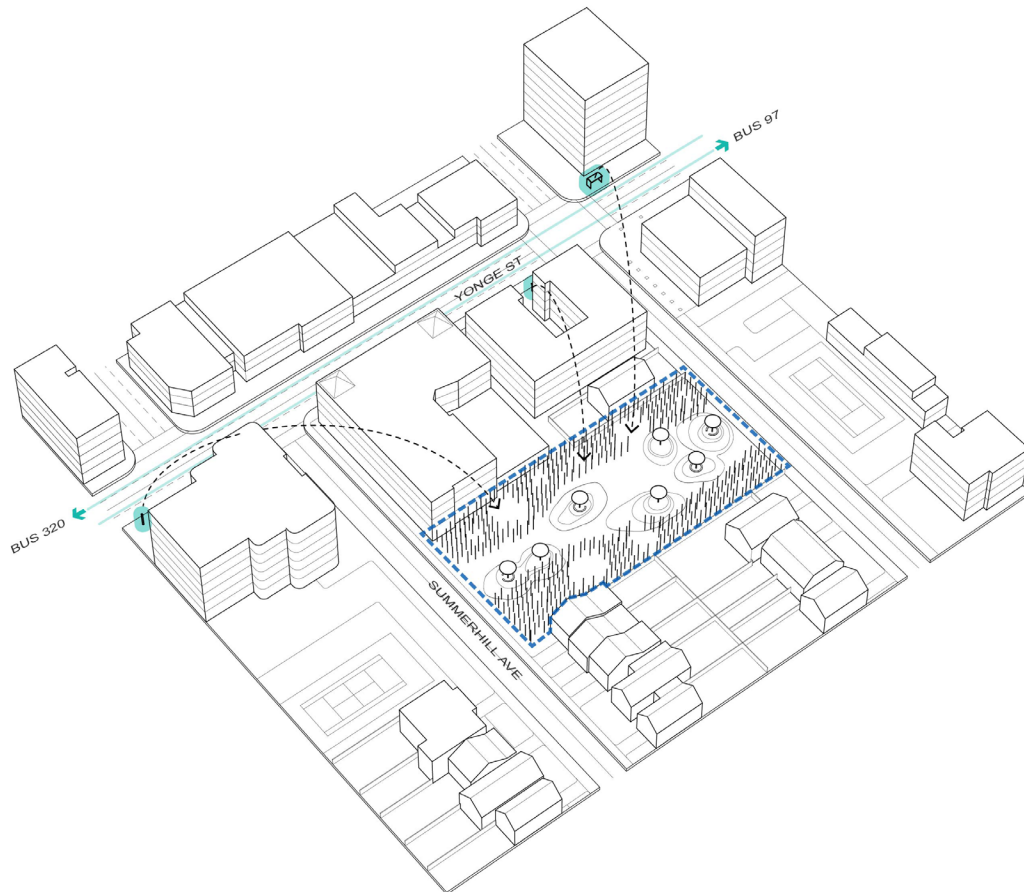
fig. 2.09 Site context diagram of transit networks at the site of the Data Forest intervention
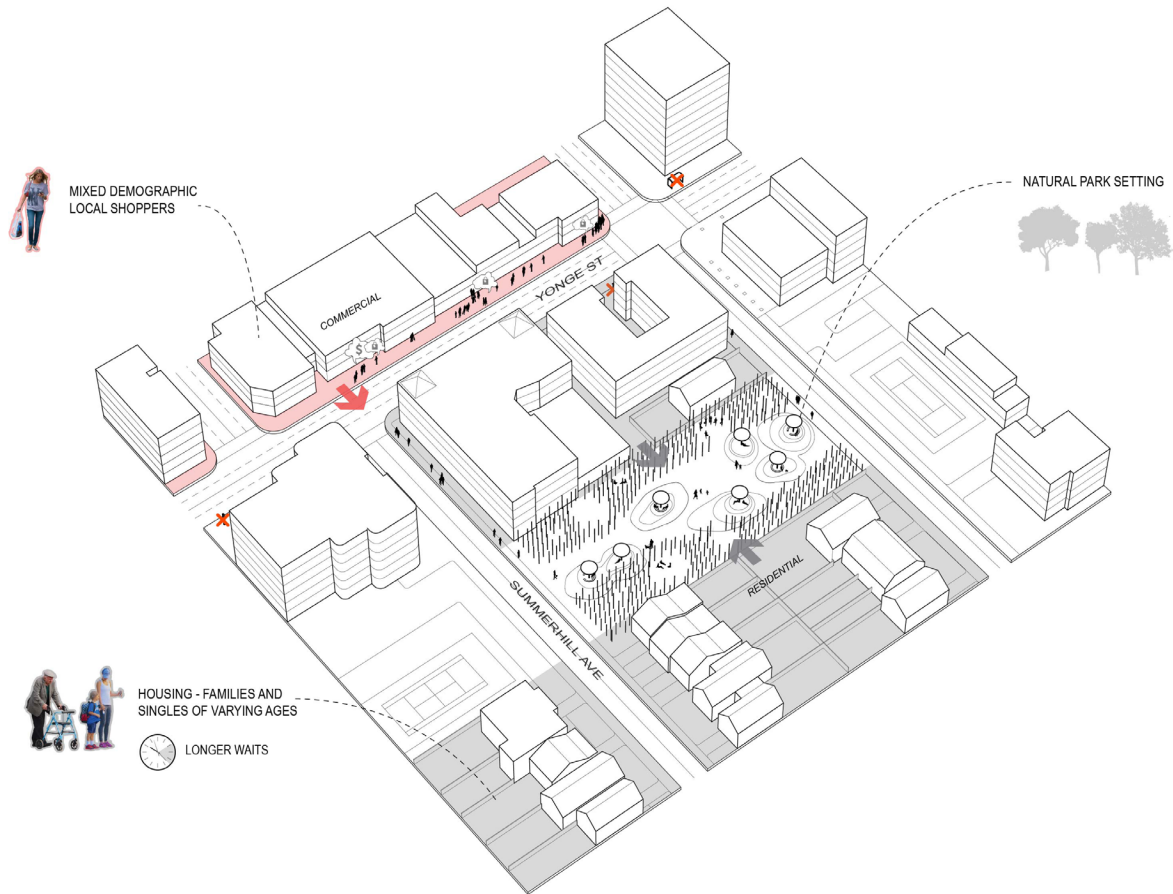
fig. 2.10 Site context diagram of existing factors affecting the site of the Data Forest intervention
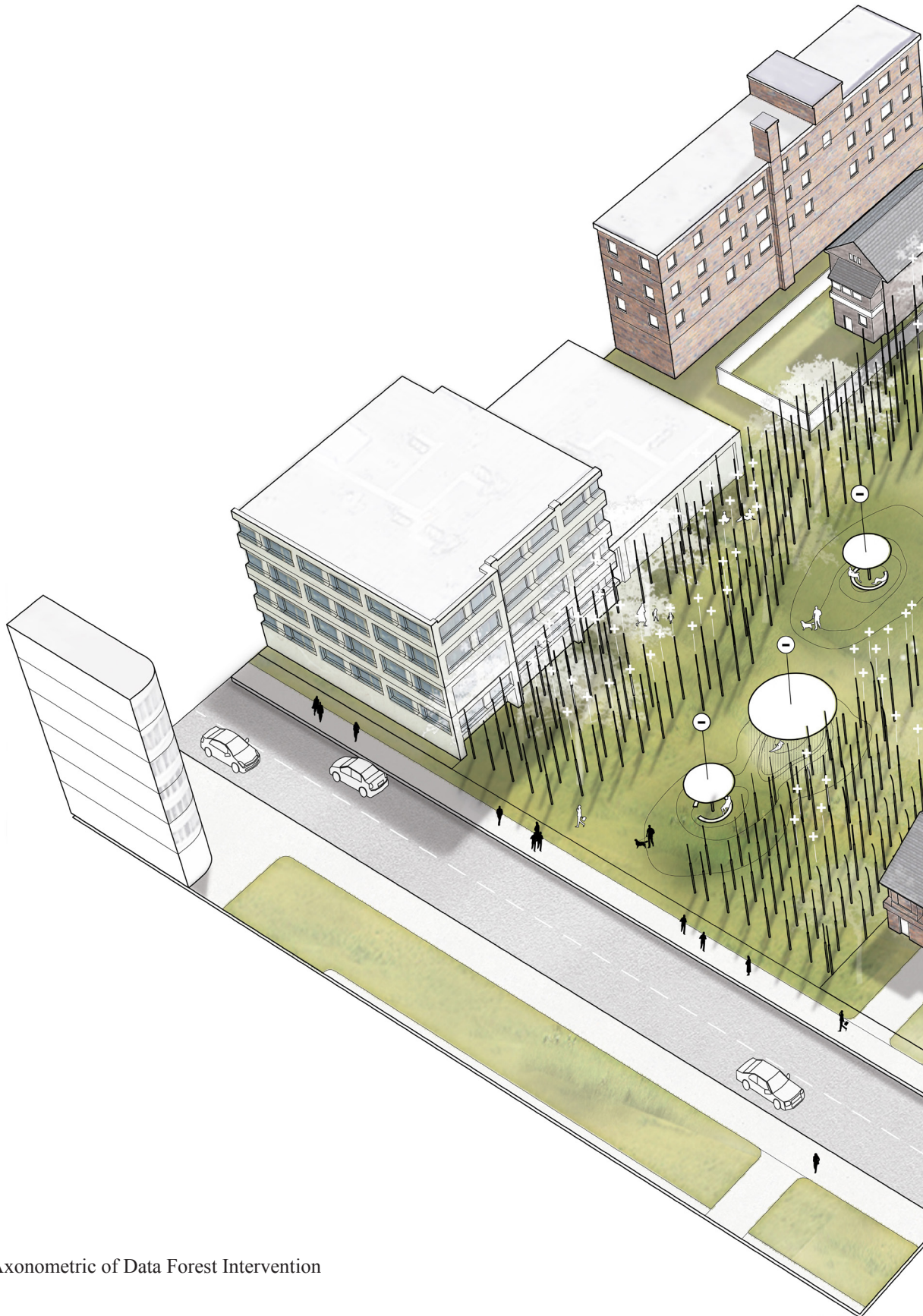
fig. 2.11 Axonometric of Data Forest Intervention
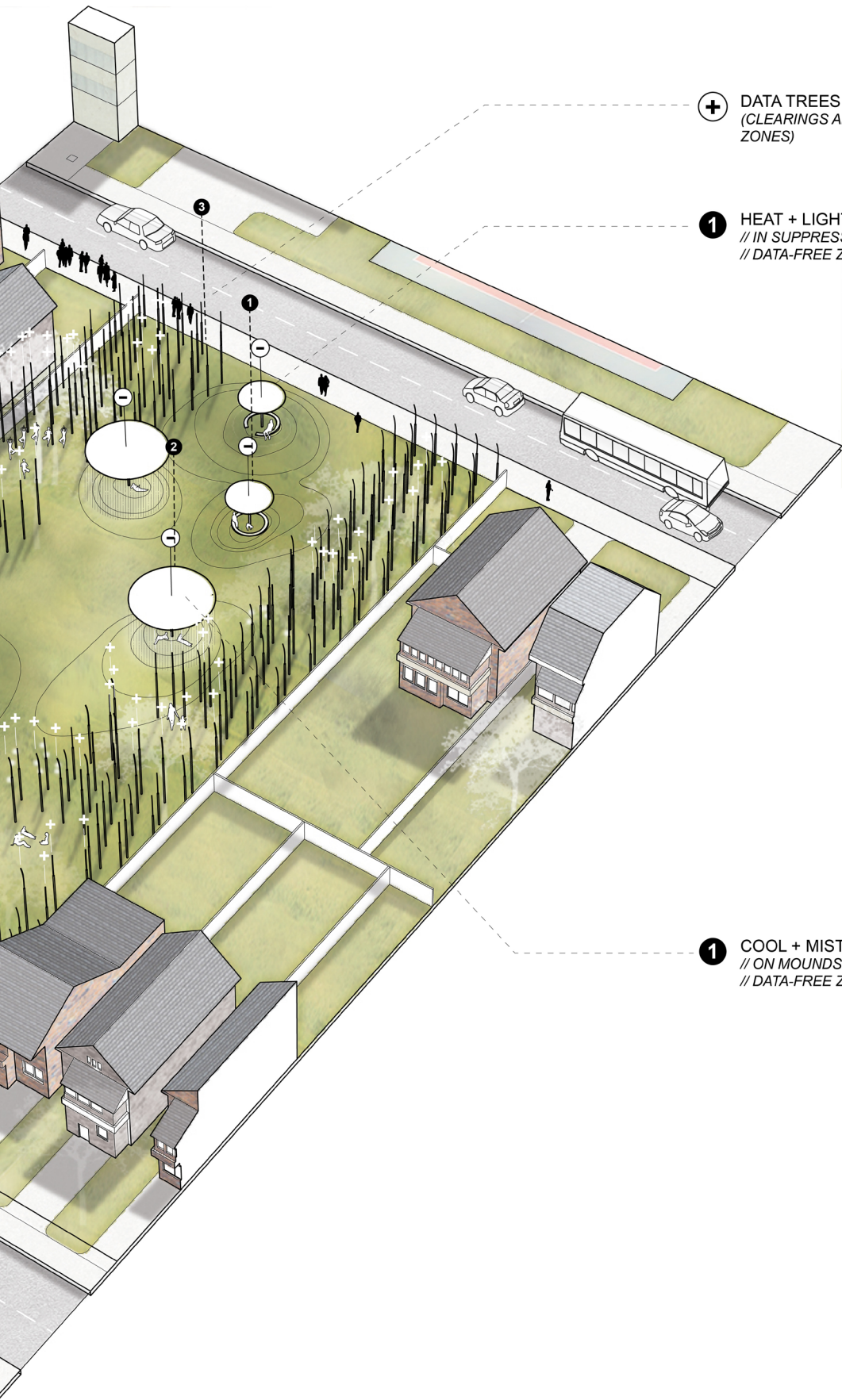
DATA TREES
(CLEARINGS ARE DATA-MAXIMIZED ZONES)

1 HEAT + LIGHT CANOPIES
// IN SUPPRESSIONS
// DATA-FREE ZONE

1 COOL + MIST CANOPIES
// ON MOUNDS
// DATA-FREE ZONE

50

C¹ *heating+lighting canopies*

C² *cooling+misting canopies*

S *suppressions*

M *mounds*

EXISTING LANDSCAPE
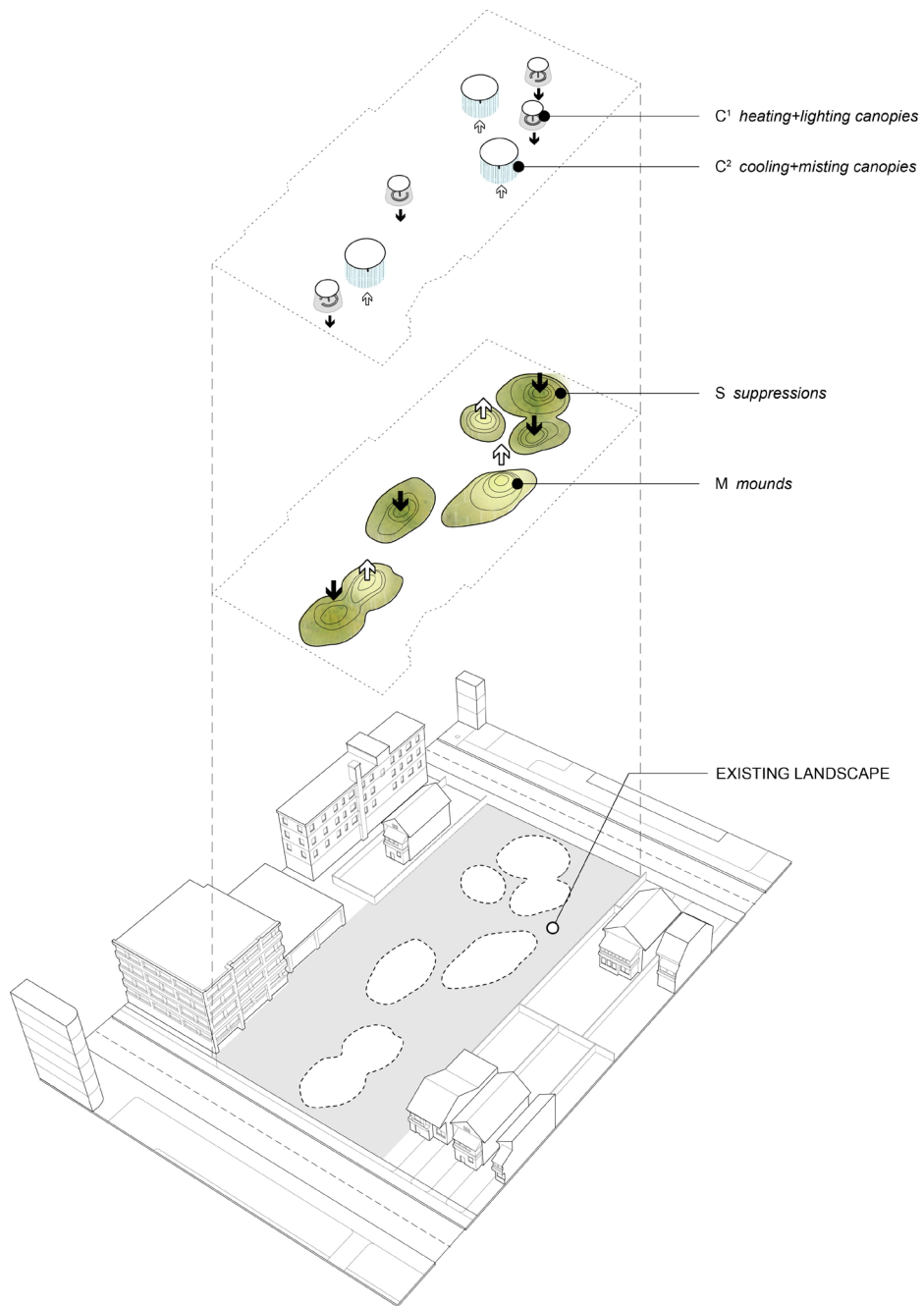
fig. 2.12 Site massing diagram, showing the relationship between ground, mounds, suppressions, and cooling and heating canopies

