**Coerced User and the Era of Smart City Dissonance**

**Abstract**

This paper discusses the societal impact of increased connectivity and innovation in the smart city on the city’s inhabitants and its effect on the definition of usability. We start by discussing the smart city’s connectivity revolution and the way it effects the perception of usability; eliminating the concept of *Non-Users* and creating the *Coerced User* and the *Unwitting User,* that don’t want to use the innovation, but are coerced to participate; providing it with physical space and data, therefore enjoying the data these service provide back in the form of city optimization. We then discuss the need for new design approaches addressing these users that will be translated to innovation *acceptance*. We present an empathic design study about the Coerced Users of sharable electric-scooter services in Tel Aviv. It demonstrates the importance of Coerced User design, and its impact on the inhabitants’ wellbeing. We found that Coerced User’s innovation rejection is mostly due to low value technology implementation in the complex smart city structure creating a feeling of injustice in public goods distribution and an anomalous feeling of “Smart City Dissonance” that effects the inhabitants’ relationship with the public sphere.

**Keywords:** Smart City, Coerced User, Innovation Acceptance Life Cycle, Micro Mobility, User Experience

# Introduction:

We are currently exposed to a large amount of technology as consumers of the public space. This due to the so-called smart city revolution that uses connectivity technologies and data-optimization software to make our city more efficient and safer [1] thereby increasing our wellbeing [2-4]. Since the smart city is based on data and connectivity [2-5] it requires a societal change in order to provide the public with its promised value. The city’s inhabitants; residents, workers and visitors, have to be digitally-connected, a change that impacts their way of life. In return they enjoy the city’s optimization and benefits. With the exponential pace of technological advancement [6] this informed transaction will likely become a core assumption of being part of a city’s ecosystem; a new rule that connects personal connectivity and being part of the city.

We are interested in the impact on the relationship between innovation, public space and the inhabitants. The main problem we examine is that the adoption of technology [7] is sometimes done without the public’s consent, and in many cases imposed on inhabitants as a sort of new non-

written rules of the Smart City. The public Wi-Fi pole, CCTV cameras, and sharable electric scooters are re-designing the public space; all of these solutions are designed and produced according to needs of their *Active Users*; users that operate these solutions. But being placed in the public space, they have an impact on all city inhabitants, users and non- users alike. As consumers of public space, inhabitants cannot avoid these technologies and, like passive smokers, can’t avoid their impact and gradually the public loses its option to “not use”. The connected inhabitants of the smart city are not just losing their ability to stop using, but they actually provide the city’s ecosystem with data and physical public space that are used for the very services that disturb their ability to consume and use the city space as they wish. These inhabitants are coerced to participate in the process becoming what we define as “*Coerced Users*” of this innovation; forced to provide it with resources but suffering from its existence. They are considered users because some of the data collected by these services that have a negative impact on their wellbeing might be used by services these Coerced Users are using as *Active*, *Passive* [8-12], or *Incidental* [12] users, and therefore have a positive impact on their wellbeing. They are not willful adopters of the technology but compelled to accept its existence as part of the “*Innovation Acceptance Life Cycle*” that could lead acceptation or to protective behavior such as active protest and civil resistance [13-14].

This conundrum generates many challenges but also possesses potential for better, more inclusive design for the city. In our research we use an empathic point of view to touch upon the smart city promise and its problems that create the “Coerced User”. Empathizing with the Coerced Users and designing products that generate value for them will become an important part of innovation design for the connected world, generating tools inclusive technology that will reduce, rather than increase inhabitants’ anxiety and stress.

