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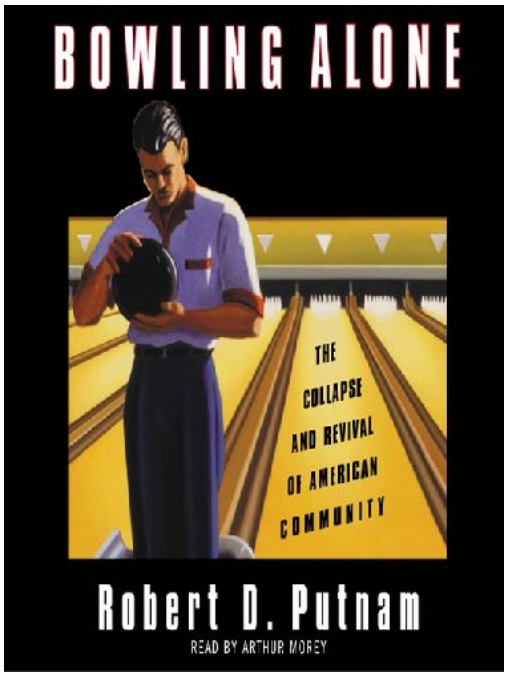
The Social Implications of Micromobility

Introduction

Social innovation is defined as the use of innovative approaches – neither state, nor market, nor traditional voluntary sector approaches to addressing the problem of social exclusion (Moulaert, MacCallum et al. 2013), which leads to lack of equal opportunity or the chance for an individual to realise their full capabilities to realise their individual wellbeing (Sen 1999, Nussbaum 2003). For example, if you live in a socially deprived neighbourhood, your local school is likely underfunded, making it more difficult to get a good education. Without that, a good university and then a professional job becomes more difficult. Local police, fire and other city services are also lacking, so there are issues with social cohesion and personal safety. These problems are something of a vicious cycle – deprived areas lack the tax base with which to provide services which underpin health, income – in other words, overall well being.



Putnam's thesis on the decline of social capital (Wikipedia, NF-CC-4.0)

Many social scientists have looked at these issues and see these as symptoms of an underlying problem which is the decline and breakdown of traditional communities – or declining social capital. Social capital is a term that is used to describe effectively functioning social groups, including factors such as: interpersonal relationships, a shared sense of identity, a shared understanding, shared norms, shared values, trust, cooperation, and reciprocity (Coleman 1988, Putnam 1995, Fukuyama 2001). Among the complexity of interrelated reasons, a major factor decline in social capital stands out and is directly implicated in the weakening of urban communities – how we have created and modified our built environments to accommodate the privately owned automobile (Jacobs 1961).

In the sections that follow, I outline some of the causes of our current transportation problems and then speculate on some of the possible futures that can be enabled by micromobility platforms through a series of hypotheses.

Superhuman Scale

The issue is that much of our built environment – our cities – have been constructed at a superhuman scale. We can now literally fly at over 70 miles an hour over land, and jump 50 stories at the push of a button. While these are all broader consequences of the private car and the carbon economy, our organic bodies and brains have not evolved to match our technology. We

still construct our social relations with one another and relate to the external environment at human scale. When we travel by car, we no longer interact with the immediate environment because it is beyond our cognitive capacity. Likewise when we work and live in a high rise building, we cannot interact with neighbours in a way that we might in a tenement flat with a shared stairway (Florida 2017). Above all, cars have enabled us to construct cities that are superhuman in scale.

Brasilia in 1975 (Urbain Kinet)

A prime example of a city built at superhuman scale is Brasilia, and a critical understanding of how Brasilia functions as a city, is illustrative of the shortcomings of the modernist approach. Designed by the famed architect Oscar Niemayer and urban planner Lucio Costa in the late 1950s, Brasilia was designed from scratch to be the "new capital to bring progress to the interior of Brazil" and to be without historical legacy (i.e. baroque architecture and other colonial baggage) and without slums (Niemeyer 1966). The problem with Brasilia is that fails to function as a city – it is strictly segregated into separate functional zones with motorised transport as the default means for travel between zones. In some areas, the only way to cross a major intersection is by car or bus as there is no allowance for pedestrians. Brasilia lacks any discernible street life - a characteristic of mixed use neighbourhoods where people live, work and play. Brasilia's wealthier and more mobile residents generally fly out to Rio De Janeiro or Sao Paulo for the weekends (Bannerji 2012). On many measures of environmental and social sustainability, Arguably, Brasilia falls short because it was built beyond human scale. Much of our urban environments are built beyond human scale.