51

R¹ *tall*
$+ + +$ DATA

R² *medium*
$+ +$ DATA

R³ *small*
$+$ DATA

DATA-MAXIMIZED CLEARINGS

DATA TREES
(CLEARINGS ARE DATA-MAXIMIZED ZONES)
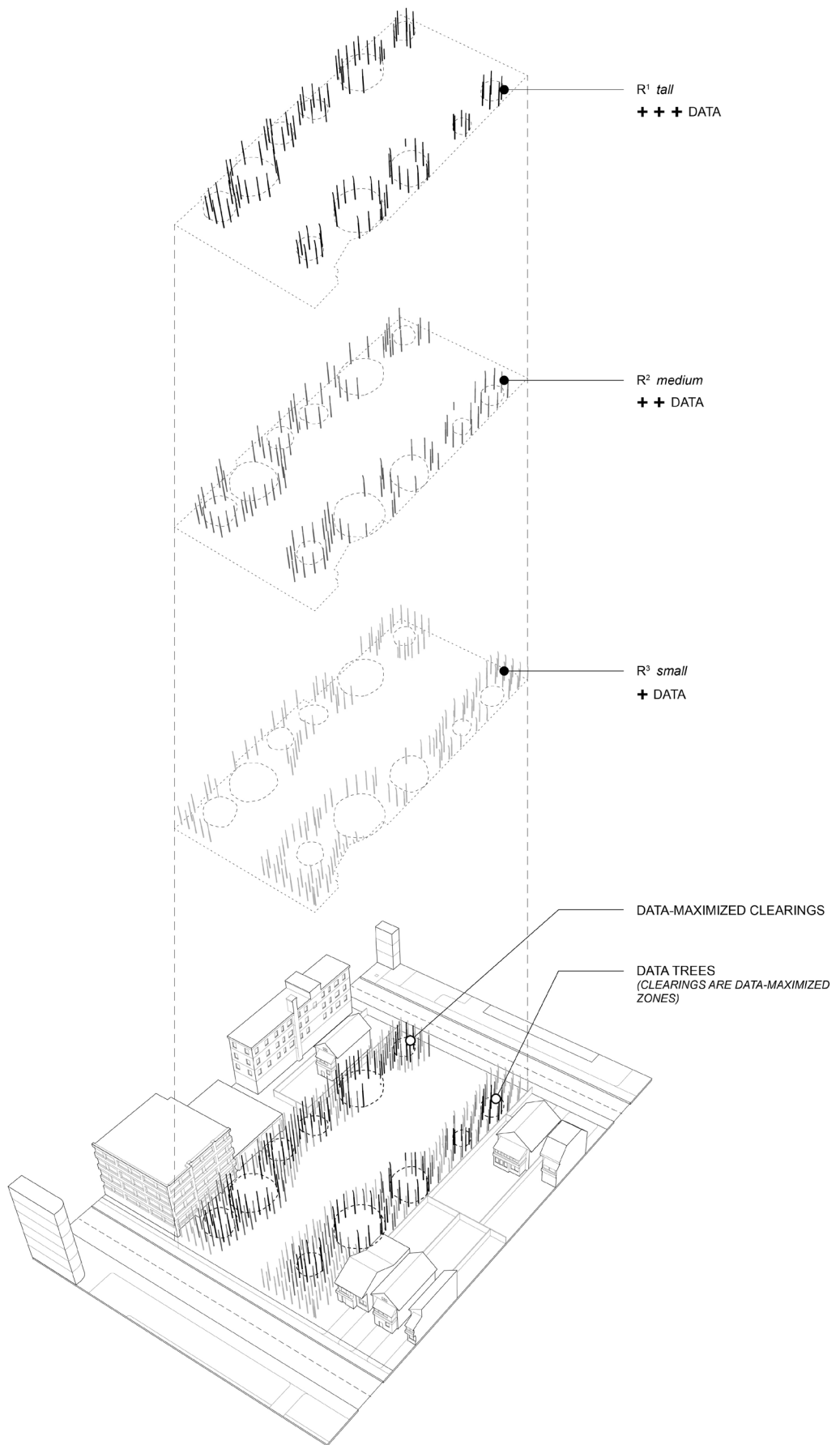
fig. 2.13 Data Forest diagram, showing the relationship between strength of connection to the data network, the height of data posts, and the location of data clearings

52

C[1] *heating canopies*

DATA-FREE ZONE

CANOPY HEATING RESPONSIVE
WITH INCREASED NUMBER OF
USERS

LIGHT BRIGHTENS WITH
INCREASED NUMBER OF USERS

HEATING+LIGHTING CANOPIES

GROUND PLANE MATCHED TO
EXISTING CONDITION
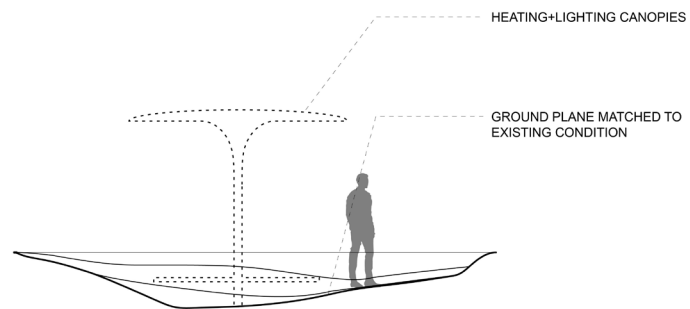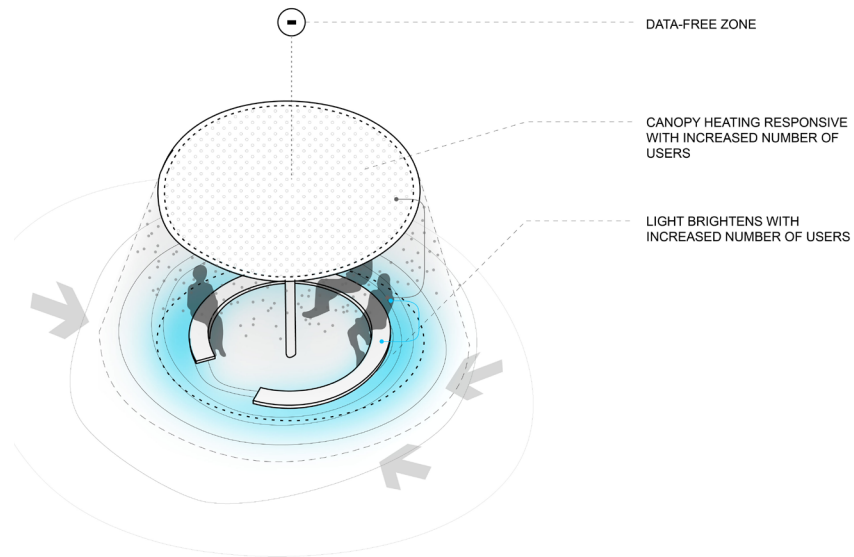
fig. 2.14 Diagram of the functions and components of the heating canopies

53

C² *cooling+misting canopies*

DATA-FREE ZONE

STREAM INSTALLED AROUND
PERIMETER OF CANOPY

PROJECTION SYSTEM

RAIN CURTAIN – MOVEMENT
RESPONSIVE TECHNOLOGY
OPENS CURTAIN AT APPROACH
OF USER

COOLING+MISTING
CANOPIES

LUSH GROUND PLANE FOR
SEATING

fig. 2.15 Diagram of the functions and components of the cooling + misting canopies

R¹ *tall*   R² *medium*   R³ *short*

② HEIGHT OF POSTS INDICATES
STRENGTH OF DATA
CONNECTION

① DATA-DENSITY RESPONSIVE
LIGHTING ACTIVATED WITH USER
FREQUENCY

③ CHARGING PORTS
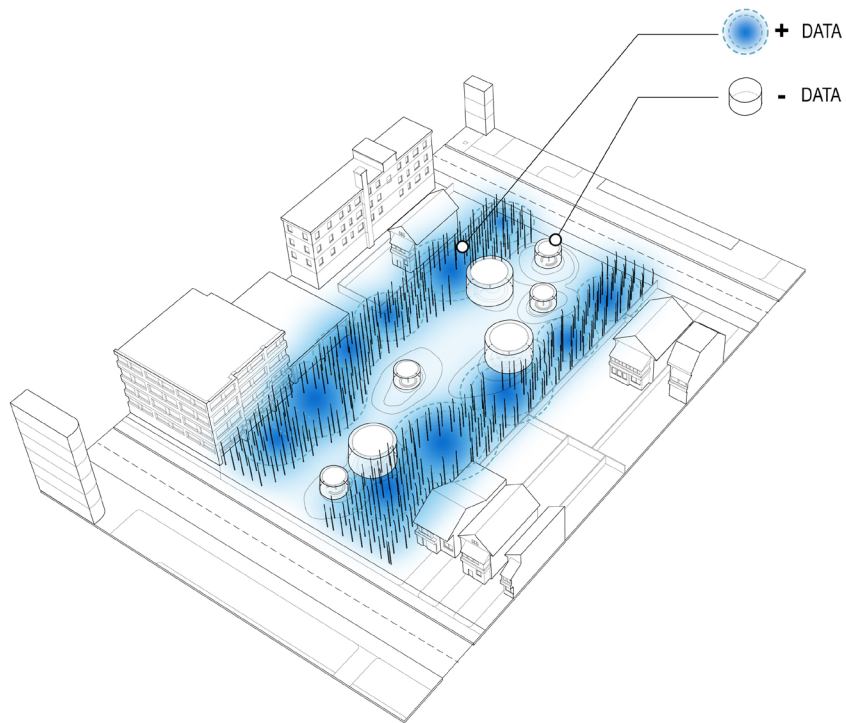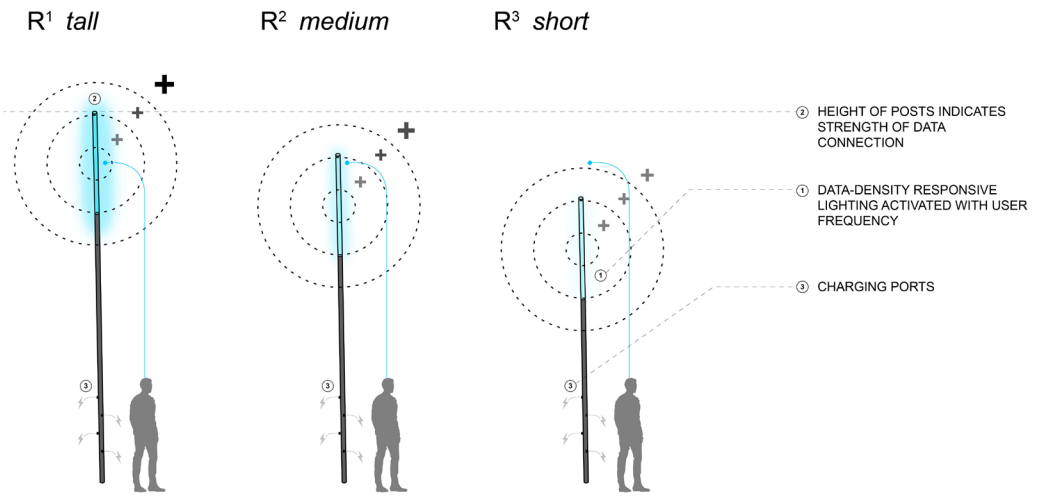
+ DATA