To elaborate about the Coerced User we review the literature definitions of users. We elaborate about innovation adoption, acceptance and the technology rejection. We then move to an emphatic contextual research on the case-study of sharable electric-scooter services using design thinking methodologies. This human centered work includes field observations, an electronic poll (68 participants), 8 in-depth interviews with experts in innovation adoption, public space design and UX, and 12 in-depth interviews with Coerced Users. The paper ends with insights and directions for follow-up research

# The Smart City and the Always-Connected Inhabitants

Smart city is a city ecosystem that uses Information and Communication Technologies (ICT), Internet of Things (IoT) sensors and optimization software to make it cleaner, safer, efficient and connected [1-5], and thereby provide value-added features for different city services and generate elevated wellbeing for its inhabitants; residents, workers and visitors. Today, to enjoy and benefit from many innovative services, inhabitant must be digitally connected. Knowingly or not they share ever more information about themselves with the city’s services; they reveal their locations, habits, and needs. As we move toward realization of the smart city vision, it becomes ever more difficult to enjoy the city’s benefits without being connected, and eventually it may be impossible to live in the city without it. This increased connectivity and the obligation to share information, new non-written rule of smart city optimization, raise concerns regarding privacy, data security, safety and ethics. Prior work suggests that these problems should be addressed using holistic co- design approaches for city services, involving all city stakeholders [3]. Our research raises a different question: in the era of always-connected cities; before we design for the city users we need to understand who are the “smart city users” and what are their characteristics?

# Usability Definitions

Current definitions of users relate to the “activeness” dimensions in user- technology interaction. Four kinds of users have been defined: (1) *Active*

(2) *Passive* (3) *Incidental* and (4) *Non-User* [8-12]. Users are divided into “active” and “passive” process operators [8]. An active process operator’s work differs from the passive’s work by the predominance of monitoring [9]. The user “activeness” is a result of task allocation between her and the technology [10]. *Active-Users* have different kinds of interaction with the technology, from operation to maintenance, while the *Passive-Users* only monitor the technology and lack control over it. The *Incidental-User* has interest in the information output of technology but has no control over it [11-12]. His communication with the technology is mediated by an Active User. The *Non-User* doesn’t use the technology, either because she doesn’t want to, doesn’t know about it, or uses a competitor instead. For example, in an Ultrasound the doctor that is operating the machine is an Active User. The senior doctor monitoring the operator is a Passive User. The parents watching are incidental users.

The parents that distrust the modern medical system and do not use these tests are non-users.

# The Extinction of Non-Users

Today when individuals choose to not use a technology, they can become non-users. This situation changes as the city services become fully and always connected, thus not allowing individuals to not use. In a smart city all inhabitants are connected and share data with the system, enjoying the optimization of services enabled by the city’s connectivity, regarding traffic, bureaucracy and more. Inhabitants supply data to all services, even the ones they don’t use, and enjoy optimization that derives from data that is the source of the same un-used services. They can’t not-use any more; they are part of the optimization ecosystem, and even if they don’t want to actively use a technology, they are coerced to use it as part of the city system. This situation brings about the extinction of the Non-Users who become what we call “*Coerced-Users*”.

# The Coerced User and the Unwitting Users

The Coerced User is a connected inhabitant of the smart city and wanting to or not provides it with data while enjoying its optimizations. Even if she decides to not use some of the city’s innovative services, she can’t avoid being part of the its ecosystem. First, because these services are in the public sphere, she can’t escape their indirect influence just like a passive smoker. Second, because she can’t stop providing information, and can’t choose not to benefit from the optimization generated by the data these services provide. For example, a Coerced User can’t opt out and not use sharable electric scooters services – for both disadvantages and advantages; they are still occupying her space and she needs to dodge them in the street, and she also benefit from the data they provide the city about the most populated routes; data that might affect the city’s public transportation schedule or infrastructure maintenance timeline, and thus have a positive impact on her life. Unlike the Coerced Users that are aware of the technology they try to avoid, some users may not be aware of it, but still provide it with data and enjoy the general city services’ optimization results. We define them as the “*Unwitting User*”. For example, the Unwitting User is unknowingly absorbing the public Wi-Fi radiation while providing it with information such as her location.

# Designing for Coerced and Unwitting Users

As the city’s inhabitants become more connected and public space occupied by antennas, security cameras, sharable scooters, drones and more, it becomes ever more crucial to understand the Coerced Users and design the city experience accordingly, using a human centered perspective. Today, the city’s technologies are designed according to a “correct” design methodology that addresses Active Users: *Desirability*; attracting users to use them, *Feasibility*; can be produced by the manufacturer, and *Viability*; are economically viable and generate value for both users and suppliers [16]. But since these technologies are deployed in the connected public space, they need to address Coerced Users as well, answering their needs and improving their wellbeing.