To understand how we arrived at this point, perhaps a bit of background is needed.

Prior to WWII, cities were organised and developed as mixed-use neighbourhoods where walking was the default mode of transport, particularly for access to retail and services. Greenfield or new development on empty land tended to be incremental and adjacent to existing built areas. Walkability was synonymous with urban design. The development of mass transit – streetcars, buses and metro lines – enabled the development of pedestrian communities along these lines. Stations (Bruegmann 2006). A rule of thumb with transit planners is that ridership falls off drastically for local bus services beyond 400m (about ¼ mile) or 1000m (⅝ mile) for rapid transit (O'Sullivan and Morrall 1996, Walker 2010), and this defined the shape of how neighbourhoods grew.

The expansion of the middle class in the postwar boom, combined with the widespread adoption of the private automobile and supportive government policies led to an auto-centric approach to urban planning and development (Harvey and Clark 1965). In the postwar period, the priority of urban planners shifted towards the use of municipal zoning bylaws and ordinances to create segregated zones – residential, commercial and industrial zones – with residential zones now designed in the new ideal which was suburban middle class detached house, rather than say tenements or row housing that was the dominant design for urban residential housing up until the

prewar period. Suburban sprawl, which is characterised by areas of low density settlement that are physically separated by nearly empty tracts of land, with single use residential areas, with retail and services, often in physically separated shopping centres or strip malls (Duany, Plater-Zyberk et al. 2001).

It is from this physical separation of work, school and leisure, combined with low density residential developments, that our modern car culture has developed, and the consequence of weakened communities that result from car dependency. Now this is something we have been aware of since the 1950s. Victor Gruen was an Austrian-born architect who emigrated to the United States in 1938 when Germany annexed Austria. With little money and poor English, Gruen became a draftsman and found work designing store windows to attract pedestrian traffic. He was so successful, particularly in the postwar boom, that he started getting commissions for making storefronts all over the country. In his travels across the country however, Gruen observed how much time people were spending travelling by car. It is In these residential suburbs in particular, that people lost their connection to their local communities and to the city (Hardwick and Gruen 2004).

Victor Gruen's invention of the mall had unintended consequences (Victor Gruen, Image from the American Heritage Centre)

Gruen sought to redress this lack of community space or what sociologists call the third place (Oldenburg and Brissett 1982). If home is the first place, and work or school are the second place, then the third place can be any public or private place that is relatively inclusive and allows individuals to hang how and meet others, and in the process build the social capital that constitutes a community. Parks, coffee shops or even a barber shop can be a third place (Oldenburg 2007). Gruen's initial concept for rebuilding communities was to create new third places for suburbs that combined offices, apartments, retail and crucial services such as libraries, medical centres, post offices and daycare centres . The Northland Mall near Detroit and the Southdale mall in Edina, Minnesota were his early designs. Also critical to his designs were greenery as the whole point to his malls was that he wanted to get people out of their cars to walk around and reconnect with other people in a green environment (Gruen and Smith 1960). He wanted to recreate the village centre for the suburbs. In total Gruen designed over 50 malls over a 30 year period until the mid 70s. He then returned to Austria in 1968 where he engaged in plans to transform central Vienna into a pedestrian zone (Hardwick and Gruen 2004).

The Northland Mall in 2015
(Nikolai Nolan, CC BY-SA 4.0)

Some years later, he visited one of his old malls and was utterly appalled by how his concept had been implemented – describing the experience as one of "severe emotional shock". What most disturbed Gruen was "the ugliness and discomfort of the land-wasting seas of parking" which disconnected the malls from the communities that surrounded them and the emphasis on retail only at the expense of mixed use, which is crucial for creating a third place. Gruen blamed developers for bastardising his idea in the pursuit of profit. In a speech in London in 1978, he reportedly said, "I refuse to pay alimony for those bastard developments" (Gladwell 2004) Another effect of the growth of malls and the later big box stores that overtook them is that they draw away traffic from the inner city, thus destroying its economic ecosystem (Mitchell 2006).