- DATA

fig. 2.16 Diagram of the functions and components of the data posts and data connectivity across the site
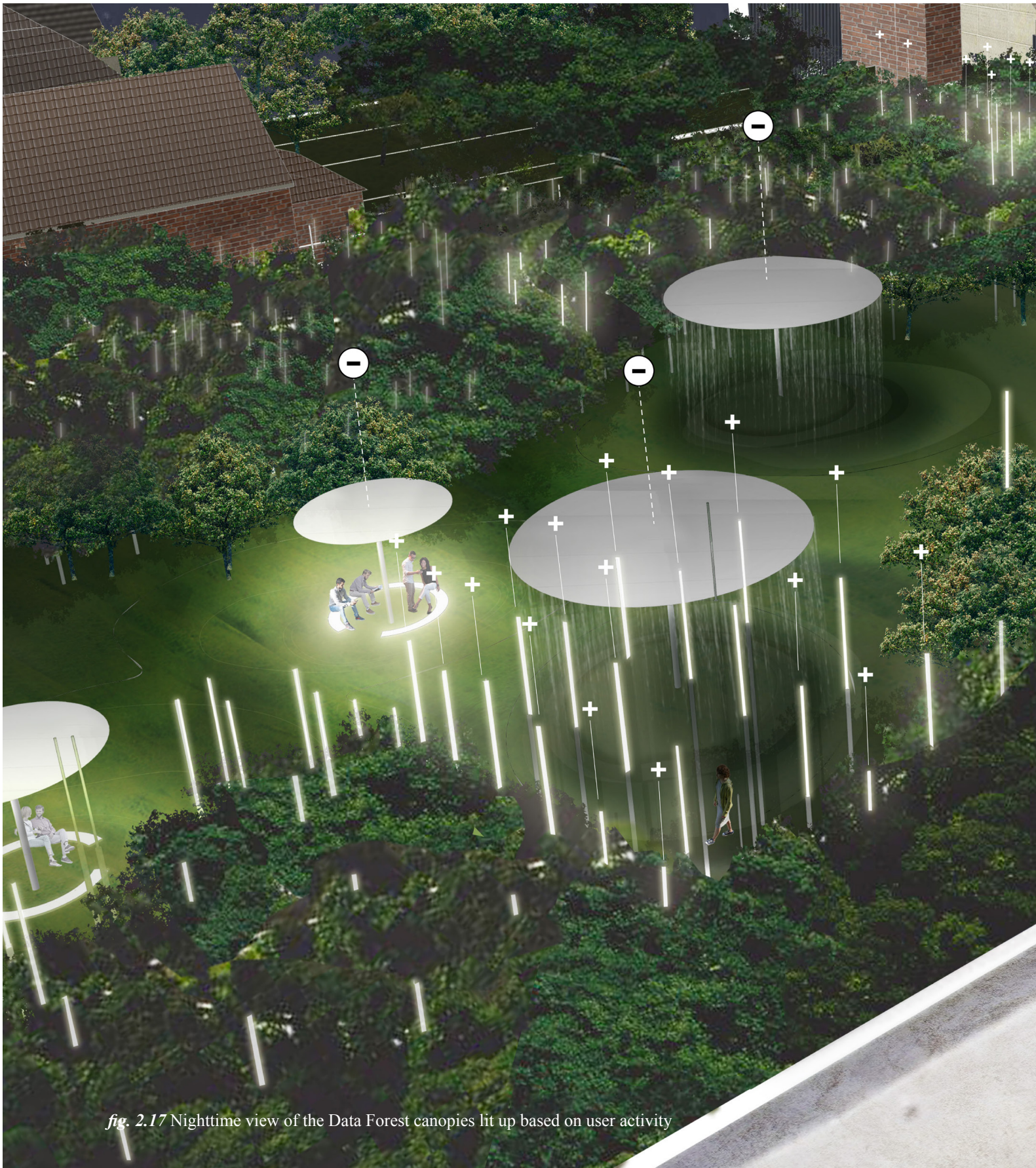
fig. 2.17 Nighttime view of the Data Forest canopies lit up based on user activity
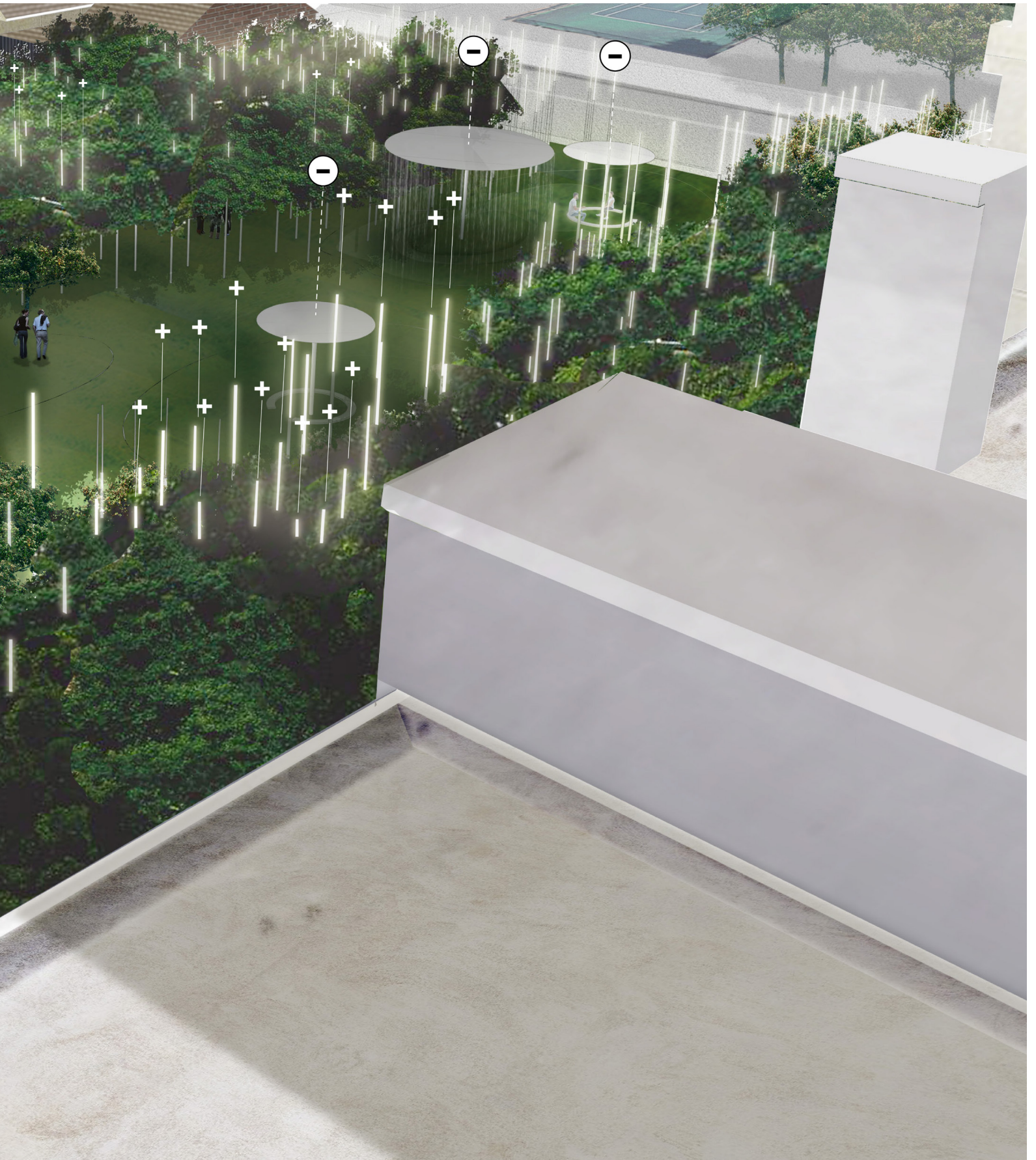
fig. 2.18 Corresponding existing view of the Data Forest site from Google Map's Street View

fig. 2.19 Daytime visualization of Data Forest intervention, displaying canopies and data posts with attached functions

EVALUATING THE INTERVENTION

As stated when introducing the designed interventions, the Exchange Places are experimental proposals, not an all-encompassing solution to the problem of in-person interaction in the digital city. The following sections will analyze the interventions proposed, following each intervention, noting where they were more or less successful in achieving meaningful interaction among users and their environments. The interventions will be judged based on the three-part definition of public interaction outlined earlier in this thesis: achieving synchronicity in space and time, confronting antithetical individuals, and providing the opportunity for user agency. The last category, the opportunity for user agency, will also be evaluated based on the success of the intervention to impose the user's agency on their personal digital devices.

The interventions will also be evaluated on the success of using this three-part definition of interaction as a means of fulfilling the initial ambition of the thesis: to create a new urban typology for successful interaction in the digital age, by firstly, reversing the exchange relationship of data to the benefit of the user, and secondly, by synthesizing the immersive qualities of digital tools and physical architecture.

Evaluating the DATA FOREST

synchronous space & time	●	●	○	○	○
confronting antithetical individuals	●	●	○	○	○
opportunity for user agency	●	●	●	●	●
reversing the exchange relationship	✓				
synthesizing digital tools & physical architecture	✓				
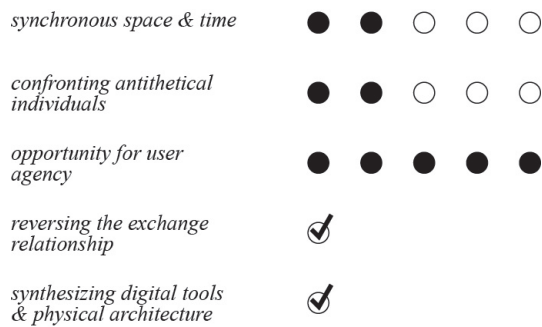
fig. 2.20 Evaluation results of Data Forest

Synchronicity of Space and Time

The canopies in the Data Forest were designed to bring together users by offering improved heating, cooling, and lighting when individuals sat together. However, the size of the site and dispersed programming arguably lends itself less likely to achieve synchronicity of space and time. The multiple clearings in the data node forest, three cooling and misting canopies, and four heating and lighting canopies could potentially provide users with too many spatial opportunities and would make them less likely to choose the same location as other individuals. While the intention of the canopies was to organize users around lit, heated, or cooled locations, it might be more successful if there were fewer locations to choose between.

Confronting Antithetical Individuals

The Data Forest's widespread programming could further limit its effectiveness in terms of confronting antithetical individuals. As described above, strangers, especially from different social groups, have ample opportunity to spread out amongst the different seating areas. While it is still probable for strangers to meet in the Data Forest as proposed, fewer canopies and clearings would have made these interactions even more likely to occur.

Opportunity for User Agency

The Data Forest should be especially successful in providing the opportunity for user agency. When judged under this criteria, the variation of environments designed across the site provide users with the option to self-select their experience of the Exchange Place. Users are able to choose between sitting and standing, shared and empty canopies, data connection and isolation, and heating or cooling. The user's experience of their environment is more explorative and involved than in other interventions, arguable resulting in a more authentic and meaningful interaction with their environment.

This intervention also successfully addresses the necessary change in relationship between digital devices and users, from voyeuristic to intentionally active. Users are able to choose from many different options; between thermal and social comfort, digital connectivity and 'unplugging', and sitting in clearings or roaming through the forest. The time spent in the Data Forest is not intended for a singular, 'optimized' experience. Rather, it offers a plethora of different activities based on users' individual hierarchies of thermal comfort, social interaction, or data connection.

The synchronicity of space and time and resulting confrontation of antithetical individuals is left up to chance in the Data Forest, though in return provides the user with an increased agency in how they interact with the site.

Reversing the Exchange Relationship

The Data Forest addresses the problem of using technology to the benefit of the user, as opposed to the typical ambitions of optimization and efficiency, in applications such as the unplug canopies and user-marking data posts. The function of the unplug canopies to disconnect the user from the digital network poses a direct disadvantage to companies maximizing from user data harvesting, by temporarily making users unavailable.

Therefore, this program reverses the relationship in order to benefit the user by providing the user with an opportunity to be more intentionally present in their physical surroundings. In this way, an individual will have a greater opportunity to focus on activities such as offline hobbies or building in-person relationships, as they will be less drawn to the attractive and personalized services and products of the digital realm. Additionally, the data posts also benefit the user by lighting up as visual cues when digital activity is detected. This feature makes the user more aware of their data use, and therefore more likely to use data more intentionally rather than engage in banal scrolling or likewise. While the latter benefits technology companies, the alternative allows the user to more effectively and intentionally use their time both on and off the network.

It is likely that technological companies may express an interest in funding these data-free-zones, if only to address the most recent public pressures of the addictive and psychologically harmful nature of their products.[61] As less online usage directly contrasts with the business model of these technological corporations, addressing the public's concern in these outward urban initiatives may be more beneficial to these companies in their marketing strategies, than changing the nature of their interface.

Synthesizing Digital Tools and Physical Architecture to create Immersive Environments

The Data Forest synthesizes digital and physical design in multiple ways. It does so largely by attaching the digital unplug function to the canopy structures, as well as in their ability to heat, light, cool, and mist based on user detection - a function that also relies on digital tools. The 'physical' light-up feature of the data posts is also made possible through the intersection of digital technologies with their spatial counterparts.

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61   Nitasha Tiku, "Everything You Need To Know About Your Smartphone Addiction," Wired, April 18, 2018, accessed August 01, 2018, https://www.wired.com/story/wired-guide-to-internet-addiction/.

DIGITAL READERS

The Digital Readers are the second intervention, located at the Toronto Reference Library on Yonge Street and Bloor Street; near Bloor Street subway station and along the 97, 320, and 300 bus routes. The primary existing factors affecting this intervention are the library users, students, and residential areas nearby.
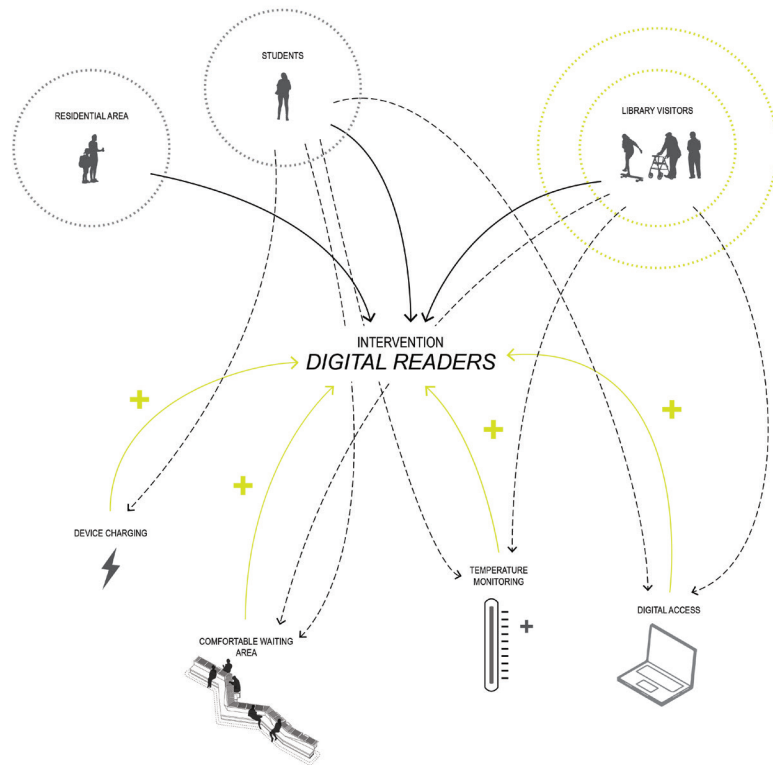
fig. 2.21 Diagram of factors affecting the site, and corresponding programs introduced

Figure 2.21 demonstrates the relationship between these existing factors and the services proposed as part of this intervention. The intervention responds to the needs of a certain demographic, which relies on the library as a resource for data connection.

The Digital Readers extend the library's computer banks into a 24 hour service, providing a comfortable place to retrieve digital information, charge devices, or read an ebook while waiting for public transportation. While Smart City proposals are often marketed to elite, tech-savvy users, this Exchange Place makes digital resources equally accessible to all demographics. The Digital Readers challenge the Smart City to become a more democratic, publicly accessible development, that does not exclude those lacking digital resources.

fig. 2.22 Toronto Reference Library patrons use bank computers with free Internet access in January of 2007

The benches are heated and comfortable, and organized in geometries that cater to both groups and individuals. This way, the architecture of the intervention allows users to feel comfortable in a shared space while forced to confront each other's differences. While data connection or device charging may be the factor that at first attracts users to engage with the site, the aim of the intervention is that by coexisting in this shared public space, users may be more likely to interact with one another as well, or at the very least become more comfortable with the members of their community.

fig. 2.23 Site context diagram of transit networks at the site of the Digital Readers intervention

MIXED DEMOGRAPHIC
LIBRARY VISITORS

ASQUITH AV

YONGE ST

SHOPPING &
RESTAURANTS
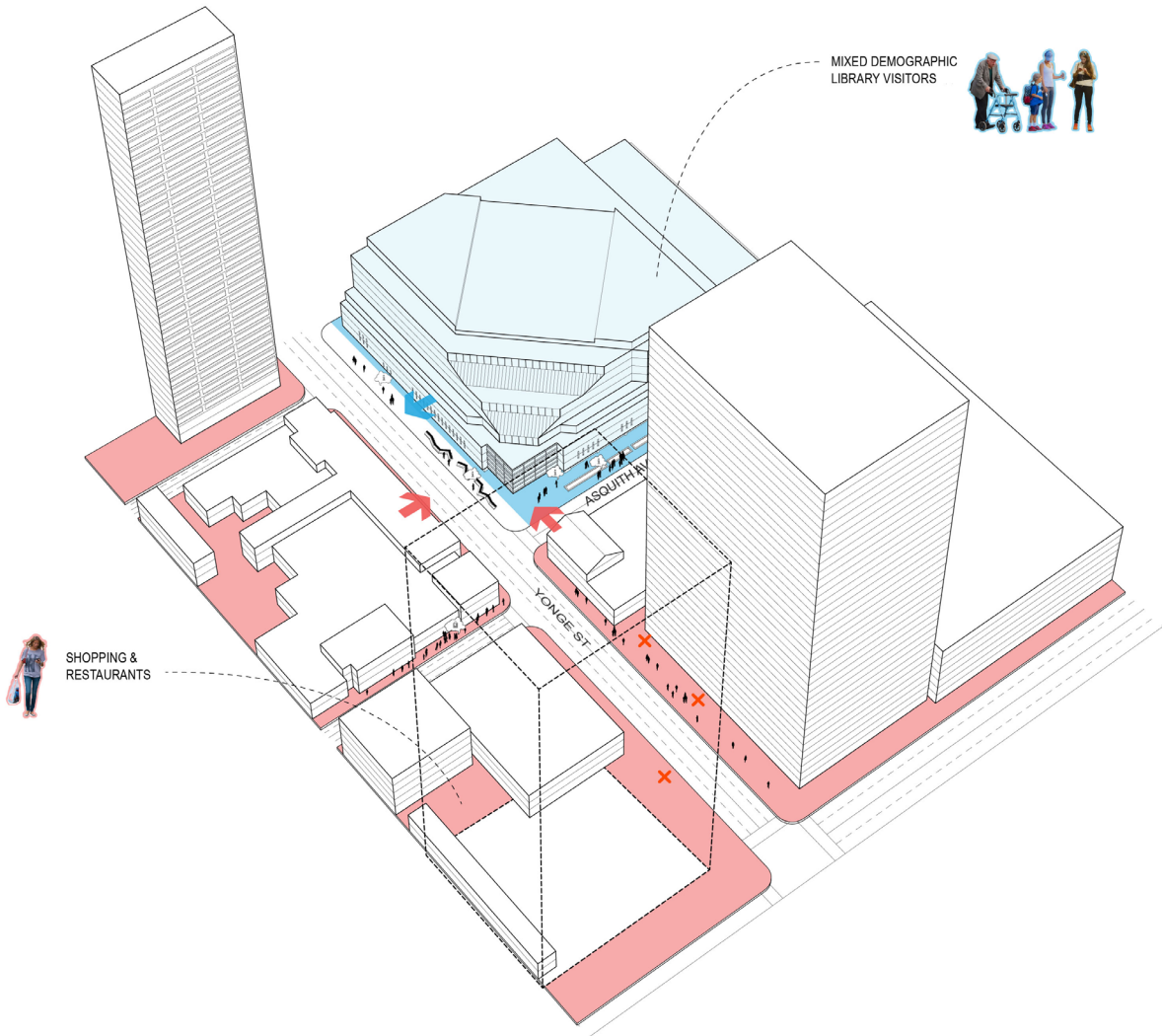
fig. 2.24 Site context diagram of existing factors affecting the site of the Digital Readers intervention