# Coerced Innovation Acceptance

In Coerced User design it is important to understand that unlike with active users, service value does not translate into *Adoption*. For Coerced Users, it translate into *Acceptance.* Designers need to account for the different kinds of Active User according to Rogers’ *Innovation Adoption Life Cycle* (Innovators, Early Adopters, Early Majority, Late Majority, Laggards)[7]. Each of these Active Users must be addressed accordingly; a designer can’t approach a Smartphone for Millennials in the same way she approaches one for a Baby-Boomers. The same is true with Coerced Users; the designer must be empathic to the kind of Coerced User she is designing for. As Coerced Users don’t actively use a product, they either reject it if they find it disturbing, or they accept it as a service that might be beneficial for others, but they consciously choose to not use it. We define a tool that can assist designers with this mapping; the *Innovation Acceptance Life Cycle* examines Coerced Users on the spectrum of acceptance: (1) *The Supporter* supports the innovation but doesn't use it.

(2) *The Indifferent* accepts it without supporting it. (3) the *Soft Rejecter* rejects the innovation but is not active about it, and the (4) *Hard Rejecter* actively rejects the innovation. Each of them must be approached differently. Bad design will cause a Coerced User to reject the innovation and the value it might entail via the city ecosystem. It is therefore important to understand factors that lead to innovation rejection or acceptance. These will assist with better Coerced User design.

# Innovation Rejection and the Social Amplification of Risk

The social, psychological, cultural, and economic background of a person, as well as media coverage and gut feelings have an impact on her perception of technology as a risk, or something of value [17-21]. Instead of analyzing risk according to probability for occurrence and the intensity that it will cause, the individual analyzes it according to a fraction of the information she receives, using her psychological and cultural filters. To these filters she adds possible consequences of the risk occurring and then she designs a mechanism to cope with the it. This private and irrational action can become a public approach that leads to public actions [13]. The *Social Amplification of Risk* theory suggests that an individual’s risk perception could have an amplification impact. Her family and community’s perception of risk are influenced by her, creating a ripple effect of risk perception [14]. The “risk signals” are passed from "mouth to ear”, added to other personal perceptions that reframe the risk. This social amplification can impact social, political and economic structures. Innovation’s risk perception is framed in a short time as risky or not, after which the window closes. Once the public shapes its perception it is difficult to change it and so it is important to take this into account when designing for the Coerced User.

# Contextual Field Research Methodology

* 1. **Human Centered Design Research**

After establishing the “Coerced User” and the "Technology Acceptance Life Cycle” theories using the British Design Council’s *Double Diamond* approach, learning from academic and secondary sources, and interviews, we now turn to a contextual study to validate our theory.

# Contextual Case Study: Shareable Electric Scooters

The contextual field study was designed to understand the Coerced Users in a “smart city” environment using a defined case-study that represents connected technology in the public space. We chose sharable electric scooters; a last mile transportation vehicle spread across the city aiming to be a clean and cost effective urban public transportation. The Scooters don’t represent a disruptive technology but a unique business model of “use and discard”; The user find a nearby scooter and unlock it using the app, ride, and pay according to the time used. He then locks it. These

scooters can be placed anywhere and do not require an anchoring station. This service represents the main characteristics of connected technology in the public sphere: (1) An innovative intervention in a public domain, which (2) forces the user to be connected since it can’t be used without a smartphone and credit card; and (3) is now in the interim period that will define its future. These scooters also represent an interesting case study as there is a growing worldwide public debate about them. These scooters are added without any change to the city’s infrastructure and therefore change the way pedestrian need to act. As the Active Users of the scooters can leave them wherever they want, it can create an obstacle on the sidewalk. These issues generate rejections that lead to active protest and in some cases vandalism of the equipment. Sharable scooters entered Tel Aviv in 2018 and their numbers are growing monthly, from

~300 in late 2018 to ~2,000 in Feb 2019.