Perhaps why so many of these malls are dying today, it is not just because of a shift Amazon and other to online retailers. More importantly, it is because they never successfully accomplished the job that Gruen originally designed them to do, which is to be a third place. Teenagers used to 'hire' malls to be third places - now they do that elsewhere, including online. If you study the ones that are thriving - not just surviving, what they have in common is that they function as third places for many people.

Mobility Poverty

Another consequence of a car-centric design is issue of mobility poverty. I use the term mobility poverty, not to describe the concept of social mobility from poverty, but rather I define it as how lack of access to effective mobility can effect an individual's economic and social opportunities.

This has as much to do with how inner cities have switched places with suburbs. In recent decades, we have seen a significant gentrification of neighbourhoods and a great number of professionals who choose to live in the city (Florida 2014). Now the areas of greatest social deprivation are not the inner cities, but rather the suburbs. City neighbourhoods experience renewal and gentrification while in recent decades, many new developments have experienced decline (Vicino 2008). A lot of this decline is due to the way suburban developments are created through top-down planning. They are often built on greenfield sites that are physically separated from the city and lack good public transit connections. These transit connections are unlikely to improve in the future because they lack the density to justify frequent service. They are often built with tax or other financial concessions from the local authority (Zuegel 2017).

The residences, the underlying infrastructure, everything, is also built at roughly the same time. Shopping malls, schools and community centres are sometimes also built to accompany this new development. As the units are bought in moved into, things are fine and generally prosperous for at least for the first 30-40 years. But what happens when things start to age? The dwellings start to age too. The below ground infrastructure also starts to age and breaks down (ASCE 2017). Unlike the heterogeneous neighbourhoods in the city where things are repaired as they breakdown, these suburban areas something like old cars where everything starts to break down at roughly the same time. What do most people do when the car starts to fall apart – sell it and move on. Similarly in these developments, those who are most mobile because they have strong job prospects and financial assets are the first to move on – so you have a gradual hollowing out and decline in the property tax base (Marohn 2016). Many suburban neighbourhoods are being neglected because neither the city nor its residents have the financial resources for proper maintenance, renovation and thus renewal.

Subprime auto loans can range from 11-20%

Mobility poverty is something you have when you lack the ability do basic things such as go to work, send your kids to school or even buy groceries. Public transit is a poor option, if there is any service, because it takes forever to get anywhere. Uber and Lyft are too expensive to do on a regular basis. That is one of the main reasons we have a sub-prime auto loan market, with many cars going through several owners a year and paid for many times over with extortionate interest rates (Corkery and Silver-Greenberg 2015), because they buyers have no choice. You buy a car, even if you can't afford it, because without it, you can't get a job, buy groceries and send your kids to school.

It is worth noting that mobility poverty is not a binary state, mobility poor and not mobility poor, rather it is a continuum of disadvantage because of poor access to mobility. My uncle for example, lives in Scarborough, a suburb of Toronto about 12 miles from Toronto City Hall in a straight line, but takes 1¾ hours to get there because its poorly served by transport links. By no means is it deprived either, my uncle is retired now, but he was a technical manager at IBM, and that part of Scarborough is an average middle-class suburban neighbourhood complete with cul-de-sacs and winding streets. The Toronto Transit Commission never built a subway in that area because it was low density and it didn't have the population numbers to justify the infrastructure investment (Spurr 2018). The problem now is that while Scarborough was once in the outskirts of the city, Toronto has grown so much, that it is now an inner suburb. Someone in that neighbourhood is disadvantaged from finding work in downtown Toronto because 210 minutes of daily commute is beyond the time budget of most individuals (also see Marchetti 1994, Kung, Greco et al. 2014).

This brings us to our first hypothesis about micromobility.