68

ACCESSIBLE DIGITAL INFORMATION
AND DATA CONNECTION

1 PUBLIC DIGITAL READERS
// *PROJECTED DIGITAL WORK-SURFACE*
// *FREELY ACCESSIBLE AT ALL TIMES*

2 HEATED READING-BAR STOOLS
// *COMFORTABLE, WOOD HEATED STOOLS*

3 HEATED BENCHES
// *COMFORTABLE, WOOD HEATED BENCHES*
// *VARIED BACK-SUPPORT CONDITIONS*
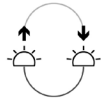
AT ALL TIMES
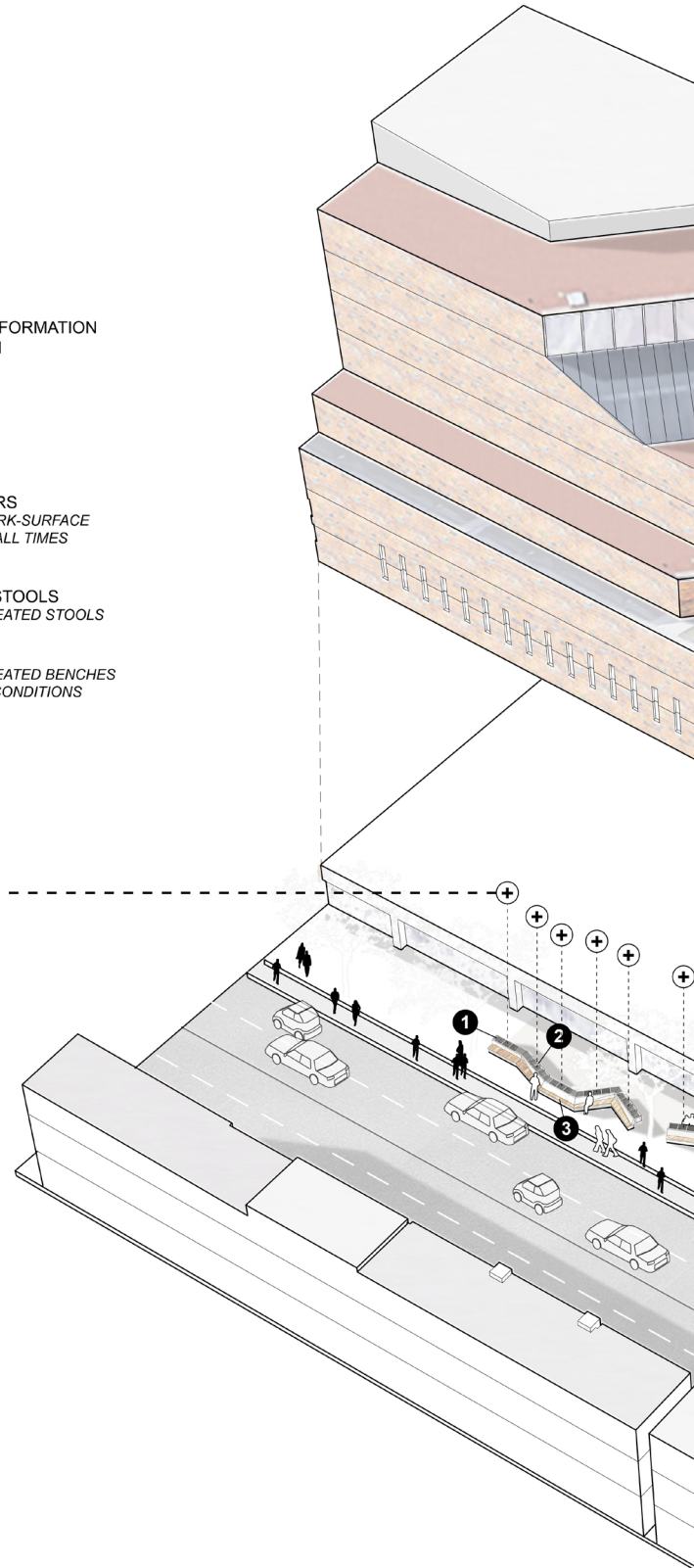
fig. 2.25 Axonometric of Digital Readers intervention

9AM - 8:30PM

INDIVIDUAL SEATING

GROUP SEATING

HEATED SEATING
// COMFORTABLE, WOOD HEATED BENCHES
// VARIED BACK-SUPPORT CONDITIONS

BUS ARRIVAL PROJECTION

PUBLIC DIGITAL READERS
// PROJECTED DIGITAL WORK-SURFACE
// FREELY ACCESSIBLE AT ALL TIMES
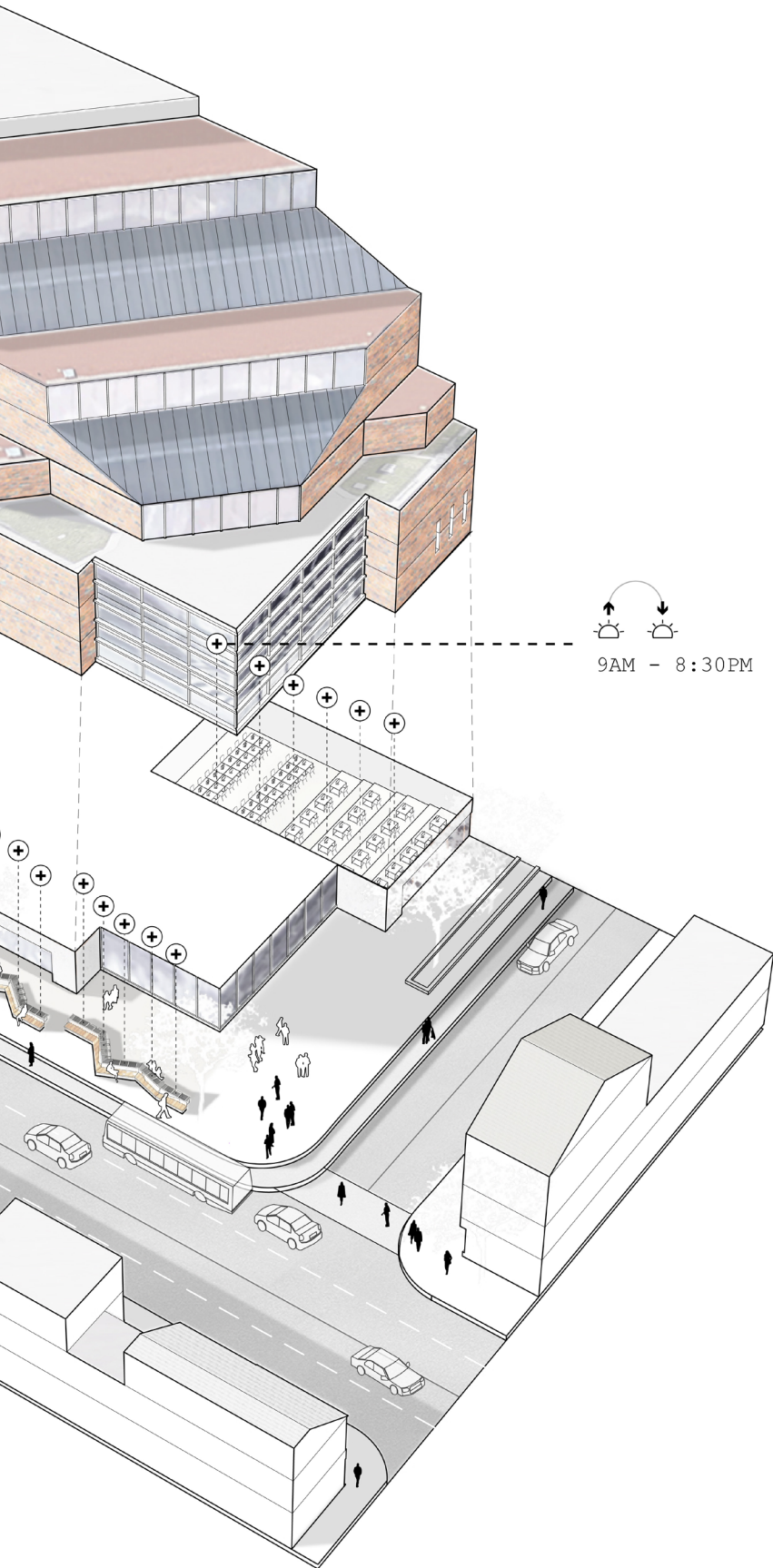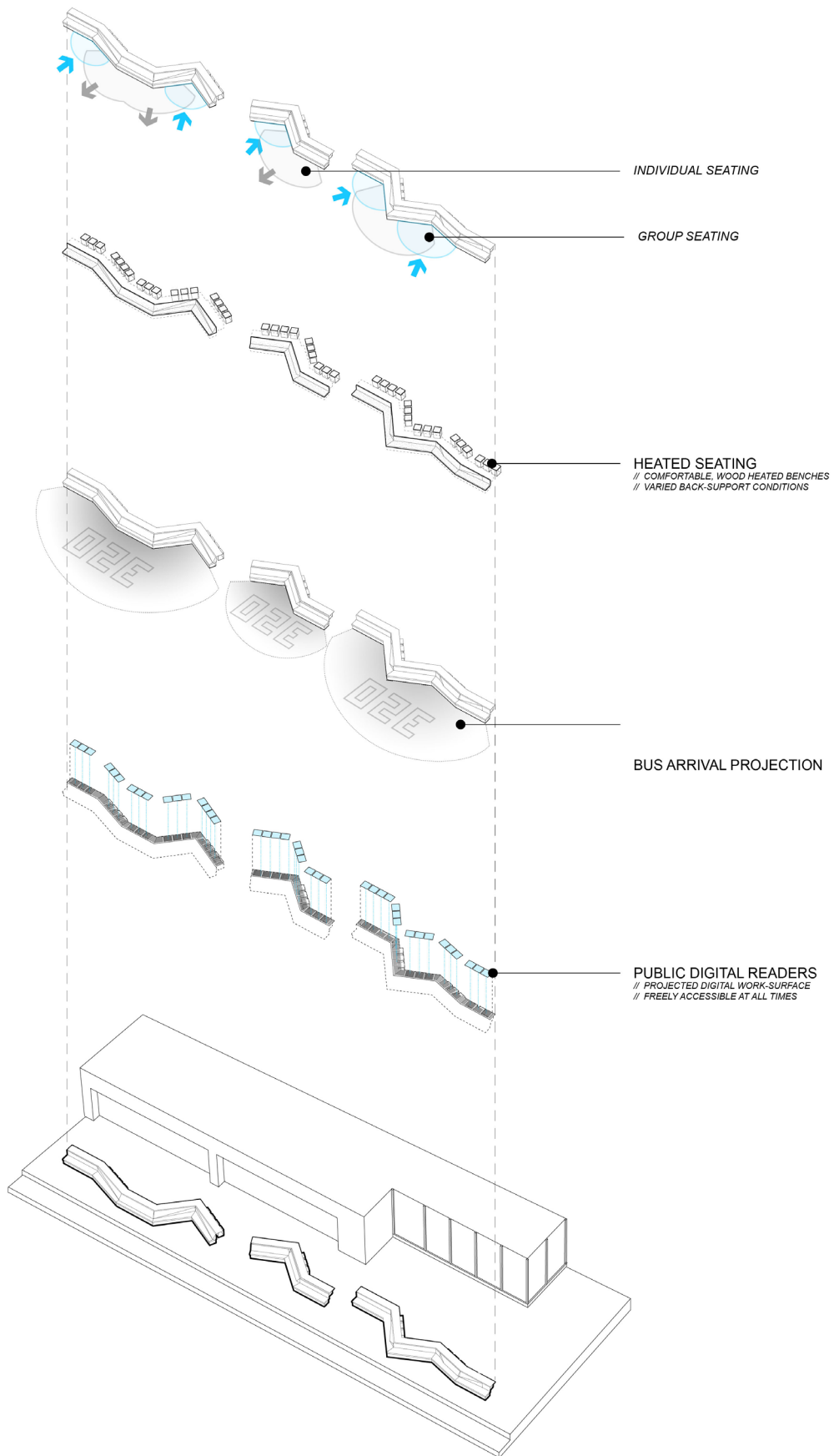
fig. 2.26 Diagram of Digital Reader components, displaying the seating options, heating functions, bus arrival projection, and location of public digital readers

71

ACCESSIBLE DIGITAL
INFORMATION

PUBLICALLY AVAILABLE
PROJECTED TOUCH SCREENS
WITH ADJUSTABLE ANGLING

BENCH HEATING RESPONSIVE
TO USERS

LIGHT BRIGHTENS WITH
INCREASED NUMBER OF
USERS

CHARGING PORTS

WOODEN SEAT AT VARIED
BACKREST ANGLES

PUBLICALLY AVAILABLE
PROJECTED TOUCH
SCREENS WITH ADJUSTABLE
ANGLING

BENCH HEATING
RESPONSIVE TO USERS

CHARGING PORTS

LIGHT BRIGHTENS WITH
INCREASED NUMBER OF
USERS

fig. 2.27 Detailed diagram of the functions and components of the Digital Readers intervention
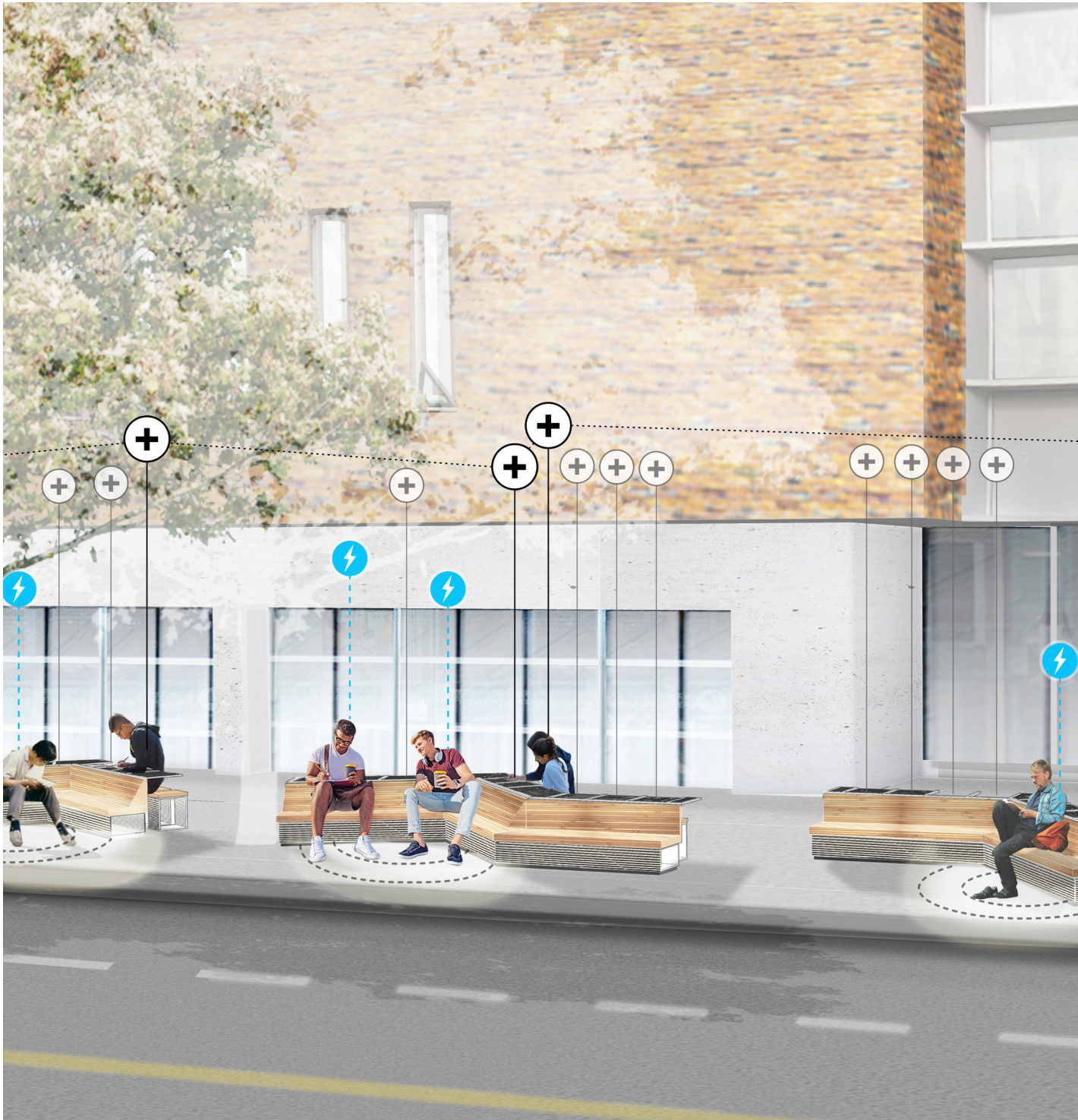
fig. 2.28 Evening visualization of Digital Readers, displaying users on bench and work surface

fig. 2.29 Corresponding existing view of the Digital Readers site from Google Map's Street View

73

74

Evaluating the DIGITAL READERS

synchronous space & time	● ● ● ● ●
confronting antithetical individuals	● ● ● ● ●
opportunity for user agency	● ● ○ ○ ○
reversing the exchange relationship	✔
synthesizing digital tools & physical architecture	✔
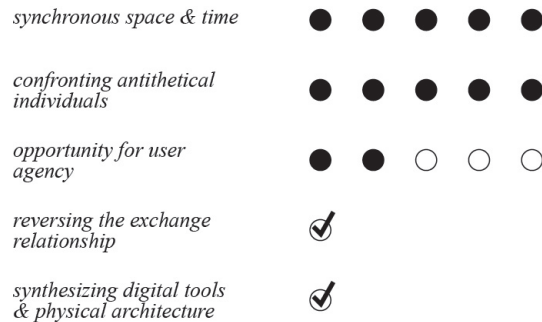
fig. 2.30 Evaluation results of Digital Readers

Synchronicity of Space and Time

The second intervention, the Digital Readers, offer to be successful in leading users to synchronicity in space and time due to the limited seating arrangements available along the bench. Users who want to access the digital screens are forced to sit along the bench with other users beside and in front of them, thereby sharing space for a variable amount of time. The same situation applies to users who need to charge their devices while sitting on the bench.