# Conetxtual Field Study Structure

Our study was composed of interview, observations and a digital poll. **In depth interviews** with 8 professionals from the fields of innovation adoption, public space design and UX. We talked about innovation in the public space, human centered design and the phenomenon of micro mobility. **Observations** in Tel Aviv included participatory scooter usage and shadowing Active Users. We also conducted a Coerced Users’ observation, learning how they handle / avoid Micro Mobility solutions. **A digital poll for 68 early adopters** aged 27-50 on the way they perceive micro mobility. This was the basis for choosing interviewees. **In-depth interviews** with 12 Coerced Users about their perception of smart city, public space innovation and micro mobility services.

# Findings

The Coerced Users support the vision of micro mobility. It is partly because Israelis are considered to be early adopters; positive feedback by Israeli media, and the scooter service’s promise to become a transportation service that is easy to use, affordable and “green”. Nevertheless, these “supporters” are Coerced Users not because they reject the innovation, but because they reject its implementation. Our research is reflected in these 6 main themes.

# Theme 1: “One fits all” solution

To date, the Tel Aviv municipality does not require the scooters’ providers to modify their product in regard to speed, quantity, and locations of operation. Accordingly, the providers deploy scooters in a “one fits all” approach; some didn't even translate the safety instructions to Hebrew. This situation creates an overload on the city’s crowded infrastructure. 91% feels that the municipality and providers don’t care about the inhabitants. The providers “invade” city space without talking to the inhabitants or modifying the product according to their needs. That creates feelings of an unsuitable and dangerous solution.

# Theme 2: Exclusion of Large Inhabitants Population

83% predive These services as inaccessible to various inhabitant populations, based on age, weight connectivity and address where these services are blocked due to fear of vandalism. This lack of justice in public goods distribution inherently creates Coerced Users. These populations can’t use these services but have to pay a “Public Space Tax”; providing these services with pedestrian public space without getting anything in return.

# Theme 3: Lack of Enforcement

As these services are owned by private profit-driven companies, 83% feels that they just want as many people as possible to use the service, no matter what. There is almost no enforcement by the providers upon inhabitants that misuse their platform, and they don’t prevent inhabitants under 16 years old from using the systems. The safety measures and restrictions presented by the providers are perceived as “Kastach” - a cover up. 75% feels that their operation method is “if it is not forbidden it is allowed”. Moreover, there is little municipal enforcement and that causes the Coerced Users to suspect a secret deal that benefits the municipality and providers at the expense of the inhabitants.

# Theme 4: Feelings of Alienation

75% say the scooters arouse feelings of alienation by the Coerced Users. It expresses feelings of anxiety and lack of connection between human and space, as described by our interviewees: (1) “It creates a feeling of alienation. What is it? Who owns it? It's just spread everywhere”. (2) “People just leave it in the street, not caring what it does to the

relationship between human and space. It scares me, this disconnection between us and our tools, we design them and then they design us”. (3) “Wherever we go, when my daughter sees a scooter, she turns and says “Hey dad, here is your scooter. And here, and there…”. This mismatch and inability to connect to a tool depresses me deeply”.

# Theme 5: A Modern “Tragedy of the Commons”

81% of Coerced User feels that the sharing model drives Active Users to behave in an irresponsible manner that harms their welfare; they ride on the pedestrian side or park on the sidewalk, blocking people with disabilities and disturbing pedestrians. The Coerced Users believe this behavior is an outcome of the lack of connection between the Active User and the scooter, and the lack of enforcement. They aspire to maximize the paid service and as there is no enforcement they misuse this service to the point where they harm the Coerced Users’ ability to consume its “public space”. The “tragedy of the commons” describes a self-interest behavior contrary to the common good that spoils a public resource. We describe the above as a *modern* “tragedy of the commons”.

# Theme 6: Mental Workload

75% of Coerced Users describe a feeling of stress when talking about Micro Mobility. The service that is supposed to be about productivity, reduced friction and reduced anxiety for the Active User, create a mental workload on the Coerced Users. The pedestrians that used to wander the sidewalk with ease now have to be at constant alert not be hit by a scooter, and drivers have to worry about a scooter popping up, hitting their car and getting them in trouble with the law.

# Discussion

We used the above research and described contextual study themes to extract three main insights about Coerced Users design.