Hypothesis 1: A crucial promise of micromobility platforms is its ability to democratise mobility by providing an effective response to the challenge of mobility poverty as a 'last mile' solution.

Some opportunities come to mind. Just as some new housing developments are contingent on allocating a certain proportion of units to social housing, perhaps some cities can insist on permission to operate as contingent on servicing areas with mobility poverty and/or poorly served by public transportation networks. Micromobility as a 'last mile solution' also has potential to unlock the economic value of these underserved neighbourhoods. Perhaps it is about making public transit service more viable by requiring micromobility providers to work with transit operators to create last mile options. So what we have here is an opportunity to tap funding for positive social impact – government and CSR budgets for example.

Jane Jacobs led opposition to freeway projects in NY and Toronto (Library of Congress: Public Domain)

Human Scale Redux

A pivotal figure in this return to human scale built environments is Jane Jacobs. She was originally a journalist in New York who became an urban activist when she mobilised opposition to slum clearances in Greenwich Village and later to the proposed Lower Manhattan Expressway which would have run through the middle SoHo and Little Italy. In 1968, given her opposition to the Vietnam War, and with her two sons at risk of being drafted into the Vietnam War, she moved to Toronto, where she was a key figure in the stopping of the Spadina Expressway, which would have destroyed parkland and neighbourhoods in downtown Toronto. She was one of the first to argue against prevailing wisdom at the time, which was that highways were needed to speed up commutes by alleviating automobile congestion on thoroughfares and in downtown cores. She argued that this was short term thinking and that faster and wider roads would only result in more traffic and more congestion on all roads. Of course we know now that it is true, that traffic increases to fill the available bandwidth, but this was radical thinking at the time. If you look all over North America, where highway projects in cities were cancelled – Jane Jacobs was a pivotal figure in that movement (Gratz 2010).

Her opposition to highways however, was only part of a broader picture, which was about how we should design our cities to maintain and build social capital for strong and resilient communities. You don't do this through slum clearances, by destroying old buildings and rebuilding massive shiny new developments. Rather, we should encourage organic and incremental development. Old buildings, particularly historical ones, should be preserved rather than knocked down, and allow new owners and occupants to find new 'jobs to be done'. She held Greenwich Village as an ideal for a neighbourhood. Diverse, mixed-use and low rise – these are among the most culturally vibrant, physically safest and economic productive neighbourhoods – or what Jacobs (1958) called 'two shift' neighbourhoods. There is street life day and night because people work, live and play in there – in contrast with the suburban neighbourhood, where there is virtually no activity during most of the day because everyone is away at work or school – and also places such as central business districts which are deserted in the evening because all the businesses are closed and there is no one about.

The new urbanist movement arose as a counter to the idea of Euclidian and radial city planning promoted by Niermayer (1966) and other modernists who designed cities around the assumption that cities should be segregated functionally and that cars and buses would remain be the default mode of urban transport. Partially inspired by the work of early urban thinkers such as Patrick Geddes (1949) who saw the built environment as an extension of natural geographical features, Architects Andres Duany and Elizabeth Plater-Zyberk (Duany, Speck et al. 2001) studied what 'walkable' neighbourhoods had in common. At that time, living in one of the Victorian neighbourhoods of New Haven, Connecticut, they observed some common factors:

- The neighbourhood has a discernible centre – a square or a green and sometimes a busy or memorable street corner, with a transit stop at the centre – with the majority of residential dwellings approximately 400 m (¼ mile) or 5 minutes walk away.

- There is heterogeneity in demographics (age, family size and income) as well as dwelling type (detached houses, row houses, duplexes and apartments).

- There is a sufficient variety of retail shops and services within this neighbourhood to supply the weekly needs of a household.

- Primary schools are close enough for children to walk from home, with small playgrounds accessible to every family, no more that 250 m away.

- Most streets are narrow with trees, making a comfortable traffic for pedestrians and cyclists and slowing traffic. These streets form a network that disperses traffic (like capillaries) and provides multiple options for pedestrians and vehicles.

- Buildings in the centre tend to be close to the street with parking and garages often at the back of buildings and accessed by alleyways.