Confronting Antithetical Individuals

Because of these localized resources, space is more likely to be shared by strangers using this Exchange Place. In addition, the free access to digital resources provided at this site could invite more marginalized members of society to visit this space. This in turn could bring disparate groups of people together, similarly to the Community Garden that is presented in the forthcoming section. Thus, the Digital Readers seem promising in terms of promoting confrontation of antithetical individuals, especially on a site that is shared and frequented by such varied demographics.

Opportunity for User Agency

The opportunity for user agency can be somewhat lacking in the Digital Reader intervention, as the Exchange Place offers only two choices to users in how they can interact with the site: either by sitting on the stools and

75

using the touch screen interface, or sitting on the bench in front. While the intervention succeeds in making digital resources available to all demographics, it does not address a reconsideration of how personal media devices are used in this space.

Reversing the Exchange Relationship

The Digital Readers address the change in relationship of digital benefit from corporation to users, by primarily providing increased anonymity on the digital network. The Digital readers could viably be funded as an extension of the Toronto Public Library, as a self-serve 'outdoor digital library' that would be available any time including beyond library hours. As these are public devices that do not require membership or account information, any usage data collected will be anonymous, barring an individual choosing to log into their private account (i.e. accessing email). Unlike the service-data exchange that drives digital technology companies to offer their services to individuals seemingly free of charge, the Digital Readers are truly 'free' as they do not collect data, or charge users a fee for using the projected interface.

Synthesizing Digital Tools and Physical Architecture to create Immersive Environments

The Digital Readers use data access as a tool to communally gather various demographics of users at a shared physical location. The opportunity to engage with the digital realm is localized to a material space. The physical proximity of the bench and work surface will encourage users who both have and do not have access to their own digital devices to share a common location, and thereby be more likely to interact. At the same time, the Digital Readers are at their core stationary digital devices. That is, they do not offer a very novel way of using digital tools that would differ much from a non-stationary digital device (i.e. cellphone). While they do create an interactive environment that heats and illuminates areas where digital user activity is detected, the Digital Reader intervention could be made more successful by becoming a more immersive and user-responsive space.

COMMUNITY GARDEN

The Community Garden is located in a green pocket adjacent to a Starbucks on Yonge Street and Gerrard Street; near College subway station, the 506 Carlton Streetcar and along the 97 and 320 bus routes. The parkette adjacent to this Starbucks location is an interesting site with two very legible social opposites: Covenant House youth and business district workers.
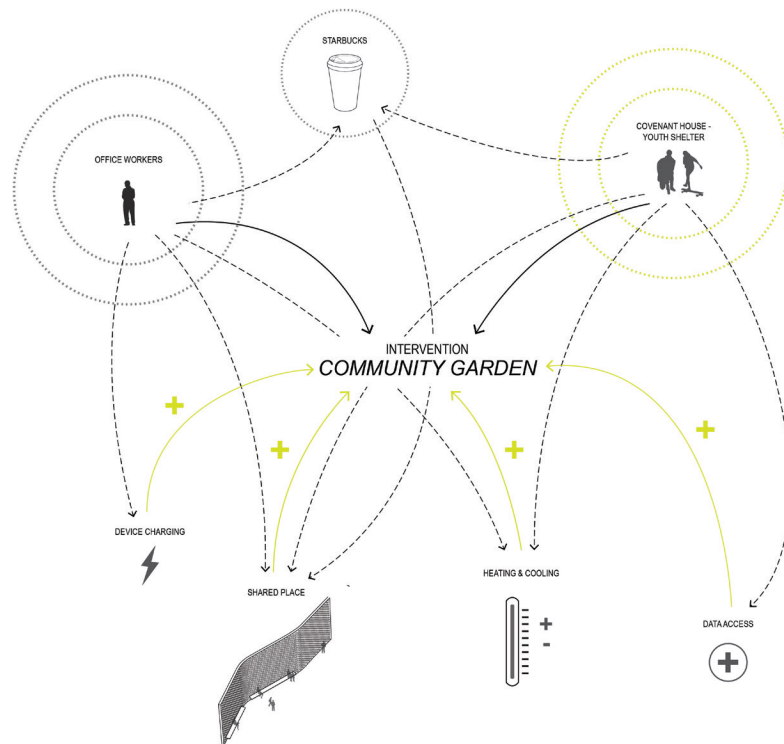
fig. 2.31 Diagram of factors affecting the site, and corresponding programs introduced

While the first can be described as the most disenfranchised members of our community, the latter represent the business economy prevailing in urban centers. The intervention is a three meter tall garden wall, which functions seasonally as a steam garden or greenwall. Figure 2.31 demonstrates the connection between existing factors acting on this site, and the functions of the garden wall proposed.

77

In colder months, the wall releases hot air in areas where users are detected, and in warmer months it releases mist. Because the heating and cooling are determined by user location, spots along the wall already occupied by other users will be better heated or cooled. Newcomers will be attracted to these more comfortable locations, and in turn gravitate to areas already occupied by other users.

Furthermore, these comfortable and more frequented spots along the wall will have increased plant life and growth due to the increased mist concentration. Users can decide to sit in the 'greener', more lush spots already benefiting from the mist, or sit in more vegetation sparse locations in order to activate the mist to promote plant growth. In this small way, users are offered the opportunity for agency in determining how the green wall develops.

A project based on a similar strategy is Natural Fuse by Haque Design + Research. The project is "a micro scale carbon dioxide overload protection framework" which forces participants to work together in conserving their community's carbon footprint. If a participant's usage pushes the community's footprint over the allocated quota, then that person is directly, and openly, responsible for killing another person's plant. The energy conservation experiment emphasizes both community cooperation and individual accountability.[62]

The wall also attracts users by offering data connection and comfortable seating. Covenant House youth will likely gather at the wall in order to benefit from the complimentary Wi-Fi connection, as they may otherwise have limited access to it. They will also be attracted by the ability to socialize and exhibit agency in a publically neutral space, in which they can feel a sense of normalcy while taking part in the public sphere. In this way, the wall would act as what Oldenburg describes as a 'third place', defined among other criteria as an "escape from home and work" and an immune "neutral ground" and social
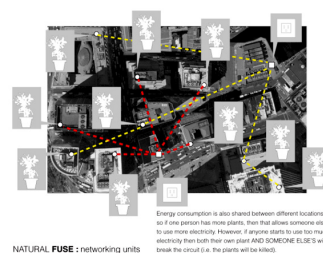
fig. 2.32 Natural Fuse project by Haque Design + Research

62   Haque, Usman, Nitipak "Dot" Samsen & Ai Hasegawa (Haque Design + Research), "Structuring Participation for an Energy Commons," in Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space, ed. Mark Shepard (New York City: Architectural League of New York, 2011), 64-89.

"leveler" where people can informally gather and feel at ease.[63] As a certain 'no man's land', the Community Garden parkette would be a place where Covenant House youth, who are so often rejected by city communities, would feel both immune to these negative perceptions and at the same be welcomed into a space they can consider their own. Simultaneously, the intervention would attract Starbucks regulars, mainly nearby business district workers. The garden offers a comfortable place to have a coffee or a meal, while staying warm or cool depending on the season. This group would primarily be drawn by the seating and coffee shop available at the site, as they would likely have access to their own data services. The goal is that they too would feel as welcome as the Covenant House youth to occupy this neutral public space. Thus, by offering both a strong data connection and thermally comfortable seating area, the intervention might create a public space to bring these disparate groups together.

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63   Ray Oldenburg, The Great Good Place: Cafés, Coffee Shops, Bookstores, Bars, Hair Salons, and other Hangouts at the Heart of a Community (Marlowe & Company, 1989), 21-25.

BUS 320

YONGE ST

GERRARD ST E

BUS 97
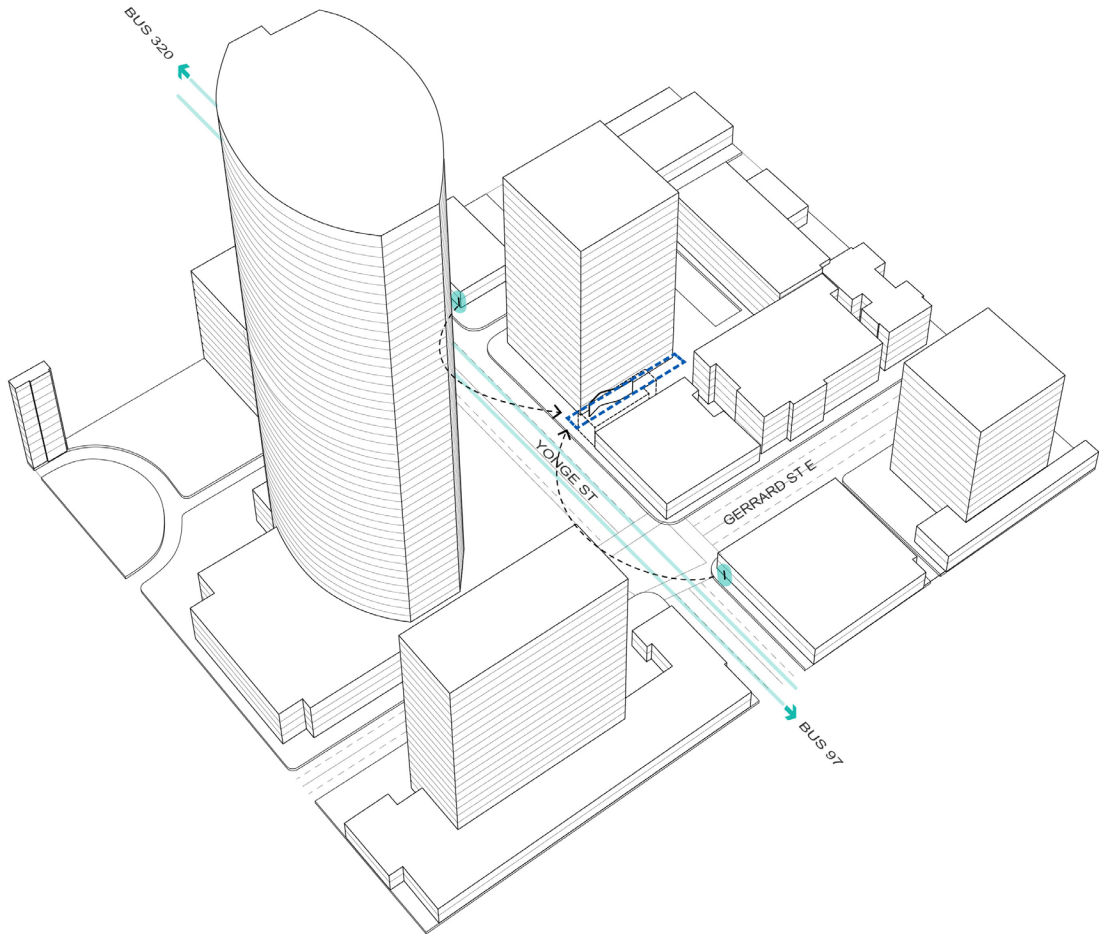
fig. 2.33 Site context diagram of transit networks at the site of the Community Garden intervention

Labels in figure:
- BUSINESS/ OFFICE WORKERS
- COVENANT HOUSE HOMELESS YOUTH
- COVENANT HOUSE
- BUSINESS
- YONGE ST
- GERRARD ST E
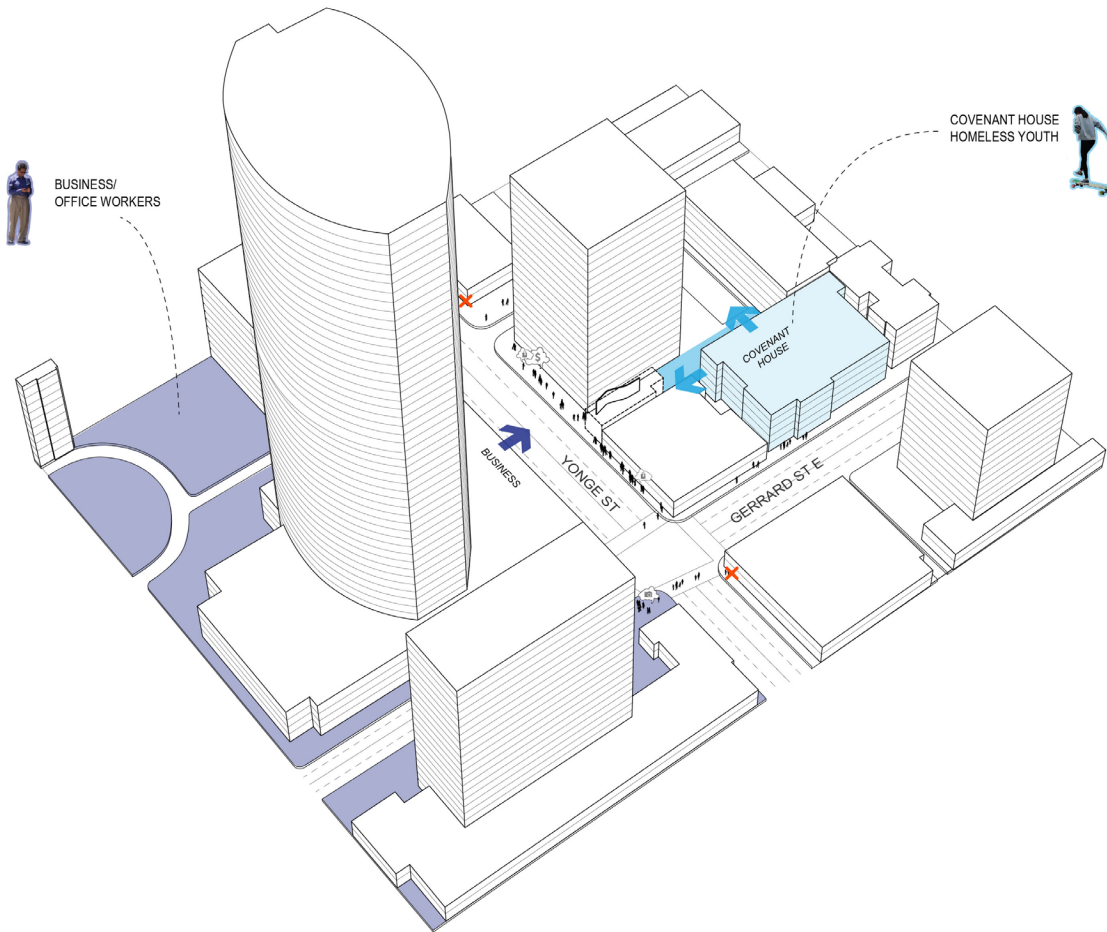
fig. 2.34 Site context diagram of existing factors affecting the site of the Community Garden intervention