# Insight 1

**The main Coerced Users problems are due to lack of communication and synchronization between the city’s stakeholders triangle: municipalities, service providers and inhabitants that leads to poor implementation.** (1) The disconnect between municipality and service

providers together with the lack of regulation creates a burden on the already populated city infrastructure. The service provider's data is not shared with the municipality and doesn’t enable optimization of public transportation where scooters don’t operate or investment in infrastructure where usage is massive. (2) The disconnect between municipality and inhabitants makes the Coerced User feel that the “city” is incompetent to deal with the service providers due to weakness or corruption that is realized in collaboration with the private service providers. Coerced Users feel they are excluded from the public space and that the “city” can’t help them as there is minimal municipal enforcement on misuse of scooters. It creates a sense that “what is not forbidden is permitted”. (3) The disconnect between service provider and inhabitants make it hard for Coerced Users to understand the origin of these solution and complain and allows misuse by the Active Users. Service providers don’t have a screening process for users so there is no connection with them when they start using, and there is no enforcement of responsible usage so there is also no relation with the violators of the law. In addition, there is an on-going struggle between service providers and the municipality about the “ownership” of the public space. This conflict comes at the expense of the inhabitants, transforming the city from a place that is supposed to increase the inhabitants’ welfare, to an exclusionary, disturbing and dangerous place.

# Insight 2

**The main rejection of the innovation is driven by the sense of injustice in public goods distribution, which is reflected in the exclusion of various inhabitants’ that can’t use these services but pay a “*Public-Space TAX*” and “*Head-Space TAX*”.** The exclusion of inhabitants from these services due to age, connectivity or residency seems unfair and raises questions about the motives of the service provider and the municipality, as well as of the ownership of public space. These inhabitants can’t use the service but must give up their public space and wander the streets alertly and anxiously while getting nothing in return.

# Insight 3

**The smart city era generates a "*Smart City Dissonance*”; an anomalous feeling regarding belonging and a double-edged sword regarding efficiency and stress reduction.** This situation effects Coerced Users’ “head-space”. The first is “*Belonging Dissonance*”; the feeling of uncertainty regarding the belonging of public space that together with a “use and discard” business model encourages

irresponsible behavior that leads to a modern “tragedy of the commons”. The second is an “*Efficiency Dissonance*”; the negative correlation between services that are supposed to make Active Users more effective and therefore reduce their tension, but by their very existence increase the anxiety and stress of the Coerced Users

# Conclusion and Future Work

The Coerced Users and the impact smart citys’ connectivity has on their lives were the core of this paper. We found that increased connectivity and innovate intervention in the public sphere obligates us as designers to change the way we view “*Usability*” in the smart city, and the way we define “*The Users*” and the experiences that will position them on the right side of the “*Innovation Acceptance Life Cycle*”; providing them with value and increasing their wellbeing. Our results taught us that technology is not the barrier, rather its implementation in the complex smart city structure. Most of the frictions experienced by Coerced Users are due to disconnection among the stakeholders of the “city triangle”; municipality, service providers and the inhabitants. The main pain point is the feeling of injustice in public goods distribution that is realized in the exclusion of many populations from these services. They can’t use these services but have to pay a “*Public-Space TAX*” and “*Head-Space TAX*”; giving up their space and feeling anxious in the public sphere without getting anything in return. This paper indicates that the smart city era generates a "smart city dissonance”, an anomalous situation that effects our feeling when going out into the open. The first is “belonging dissonance”; the feeling of uncertainty as to belonging of space, that together with a “use and discard” business model encourages irresponsible behavior leading to a modern “tragedy of the commons”; over-using public infrastructure. The second is an “efficiency dissonance”, the negative correlation between services that are supposed to make Active Users more effective and reduce their tension, but by their very existence increase the stress of the Coerced Users. The findings about the new smart city users and their spectrum of acceptance, together with the field research insights emphasize the importance of the holistic and inclusive structure that should be designed for the complex smart city ecosystem and the need for Coerced User design and ethics. This design challenge is an opportunity to fulfill the promises of a harmonious smart city ecosystem that provides benifts, value and well-being to all its inhabitants. This paper is the basis for future work in this field.

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