Now apart from downtown centres, a lot of what is being described is very close to what constitutes the best areas for micro-mobility. Apart from dedicated bike lanes, these are the kind of streets that are most comfortable for the average person on a bike or scooters (Broach, Dill et al. 2012). These are also neighbourhoods that are the historically emergent from organic growth rather than top-down large scale development. These concepts were developed into a planning model called the urban transect which proposed that cities could be better understood as series of transitional zones. This view of zones does not imply a series of concentric rings from urban to rural core, but rather a more organic view of a city as composed of a series of fractals. Just as the greater metropolitan area is characterised by gradual transition from rural activity to an urban core, each zone also is characterised by a transition from the edge to the centre of the neighbourhood. Each neighbourhood in turn must be understood as a community that incorporates both residential and commercial spaces, such that major services (e.g. banking, shops, pubs, clinics, etc.) are within walking distance from any point in the neighbourhood.

The transect approach also sees human settlement as part of the natural ecology, with each location having geographical and social characteristics that determine its spatial allocation and usage. Cities are composed of neighbourhoods that tend to increase in density as we approach the downtown core with each of these neighbourhoods can be understood as a fractal with self-same similarity in terms of factors that determine walkability. Within each fractal, there are nodes (i.e. retail and services) that are easily accessible by foot (Duany and Talen 2002).

Another aspect that walkable neighbourhoods excel in is accessibility. Transport planners use accessibility to refers to the ease by which destinations and activities, distributed in space, can be reached and interacted with (Geurs and Van Wee 2004). I live in a walkable neighbourhood in Edinburgh, and in an hour, I can see the doctor, buy groceries, pick up my prescription, go the post office and then the bank in an hour from my front door. Because of all that I can do within an hour, I would characterise this as high accessibility. In a place with low accessibility, such as the suburbs, it can take 20 minutes just to get to the big box superstore, and 20 minutes just to locate

and buy some basic groceries and another 20 minutes to get home within that hour, so in that same period of time, all that you've accomplished is to buy groceries.

What is the proof that these walkable neighbourhoods are actually better than suburbs? Couldn't you argue that this is merely a matter of taste – that some people prefer to live downtown and others in the suburbs?

Perhaps it is more subjective than this. If we consider the residential real estate prices, apart from downtown cores, the most expensive real estate on a per square metre basis is in these historic, mixed-use, heterogeneous neighbourhoods. These places also generally have high commercial rents, which is also an indicator of the profitability of retail shops and restaurants. Le Marais of Paris, the Village in New York, Notting Hill in London, are prime examples of highly walkable neighbourhoods, where prices are high because they are also highly desirable. Retailers pay for the traffic and economic productivity. Residents pay for the accessibility to retail, services, third spaces and therefore personal and social productivity. The most liveable neighbourhoods have a high place value because it positively supports positive social, health, economic and environmental outcomes (see Carmona 2018).

At the beginning of each year, I ask each new cohort of students where and how they want to live. Very few, including those that grew up in suburbia, want to return. Most want to live in the city, some want to live in the country, and very few want the compromise of two cars and the detached house. Looking forward, the increasing acceptance of micromobility as both a viable option that provides tangible benefits in terms of reduced congestion and increased accessibility will also change in attitudes around the relative allocation of space and infrastructure between different mobility options.

Micromobility then, creates opportunities that leverage the phenomenon of walkability.

Hypothesis 2: An emergent consequence of micromobility platforms is the lowering of minimum viable conditions for these walkable neighbourhoods. The threshold for walking for retail and public transport, according to various studies, is about 400m, after which you get a significant drop off. The threshold for cycling is somewhere between 400-1600m, so extrapolating from existing studies, approximately 1000 m for a five minute ride (Krizek and Johnson 2006). The threshold for scooters is likely a distance that is somewhere closer to cycling than walking. Widespread bike and scooter sharing platforms have the potential to reinforce existing walkable neighbourhoods, and to make others below the threshold just possible.