BUS ARRIVALS PROJECTED FROM
BUILDING FACE ONTO SMOKE OR
PLANTS

GARDEN WALL
// STEAM GARDEN / GREENWALL
SEASONALLY
// HEATS OR COOLS IN RESPONSE
TO USER INTERACTION

DATA WALL
// ACCESSIBLE PUBLIC DATA
NODE
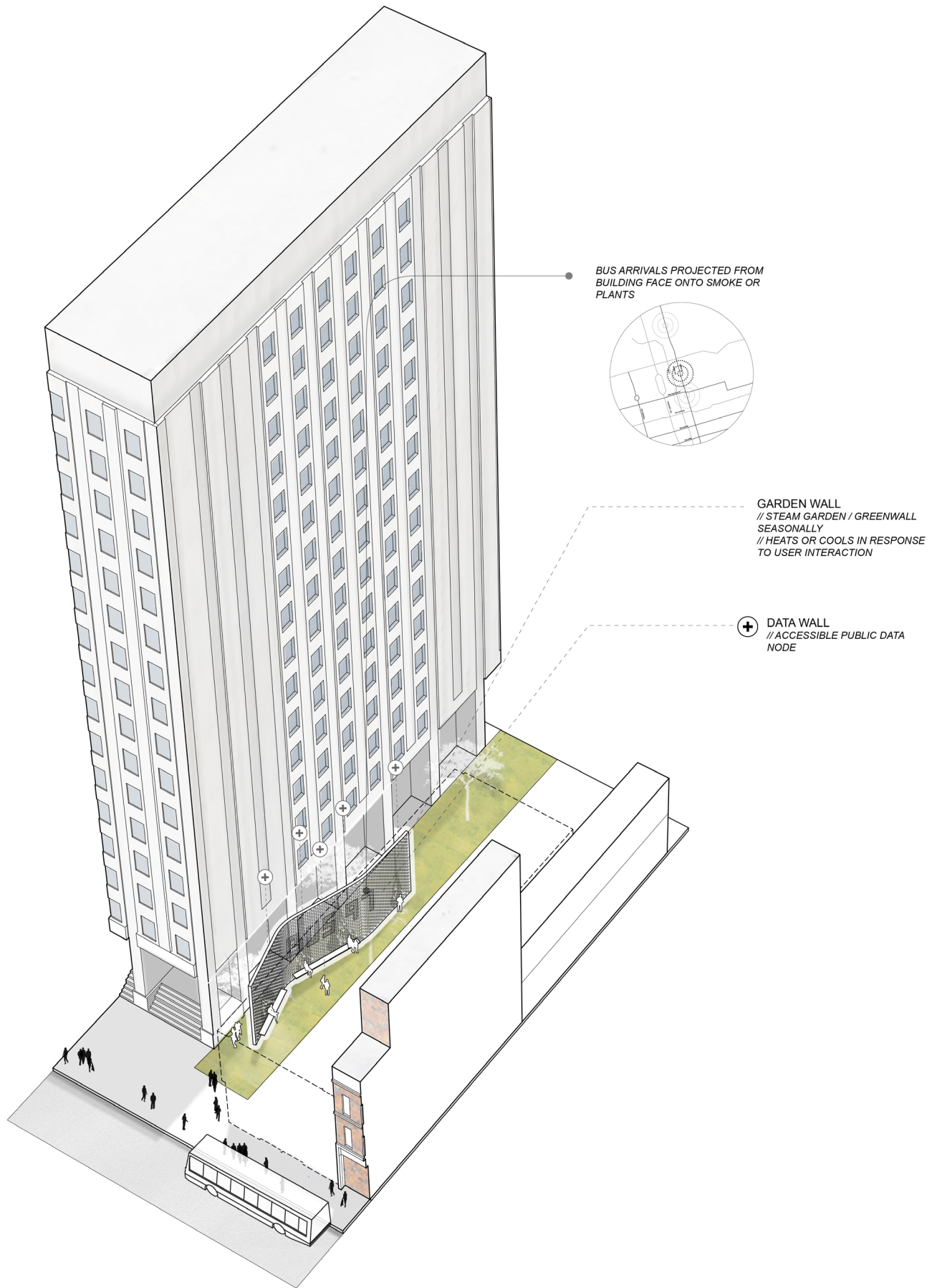
fig. 2.35 Axonometric of Community Garden intervention

83

WALL COOLS/ HEATS USERS IN
RESPONSE TO INTERACTION

BUS ARRIVALS PROJECTED FROM
BUILDING FACE ONTO SMOKE OR
PLANTS
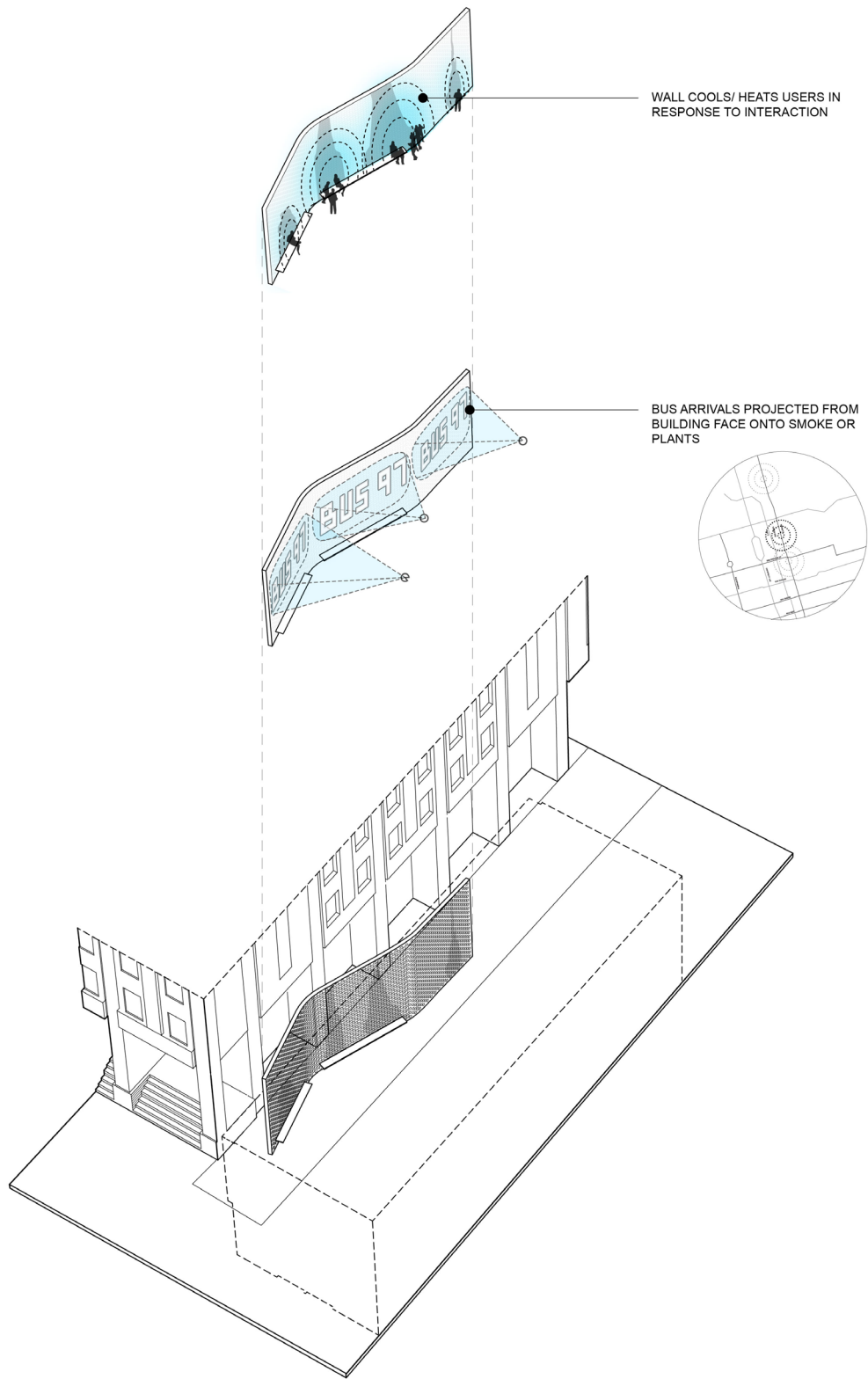
fig. 2.36 Diagram of the functions and components of the Community Garden wall

84

BUS ARRIVALS PROJECTED FROM
BUILDING FACE ONTO SMOKE OR
PLANTS

DATA WALL - ACCESSIBLE PUBLIC
DATA NODE

GREENWALL COOLS USERS IN
RESPONSE TO INTERACTION

BUS ARRIVALS PROJECTED FROM
BUILDING FACE ONTO SMOKE OR
PLANTS

DATA WALL - ACCESSIBLE PUBLIC
DATA NODE

STEAM WALL HEATS USERS IN
RESPONSE TO INTERACTION
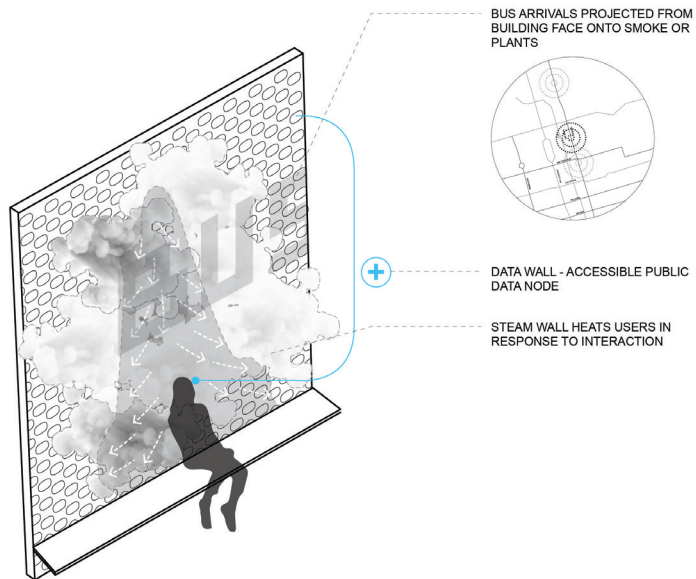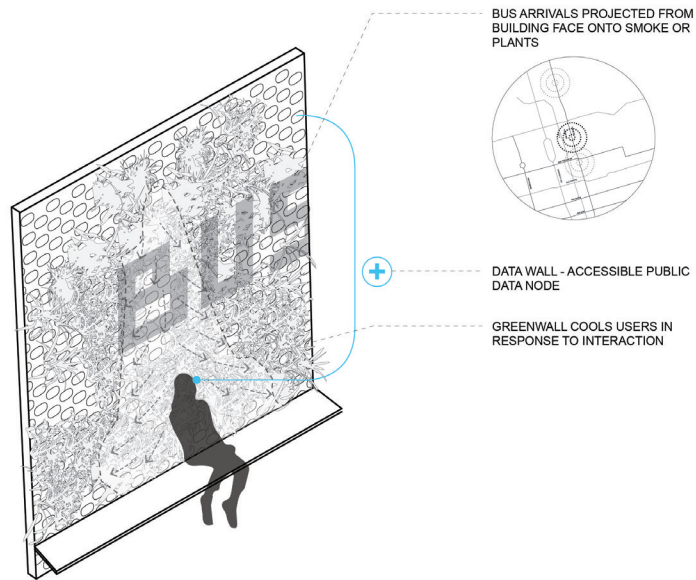
fig. 2.37 Detailed diagram of the garden wall functions in the summer and winter seasons

fig. 2.38 Corresponding existing view of the Community Garden site from Google Map's Street View

fig. 2.39 Winter visualization of steam wall at the Community Garden intervention, showing people using the wall for heating, seating and data access

Evaluating the **COMMUNITY GARDEN**

synchronous space & time	● ● ● ● ○
confronting antithetical individuals	● ● ● ● ●
opportunity for user agency	● ● ○ ○ ○
reversing the exchange relationship	✔
synthesizing digital tools & physical architecture	✔
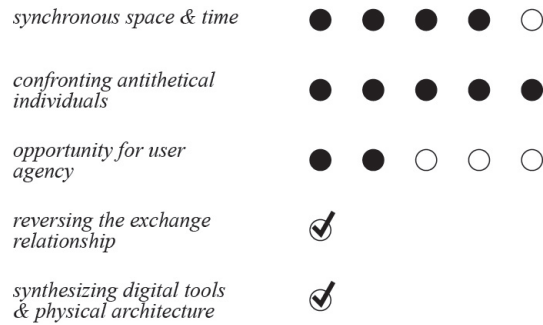
fig. 2.40 Evaluation results of Community Garden

Synchronicity of Space and Time

Similarly to the Digital Readers, the Community Garden's limited options for seating along the intervention create successful opportunities of synchronicity in space and time between users. The garden wall has only two benches along the Starbucks side of the wall, and a third on the opposite side.

Confronting Antithetical Individuals

The seating arrangements described would likely lead the Covenant House youth and Starbucks users to sit in close proximity to one another, whether beside each other or back to back between the semi-transparent perforated wall. This would hopefully invite some form of social confrontation between these disparate groups or at least challenge one's comfort zone. Device charging and strong data connection available along the wall should further encourage the shared usage of this space by these different demographic groups.

Opportunity for User Agency

The opportunity for user agency at the Community Garden is most prevalent in the cooling and heating misting functions of the wall. Since these functions are user-responsive, users are given the agency to choose spots along the wall that are thermally comfortable, and also contribute to seasonal plant growth. Furthermore, the atypical social intersection at this intervention, between at risk youth and business-district workers, may promote agency in the shared space created by compelling users to interact with community members they otherwise rarely encounter. However, the agency of user and digital device is not addressed on the site, as users are free to use and charge their smartphones along the garden wall as they would at a regular bus shelter.

Reversing the Exchange Relationship

The Community Garden does not entirely reverse the data exchange relationship as users will still be accessing the digital network on their personal devices. That being said, the intention is to attract groups together, and not solely to collect data for a private interest. The network connection available along the wall is provided with the aim of benefitting the user through the in-person interactions that will hopefully spark from the sharing of physical and digital resources by these diverse social groups.

Synthesizing Digital Tools and Physical Architecture to create Immersive Environments

The project synthesizes the use of digital tools and physical architecture in the design of the Community Garden, through its hybrid features like the heating and cooling wall. These physical elements are activated by user digital activity. Additionally, the projection of bus arrivals onto the intervention allows users to disconnect from their phones without fear of missing their bus.

PROJECTED AGORA

The last intervention is the Projected Agora, located in front of Old City Hall, at Yonge Street and Queen Street West; along the 301, 501, and 502 streetcars. Factors acting on the site are its location as Toronto's political centre, and the consumers and tourists in the surrounding area.
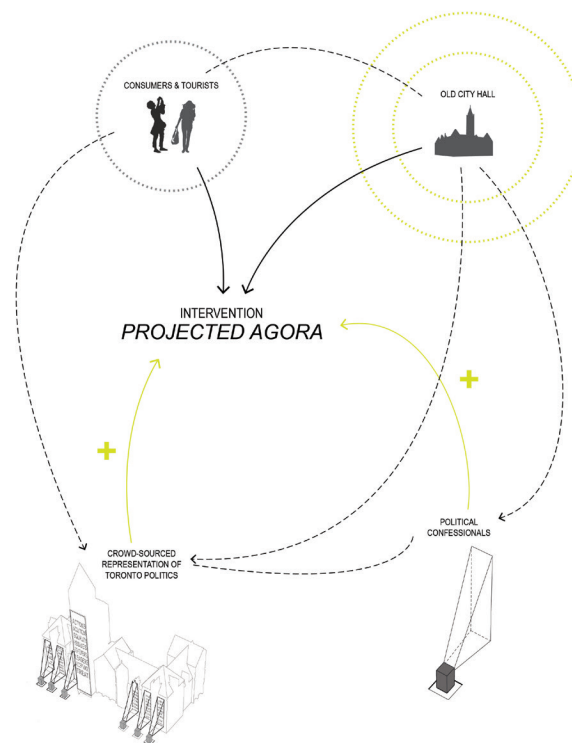
fig. 2.41 Diagram of factors affecting the site, and corresponding programs introduced

As demonstrated in Figure 2.41, acting upon these factors, this intervention proposes a series of projectors, that display unfiltered (but screened for profanity) public opinions onto Old City Hall. Users can voice their opinions by entering glass booths akin to 'political confessionals', which, using electro-chromatic technology, become opaque when occupied. A sound-responsive digital visualization system then listens to and receives the user's message, and the booth

device projects it with a 10 minute delay. The delay gives users their anonymity, while projecting their words allows them to also be heard as public agents in the political discourse of their city. The messages from all six booths are also combined and re-calibrated by most common verbs, adjectives, or nouns and displayed in varying sequences on the clock tower, before resetting each 24 hour period. The intention of the project is to contrast the political messages that fill digital social networks, but are often abstracted and removed from the individuals and communities they affect.