Given this potential lowering of thresholds for minimum viable conditions, some further opportunities come to mind:

i) **Micromobility service providers could for example, be conceptualised as a search engine, with neighbourhood retail or merchant associations paying or offering favourable prices or incentives in kind for travel to neighbourhood centres – for example a 10% flash sale or a free croissant with coffee. Just like eScooter pricing is more expensive to travel to downtown than away from downtown, perhaps retailers can pay for favourable pricing in a way they might pay a search engine for a better ranking given certain key word;**

ii) an even greater albeit longer term opportunity is the repurposing of car-centric infrastructure – additional lanes and parking spaces for example. What happens and who benefits if we can turn this space into third places such as sidewalk cafe seating or informal parks or a pop-up market for example?; and

iii) related to hypothesis 1, micromobility also has the potential to create walkable neighbourhoods in some urban and suburban neighbourhoods.

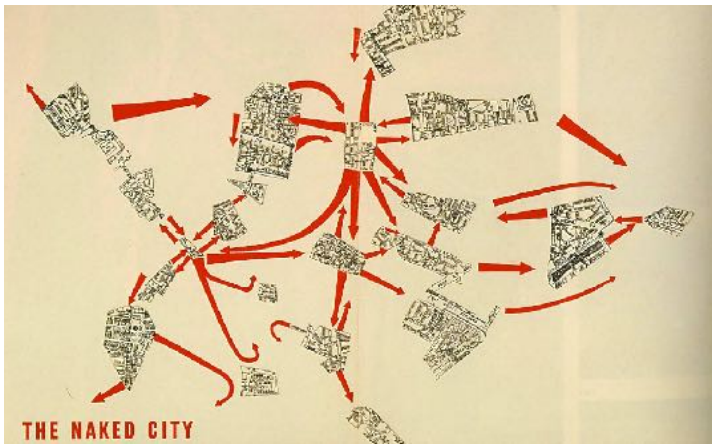
There are however boundary conditions to the capacity for micromobility to solve problems of congestion in highly populated urban areas in the absence of a mass transit infrastructure. If you've ever been stuck in a rush hour rickshaw traffic jam in India, you will understand. Although pedal rickshaws, motorised 'auto' rickshaws and the new electric rickshaws easily fit within the definition of micromobility, their potential can be best realised in an urban system that also includes mass transit such as metros and trains.

Active Travel

Car dependency creates social isolation in more ways than just disconnecting places where we live, work and play, it also isolates us from the immediate physical environment. Cars are steel and glass cocoons that isolate us from the weather, from the surface of the road and from the people and things along the way. We might see them, but we don't engage with them because we don't have the cognitive bandwidth – if we are driving – and don't have to if we are a passenger. Now this is totally different when we are walking or cycling or even scootering. Terrain makes a difference. We are very aware of hills when cycling (Gatersleben and Appleton 2007). We notice cracks, curbs and undulations when walking because we have to. When cycling we also notice speed bumps and potholes because we have to. I notice that on a scooter, with the small wheels, you even have to be more careful about road surfaces. I recently tried an electric scooter for the first time a few weeks ago in Portland. It was a bit of a learning curve. As an experienced cyclist, as I approached an intersection, by instinct I put out my arm to signal my intention to turn. That caused me to wobble dangerously an I quickly learned that scootering is rather different than cycling in some key aspects. With those small wheels, you also lack lateral stability, as opposed to a bicycle with its two large built-in flywheels.

Another thing about active travel – or micromobility, although eScooters fall a bit short of the active travel definition – is that we are more aware of not just the path, but of the people and things we pass by. You pay more attention to shop windows, to other cyclists and pedestrians. It is not just because you are travelling more slowly, but because that is how are brains are wired. Although we are surrounded by advanced hardware and software layers, underneath everything is a core of hunter-gatherer wetware. Hunter-gathers that didn't pay enough attention to the surrounding environment, tended to have trouble passing their genes on to the next generation.

Beyond the strict functionality of active travel – going from A to B for work or school – there is the issue of how we literally 'consume' the environment. While there isn't much on cycling and nothing on scootering as modes of travel, there has been a significant amount written on the phenomenological aspects of walking – basically about how we experience the practice of walking.



Walking enables us to 'consume' the city
(Rudy De Doncker, CC BY-SA 4.0)

For example Guy Debord (1955) in his essay 'Theory of the Dérive' proposed that small groups of people can 'drift' through a varied urban environment and "let themselves to be drawn by the attractions of the terrain and the encounters there find there". Key to this idea is that people do not see urban environments as they are formally laid out with Euclidian accuracy on maps and charts, but rather that we perceived cities as a series of nodes or 'situations' that exert specific effects on the emotions and behaviours of individuals. Key to this idea is that people do not see urban environments as they are formally laid out on maps and charts, but rather that we perceived cities as a series of nodes or 'situations' that exert specific effects on the emotions and behaviours of individuals. Places are literally imbued with meanings and emotions. Debord defines the dérive as "a mode of experimental behavior linked to the conditions of urban society: a technique of rapid passage through varied ambiances." In the above illustration for example, Debord attempts to describe how a student experienced Paris.

Another French thinker also saw walking as a willful act. Michel de Certeau, a Jesuit monk and academic scholar visited New York in the 1980s and went to the top of the Twin Towers. What he saw from the roof was a New York City that constructed and rationally laid out in functional zones according to a detailed and highly thought out architectural plan. It was clearly designed as part of a broader city planning strategy. When he went back to street level and observed how pedestrians were actually using the city, a different picture emerged. Pedestrians wandering here and there, meandering about and adopting the heuristics or 'tactics' that best suited their intentions and desires. In other words, pedestrians were not sticking to the script, they were messing about with the grand strategy of the city planners by doing their own thing (De Certeau 1984).

We make countless decisions on any given trip. For example Edinburgh is getting cold now, and so I made a conscious decision to cross and walk on the other side of the road where there was sun. I then decide to cross over and walk through the park even though it makes the trip longer, because it is quieter and the air is better there.

But how do we know that the immediate environment affects us?

We do have research. For example, researchers have monitored the heart rates of people walking down the street. Did you know that when people walk past empty littered lots or derelict houses, their heart rates go up? Conversely, when people walk past gardens, parks and other greenery, their heart rates go down (South, Kondo et al. 2015). From experience, we also know that walking along routes that provide little or no stimulus is uncomfortable, whether windowless halls or a long featureless structure. It is not that hard to figure out why this is the case. Things broken, abandoned and otherwise neglected are signs of danger. Things natural or well tended signal the opposite, safety and perhaps opportunity. People will go out of their way to avoid routes that lack

Neglect creates physiological responses that signal danger

stimulation. Travel and engagement with the external environment is the natural state of affairs.

Heterogeneous environments, such as streets in walkable neighbourhoods dotted with small shops are places that people like to linger and explore. We know this because if this was not the case, the shops wouldn't survive. Arguably, the level of stimuli is also related to the heterogeneity or what some urbanists refer to as the granularity, with fine-grained urbanism referring to areas with buildings and usage of sufficient variety. The opposite of this is termed coarse-grained urbanism characteristic of (Price 2017) . Few understand the principle of granularity in terms of building design and the activities that inhabit them better than the architects and designers that create Disney Theme Park, who have had more than 60 years of experience in designing streetscapes that cause people to stay and linger. Note how the architecture is designed to mimic old and established neighbourhoods, with multiple styles from varying eras (Von Hausen 2017). Despite the artifice of a Disney streetscape however, it is clear from observation that the design is 'sticky' in the same way we might describe a well designed website or platform encourages users to stop, linger and interact. In a recent study of several areas in London that had benefitted from Dutch-style streetscape improvements, such as dedicated cycle paths, cyclists spent 40% more time in local retail shops than motorists, with some areas seeing nearly a doubling of pedestrian activity and a tripling of activity such as going into shops and cafes, leading to a 7.5% increase in retail rental values and a 17% decline in retail vacancies (TfL 2018).

Because micromobility forces us to interact with the environment then, new practices emerge which opens the door for new opportunities. The fact that we notice the environment, it also allows to us interact with it along the way with relatively little friction. Unlike a bus or car, there is relatively little penalty for stopping to take a look at something that interests us. On a bike, we just have to find something fixed to lock to and take off your helmet. Walking or scootering has even less friction.