A similar project is Wodiczko's 1986 Homeless Projection: A Proposal for Union Square, in which the artist projected images associated with homelessness onto monuments in Union Square in order to address the economic tensions of the site's history.[64]

The Projected Agora is meant to act as a reminder of the weight of public opinions, by projecting them onto a monumental building located in the heart of the city. The intervention also acts as a commentary on digital media filtering devices that often portray an inaccurate representation of the true majority. Whereas social media allows users to self-select the communities and opinions they encounter, the Projected Agora will act as a platform for interweaving all communities views, despite at times being confronted with radical disagreement.
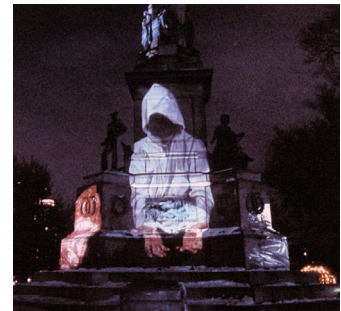
fig. 2.42 The Homeless Projection by Krzysztof Wodiczko

64   "Krzysztof Wodiczko: Abraham Lincoln War Veteran Projection," Culture.pl, accessed July 24, 2018, https://culture.pl/en/event/krzysztof-wodiczko-abraham-lincoln-war-veteran-projection.
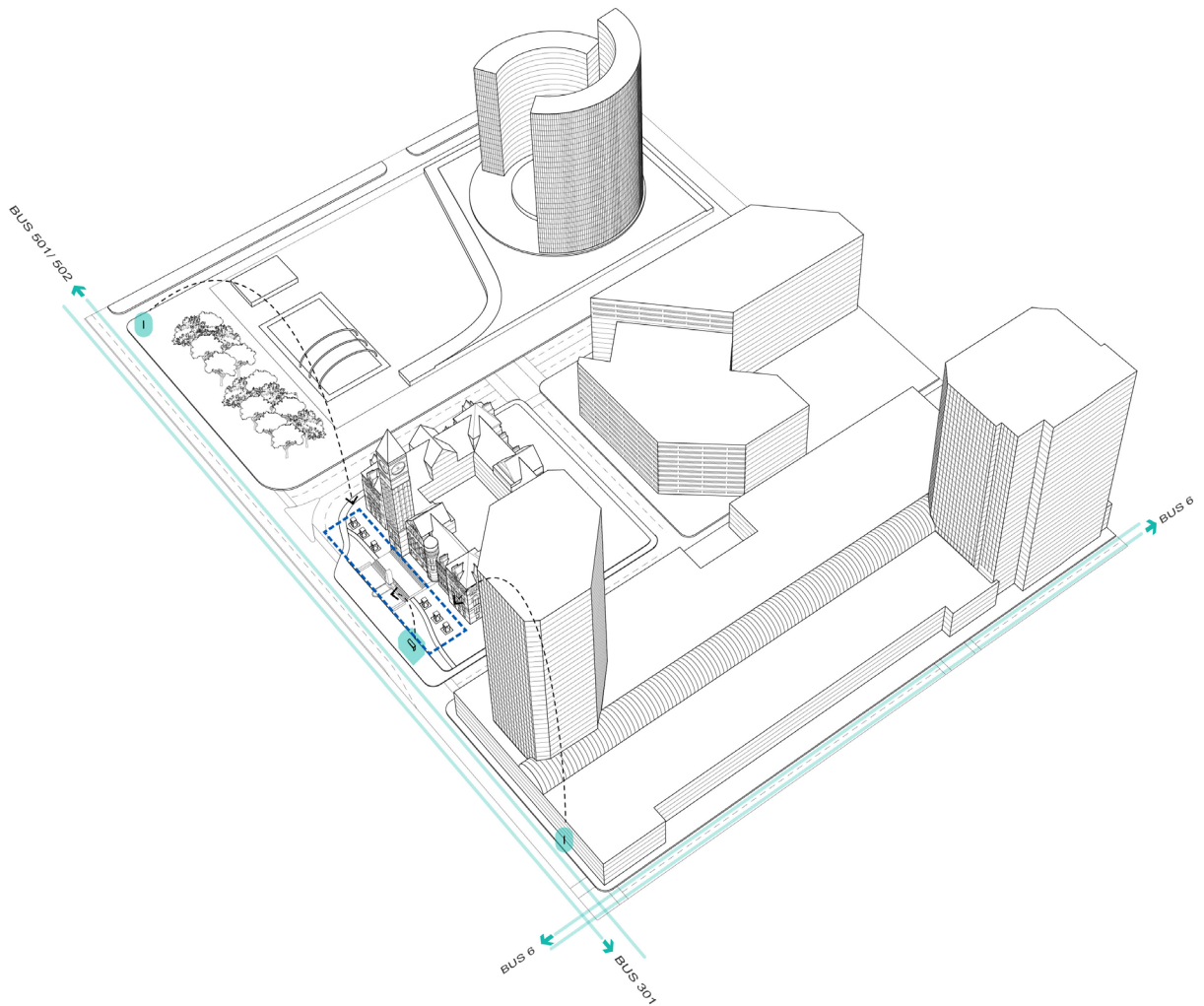
fig. 2.43 Site context diagram of transit networks at the site of the Projected Agora intervention

TOURISTS & LOCALS

WORKERS & VISITORS

MIXED DEMOGRAPHIC
LOCAL SHOPPERS
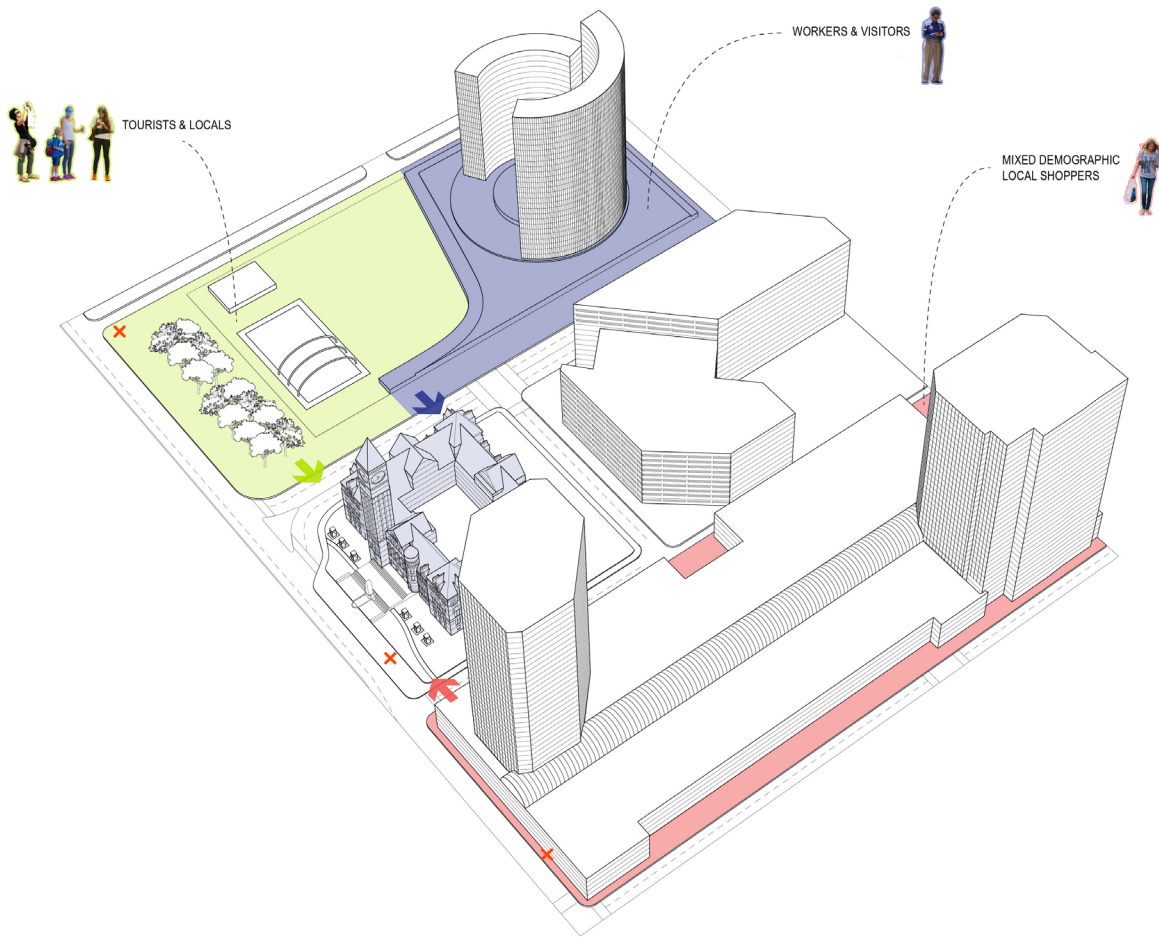
fig. 2.44 Site context diagram of existing factors affecting the site of the Projected Agora intervention

FILTERED TREND MESSAGE WALL
// BASED ON DAILY STATS OF TERMS USED
IN EACH CONFESSIONAL

REAL-TIME MESSAGE WALLS
// DISPLAY UNFILTERED (CENSORED)
MESSAGES FROM EACH BOX WITH A 10
MIN DELAY

(+) SOUNDPROOF, SOUND-RESPONSIVE
ELECTRO-CHROMATIC GLASS POLITICAL
CONFESSIONALS
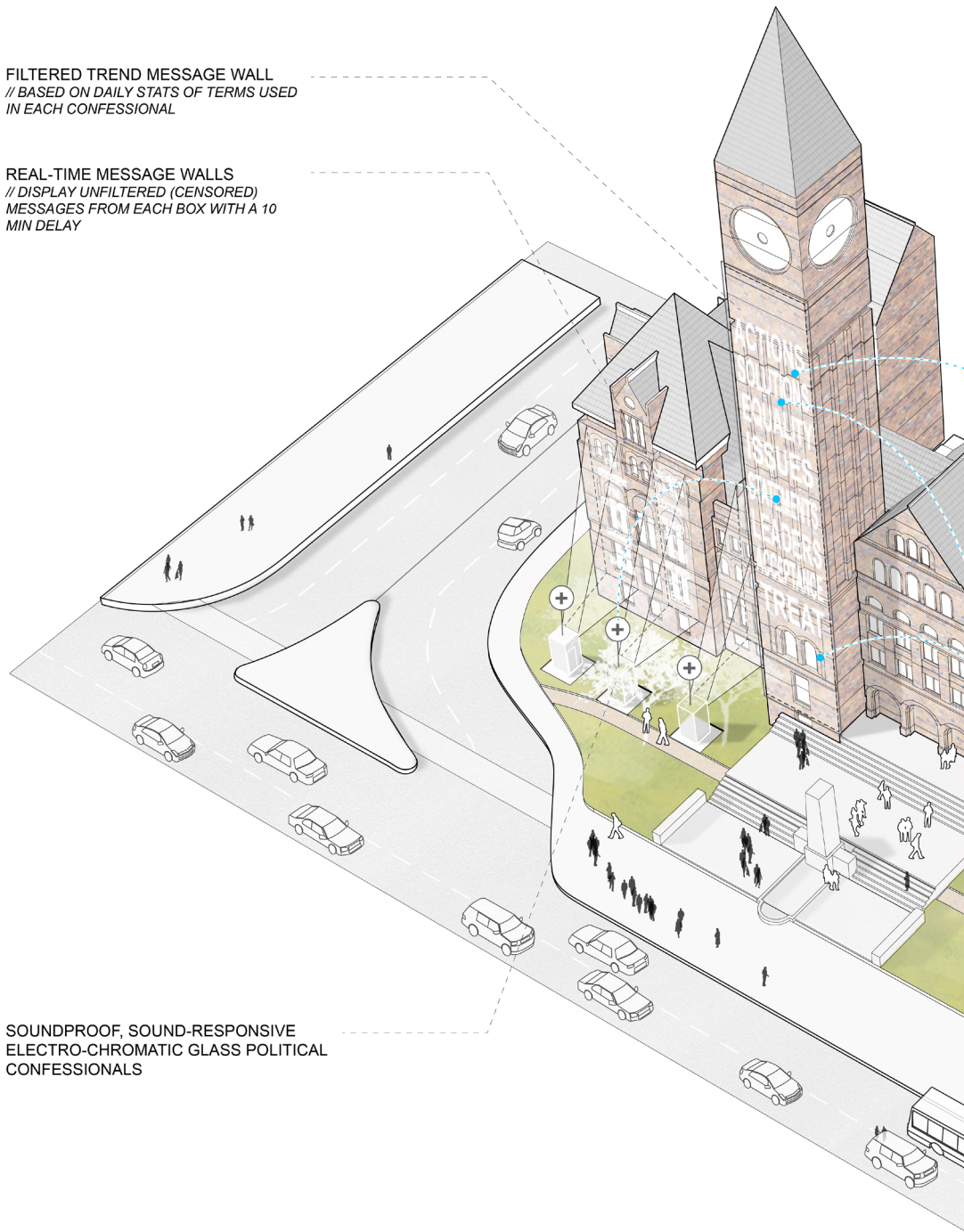
fig. 2.45 Axonometric of Projected Agora intervention

95

FILTERED TREND MESSAGE WALL
// BASED ON DAILY STATS OF TERMS USED
IN EACH CONFESSIONAL

REAL-TIME MESSAGE WALLS
// DISPLAY UNFILTERED (CENSORED)
MESSAGES FROM EACH BOX WITH A
10 MIN DELAY

POLITICAL CONFESSIONALS
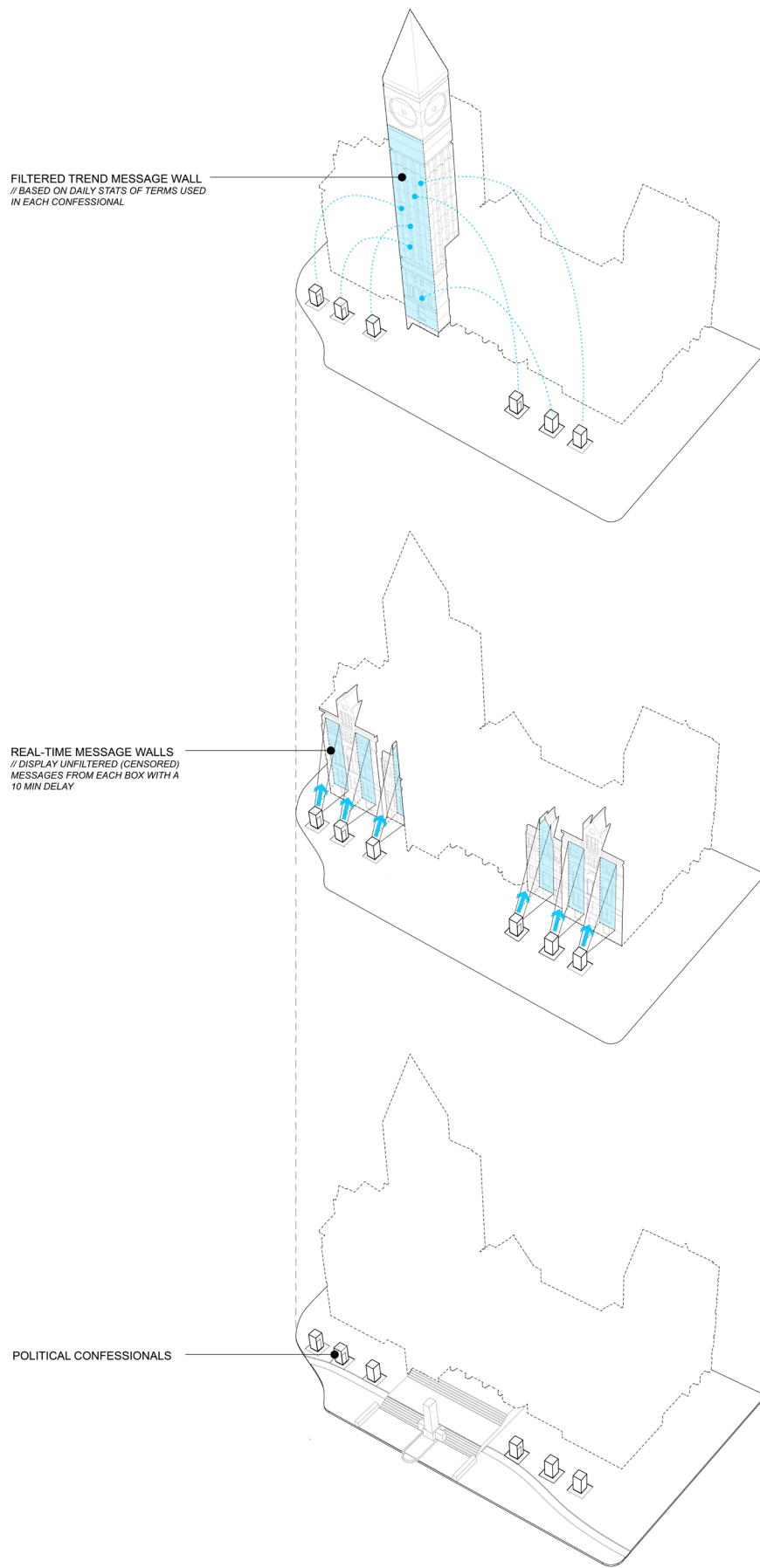
fig. 2.46 Diagram of Projected Agora functions and components, displaying the filtered clock-tower projections, real-time message walls, and 'political confessional' booths