For example, in Portland a couple of weeks ago, I took a Lime Scooter from the Alphabet District back to Downtown, near Pioneer Square. On the way back, I saw an interesting restaurant and so I stopped to look at the menu. A few blocks later, I saw a cool furniture store, so I stopped again, parked on the sidewalk and ended the ride. Twenty minutes later, I came out and fortunately that same scooter was still there. Actually it didn't matter that much either, because across the street, there was another Lime. Instead of going in a straight line back to the downtown, I decided to swing through the Pearl District and somewhere along the way I encountered the Food Truck Village. So what is my point here? The point is that micromobility allowed me to actively create a journey in which I literally 'consumed' Portland in a way that would not have been possible by car, bus, streetcar or even walking – within a 2 hour period.

Hypothesis 3: Micromobility enables the creative construction of journeys by increasing situational awareness of, and decreasing friction with, engaging the external environment.

Opportunities brought about by this engagement might include: i) attracting passing traffic through virtual billboards or geo-location triggered advertisements – perhaps enabled by augmented reality devices for example, ii) reducing friction for stopping by providing charging/ parking for vehicles; and iii) increasing mobility traffic volume on certain routes by lowering speeds and narrowing streets and otherwise restricting car traffic.

Ostrom argued that intelligent complex systems were more efficient and more sustainable than simple dumb ones. (Manitoulin Island, 1968, Elinor Ostrom Collection, The Lilly Library)

Dumb simplicity and smart complexity

In conclusion, if we consider cities as complex ecosystems, the rapid adoption of micromobility has some very interesting implications. At this very moment, micromobility platforms are being introduced in many different economic, geographical, climate and socio-cultural contexts around the world. While it is premature to draw any firm conclusions, perhaps we can make some general observations of urban ecosystems, pre- and post-micromobility. In systems where the dominant mode of transportation is cars and mass public transit, which with few exceptions applies to the majority of urban contexts, there has been a tendency to construct an urban fabric that is simple and homogeneous because it is coarse grained. The great opportunity however, and something we have begun to witness in urban contexts that have seen significant adoption of diverse micromobility platforms, is the tendency to encourage the development of a heterogeneous urban fabric, with greater walkability and thus complex and of a fine-grained texture in its neighbourhoods.

As we have covered in previous lectures, and building on the work of others, we know that heterogeneous and complex systems work better from the standpoint of allocative efficiency (Ostrom 2010) and are also more resilient or antifragile (Taleb 2012, Taleb and Sandis 2014). Resources in cities are necessarily scarce, and therefore the reallocation of infrastructure and space from the automobile to support not merely micromobility, but more importantly to other more productive uses such as retail, services and new third places, can help to strengthen the socio-economic fabric of a city. As argued above, the shift to micromobility enables greater heterogeneity and decentralisation of infrastructure and services, which in turn increases systemic resilience.

There are obviously many barriers, pre-conditions and other factors that can and do influence the adoption, retention and further development of micromobility that are beyond the scope of this discussion. Cities are complex techno-socio-economic systems that defy simple prescriptive

advice. Micromobility as a form of disruptive intervention will necessary lead to emergent consequences. With countless real-time trials in micromobility unfolding across the world, and the attendant data that will flow from these experiments, an understanding of 'how to' will develop as will unintended consequences.

Change will come, and I think that the positives will far outweigh the negatives. The final hypothesis then is broadly positive and for many, frustratingly general and vague.

Hypothesis 4: Micromobility has the potential to improve the efficiency of cities by creating more equitable distributions of infrastructure and resource. This in turn, builds and strengthens the socio-economic resilience of cities.

The greatest opportunities and potential benefits will come to actors, whether state, private or 3rd sector, that adopt an arguably more realistic view of cities as complex ecosystems and are willing to experiment with and learn from micromobility – both successes and unintended outcomes – through trial and error. Although this does not preclude late movers from benefitting from lessons of failures and successes of others, cities are very complex systems and the intervention of micromobility is highly context and path dependent. With late movers, there is the temptation to succumb to attribution bias and overconfidence and engage in 'big bang' interventions.

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