97

PROJECTOR ON BOOTH
TRANSFERS SPOKEN
STATEMENTS TO BUILDING FACE

SOUND RESPONSIVE DIGITAL
DISPLAY "LISTENS TO" AND
ABSORBS THE USER'S MESSAGE

LIGHTING IN SEAMS FOR
OBJECT VISIBILITY

ELECTRO-CHROMATIC
TECHNOLOGY TURNS GLASS MILKY
FROM TRANSPARENT WHEN
BOOTHS ARE IN USE, PROVIDING
ANONYMITY TO THE SPEAKER

PROJECTED WITH A 10MIN DELAY

ACTIONS NOT WORDS
ACTIONS NOT WORDS
ACTIONS NOT WORDS
ACTIONS NOT WORDS

vacant
GLASS IS
TRANSPARENT
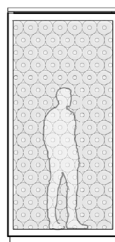
occupied
GLASS TURNS
FOGGY & OPAQUE
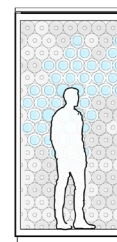
in-use
DIGITAL DISPLAY ON
GLASS RESPONDS TO
VOICE OF USER

fig. 2.47 Detailed diagram of 'political confessionals' and real-time message wall

98

fig. 2.48 Corresponding existing view of the
Projected Agora site from Google Map's
Street View

fig. 2.49 Nighttime visualization of Project-
ed Agora, Displaying user inside 'political
confessional' and their message being pro-
jected onto the real-time message wall

Evaluating the PROJECTED AGORA

synchronous space & time	●	○	○	○	○
confronting antithetical individuals	●	●	●	●	●
opportunity for user agency	●	●	●	●	●
reversing the exchange relationship	✅				
synthesizing digital tools & physical architecture	✅				
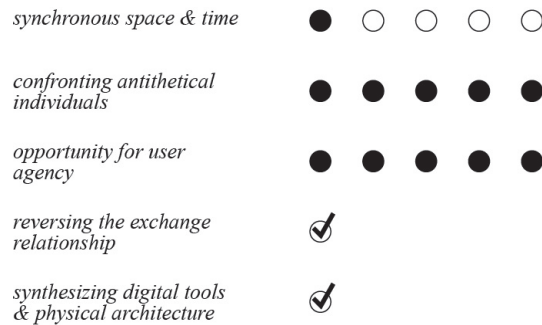
fig. 2.50 Evaluation results of Projected Agora

Synchronicity of Space and Time

In the Projected Agora, synchronicity in space and time between users is uncertain, since the program can too easily become a private experience of acting and observing. The anonymity necessary to encourage users to enact their political agency means that those speaking and receiving the messages in the Projected Agora experience the same event in a fractured way, both spatially and temporally.

Confronting Antithetical Individuals

While the anonymous nature of the intervention does not lead users to encounter one another in the traditional physical sense, the Projected Agora successfully confronts antithetical individuals by displaying varying public opinions on a monumental scale. The site therefore strengthens interaction, by creating an authentic representation of an urban community. This authentic representation brings together all opinions and views, and not just those read in self-selected digital communities found on social media.

Opportunity for User Agency

The nature of the Projected Agora intervention suggests it can be most successful in providing users with the opportunity to enact their own agency in the public realm, as its entire premise is based in the projection of public opinions. The intervention is also successful in strengthening agency by questioning the self-selective, filtered nature of digital media platforms, leading the user to form a new perspective on the authenticity of popular platforms and their consumption.

Reversing the Exchange Relationship

The Projected Agora most effectively encourages a change in relationship between data and users, by creating a new example of using media for sociopolitical purposes that unlike social media, does not provide companies with data to collect. The entire system is 'offline' using internal software to recalibrate most common words for projection onto the clock tower, and so individuals' opinions cannot be quantified for consumer purposes. Furthermore, with the absence of self-selected digital communities and the biases they create, the Projected Agora generates a reflection of authentic community diversity, not an algorithmically user-optimized product. This function also encourages users to reflect on the underlying intentions affecting popular social networks, and re-examine their relationship with a fresh outlook on the authenticity of the products they deliver.

Synthesizing Digital Tools and Physical Architecture to create Immersive Environments

The Projected Agora successfully uses both digital and built architecture to create an immersive public environment, by combining the functions of digital projections with tactile booths. The 'political confessionals' are a place-bound, familiar structure, that encourages users to be more aware of the messages they speak into the semi-digital devices; in contrast to simply typing the same message out on their smartphone. The projection of these messages onto a monumental building face also makes the act of sending a digital message more purposeful to participants. It raises their awareness throughout this process of sharing an opinion with the general public, an awareness that is often lacking when sharing on digital public networks.

part 3
CONCLUSION

EVALUATION

Achieving Successful Interaction

To conclude the analyses of the Exchange Places, it can be summarized that generally interventions that are stronger in providing user agency, fall short in the category of synchronicity of time and space. In parallel, interventions that are least successful in providing opportunities for user agency are most successful at achieving synchronicity of time and space, and the intersection between antithetical individuals. All four interventions seem to be less effective in at least one category, meaning they may not represent a completely cohesive solution to strengthening in-person interaction, based on the definition of successful interaction utilized in this thesis. However, they do offer some insights on how this problem might be approached.

According to Mitchell and de Waal, synchronicity in space and time and the confrontation of antithetical individuals are necessary components of successful in-person interaction.[65,66] The explorations of this thesis suggest that while these two aspects are easiest to achieve, they are not likely to result in a socially successful public space unless accompanied by the third component: the opportunity for user agency. In other words, simply having strangers spend time near each other is not enough to form strong urban communities. An existing example of this scenario can be observed on the subway, where people of all societal demographics are in a synchronous time and space, but are very unlikely to share even a basic interaction, such as a conversation. In the case of the subway, the first two components of social interaction are fulfilled, but the third is not. One can speculate that perhaps the third is the most crucial component, which transforms an inactive social setting to an active one. The possibility of

65   William John Mitchell, City of Bits: Space, Place, and the Infobahn (Cambridge, Mass: MIT Press, 2010).
66   de Waal, Martijn, "The Urban Culture of Sentient Cities: from an Internet of Things to a Public Sphere of Things," in Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space, ed. Mark Shepard (New York City: Architectural League of New York, 2011), 190.

agency provides the user with the clear opportunity to interact with their environment and other users.

In this way, the project becomes not singularly about user interaction, but about user action and participation in the city. While it is hard to design a public space that encourages people to predictably talk to one another, architecture can be much more successful at encouraging people to look away from their devices, and participate in their environments. In the example of the interventions proposed, the Exchange Places seemed to be more successful at encouraging users to engage with their city's nature, culture, politics, and economy, than they were in choreographing conversations and social encounters among users. Therefore, the project suggests that the first step to interaction between people in a city, is an interaction and engagement with the city itself. Shepard describes the role of urban public architecture for the digital age, as an avenue that provides opportunity for the "active role its citizens might play as designers, users, inhabitants and participants in the unfolding techno-social situations of near-future urban environments."[67] By inviting users to disengage from the digital realm and if but for a moment return to the physical one, these interventions could lead users to then potentially also engage with other users in that space.

This leads to a second consideration: does user agency need to be programmed in order to occur more frequently and successfully? In the interventions Digital Readers and Community Garden, where lower user agency was estimated, users were actively brought to the site by the digital resources and comfortable environments available, but once there, the user was free to act as they pleased. Unfortunately, this means that users could then exhibit similar behaviour as on the subway, and choose to sit near one another but revert their attention to their personal media devices rather than their physical environments and other users. Paradoxically, by leaving agency too open to the user, these interventions may have diminished the success of public interactions by not providing clear enough opportunities on how user agency should be enacted.

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67   Mark Shepard, Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space (New York City: Architectural League of New York, 2011), 14.

The projects must also be analyzed through the scope of whether using the given three-part definition for interaction was sufficient for producing an experimental solution to the initial question of the thesis. As stated, the thesis aim was to examine a new form of reflective interaction in the digital age, by reversing the exchange relationship of data to the benefit of the user and proposing a new typology of urban design which synthesized the immersive qualities of digital tools and physical architecture. These two criteria underlied the process of designing each of the four interventions. Based on the evaluations completed following each Exchange Place, it can be concluded that the combination of these elements was successful in addressing the thesis goal. The definition of effective interaction used helped strengthen the thesis by providing a clear set of guidelines upon which to design for successful interaction. Upon evaluating the interventions, all appear to offer the conceptual design for creating environments that both shift the exchange relationship of data to benefit users, and synthesize digital and built tools in their architectural approach.

The role of Personal Digital Devices in the Exchange Place

The interventions may also have been too ambitious in leaving the choice of smartphone use completely up to the user. The Exchange Places may have been more successful at creating interactions if personal digital devices were more actively addressed on each site. This could include ideas of strategically enabling or disabling phone use, as opposed to only utilizing the smartphone as a means to bring a user to the site. An example could be a digital game between users in the Data Forest, or if the Community Garden required users to put their devices in sleep mode in order to heat the wall more effectively. The thesis experiments relied on the immersive qualities of architectural space and the proximity to other users to draw users away from media consumption, but perhaps this withdrawal has to be more forcefully digitally choreographed in order to achieve better results in user interaction.

Feasibility in Execution

Another question that arose through this investigation, is the feasibility of the project's propagation as a system. In terms of its infrastructural framework, the Exchange Place proposal could have been made stronger if the relationship to the bus stop was developed further by displaying a network of new transit opportunities. This relationship could have been shown more directly through a comparison of existing bus routes, and a visualization of the fluctuating routes that would exist in the proposed network. This would also require the interventions to potentially become more infrastructural and repeatable in nature, rather than a type of site-specific, art-like installation as currently proposed. This would make the Exchange Place more suitable for dispersion on a city-wide scale. In this case, the projects would likely be funded as part of a city service by the City Council, and managed by the public transport agency. However, this would in turn question whether more infrastructural interventions would still lead users to an authentic interaction with urban environments and communities, or result in a monotonous experience similar to that of the existing non-site-specific bus shelters.

As proposed, the interventions are more art-project-like, rather than infrastructural, as successful interaction is the primary ambition of the thesis and precedes the importance of logistical efficiency for this exercise. This unique, site-specific design is instrumental in promoting public interaction. Taking the art-project-like scenario, the interventions' feasibility would rely on private funding or a government incentive plan, which would reward businesses and property owners who chose to contribute to the development of an Exchange Place on their property. This funding strategy would allow the project to retain its integrity of concept on each site, by proposing a series of unique experimental solutions to harvesting interaction across the city's varied communities.

The main purpose of the project, as proposed, would be to enhance the individual experience of the city and make it more personable, contradicting the driving factors of Smart City initiatives based in efficiency, data collection, and consumerism. Richard Sennett evaluates the success of Smart City initiatives led by IBM and Cisco in Rio de Janeiro, Masdar

and Songdo among other cities, commenting that while the technologies introduced successfully address the basic services necessary, "once [these services] are in place people don't value efficiency above all; they want quality of life."[68] As the Exchange Place seeks to change the relationship of consumption and communication between user and company to one between users and their environments, Smart City initiatives led by large technology companies would likely lack incentive to carry out these projects as part of their funding and planning strategies.

68   Richard Sennett. "No one likes a city that's too Smart," The Guardian (2012).

IMPLICATIONS

The aim of the interventions presented is to propose new ways technology and architecture can play a significant design role in strengthening communities of the future city. As stated in the thesis argument, the purpose of the interventions designed was to propose a new form of reflective interaction in the digital age, by using data in a novel way to the benefit of the user, and experimenting with a new typology of architecture that combines digital tools with traditional architectural design.

This thesis approached many problems within the ongoing digital movement and its implications on the decreasing value of places for community at the cost of optimization and efficiency. As a proposed series of experimental interventions, it does not posit to successfully address and solve the problems of interaction associated with this immense shift towards a digitized future. Rather, it argues for the importance of architects to engage in the discourse presently taking place, and continue to engage with the new questions this technological revolution implies on the field of architecture. The thesis accepts the digital evolution as inevitable. It does not frame the Smart City as a negative opportunity, but aspires to demonstrate that more technology does not guarantee a more successful city.

As demonstrated in Part 1: Introduction to the Smart City, Smart City technologies have many advantages, which among other benefits can provide city inhabitants with more safe, sustainable, and economically efficient futures. However, as noted in Part 1.3: Effects of Technology on Community, such technologies can be just as harmful in creating isolation and a loss of authentic interaction as they can be in contributing to stronger, more connected communities.[69] As a result, this thesis discourages the design of Smart Cities to be guided by technology companies alone, without the input of fields most expert in space-making, namely architects and other urban designers. The proposed interventions demonstrate a potential role for the architect in these scenarios. That is, by utilizing

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69   Igor Calzada and Cristobal Cobo, "Unplugging: Deconstructing the Smart City" (The Society of Urban Technology, University of Oxford, England, 2015), 34 and 38.

research on both the advantages and disadvantages of digital tools in the realm of social interaction, architects should be well positioned to propose a new typology of public space that is a product of both digital and physical social conditions. In this way, the thesis hopes to encourage future designers and Smart City developers to be more critical of the digital infrastructure they introduce, and not be ignorant of the lessons learned from more traditional practices that make for successful public spaces.

To prevent city development from being steered by the priorities of consumerism-driven private corporations, architects are encouraged to enter the Smart City discourse in order to build future cities based on priorities and values that contribute to successful urban communities. Architecture and urban design should play an equal role alongside the efficiencies of technological infrastructure. This, most likely, would only occur at the initiative of local governments, which enable these developments to take place in the first place. Reflecting on the current procedures of how these initiatives are made active, the thesis proposes that architectural involvement should be a requirement at the earliest stages of project development for city approval of Smart City projects. Both fields of architecture and digital technology should yield to one another, so that the digital movement may result in a new evolution of active cities, and not just well-functioning 'machines'.

OUTLOOK

Based on the evaluated outcomes of the Exchange Places, the thesis successfully poses new questions in regards to technology and design, in forming a new definition of architecture for the digital age. The thesis points future designers and thinkers towards a new set of considerations when designing for Smart City public interaction. Namely, the thesis work extracts that architecture cannot force city publics into one-on-one user interaction, but more successfully can lead to an active participation in the public realm. Therefore, this thesis demonstrates that architects should aspire to create engagement with the physical environment, and let interaction happen organically (or not) as a consequence.

The thesis also concludes that the third criteria, that of providing users with an opportunity to demonstrate agency and participation in the physical realm of the city, is most crucial to redefining the role of public architecture in Smart Cities. The urban public environments of the future must be just as immersive, and engaging as their digital equivalents. If this is not achieved, citizens may become removed observers of their cities, who instead turn to the digital network to participate in larger communities.

The experiments designed also propose new avenues for further investigation in creating a new social typology for public engagement. Firstly, it could be beneficial to perform a psychological analysis of how physical architecture can be just as, if not more immersive than the digital realm. The natural extension of this would be to then explore the plausibility of injecting similar 'immersive' interventions throughout cities, by also further researching new technologies that can make these technologically synthesized designs more successful. A second area for further research that arises is if frameworks other than the transit system could be effective mediums for promoting social interaction and user agency in the Smart City. Finally, a third aspect for future investigation could be further defining participation, and what architectural prods succeed at engaging users, and altering their mindset from removed individual to engaged community member.

Based on the experiments proposed, this thesis demonstrates that the role of the future architect is not to ignore the digital network, nor adapt it as an out-of-place prosthetic onto old architectural practice. As summarized by Mitchell, the effects of technology on present-day civic interaction are most legible in a shift towards asynchornosity and despatialization.[70] Therefore, in order to re-engage users in the experience of urban public space, architects will need to approach "familiar urban design issues [of the Smart City with] radical reformulation" who's design will be "as much a matter of software functions and interface design as it is of (…) construction materials".[71]

Finally, the thesis argues that in order to remain relevant in the formulation of urban public spaces, architects need to rethink how they understand their role in design. In this digital age, does our understanding of how we interact have to change? In a city of asynchronous network flows, the Exchanges Places are but one example of how the role of the architect may have to evolve to harvest opportunities for synchronous interaction, even if just for a brief moment while waiting for the bus.

70   William John Mitchell, City of Bits: Space, Place, and the Infobahn(Cambridge, Mass: MIT Press, 2010), 16-17.
71   William John Mitchell, City of Bits: Space, Place, and the Infobahn(Cambridge, Mass: MIT Press, 2010), 105

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