

Repositório ISCTE-IUL

Deposited in *Repositório ISCTE-IUL*:

2021-02-18

Deposited version:

Accepted Version

Peer-review status of attached file:

Peer-reviewed

Citation for published item:

Rodrigues, N., Vale, M. & Costa, P. (2020). Urban experimentation and smart cities: a Foucauldian and autonomist approach. *Territory, Politics, Governance*. N/A

Further information on publisher's website:

10.1080/21622671.2020.1777896

Publisher's copyright statement:

This is the peer reviewed version of the following article: Rodrigues, N., Vale, M. & Costa, P. (2020). Urban experimentation and smart cities: a Foucauldian and autonomist approach. *Territory, Politics, Governance*. N/A, which has been published in final form at <https://dx.doi.org/10.1080/21622671.2020.1777896>. This article may be used for non-commercial purposes in accordance with the Publisher's Terms and Conditions for self-archiving.

Use policy

Creative Commons CC BY 4.0

The full-text may be used and/or reproduced, and given to third parties in any format or medium, without prior permission or charge, for personal research or study, educational, or not-for-profit purposes provided that:

- a full bibliographic reference is made to the original source
- a link is made to the metadata record in the Repository
- the full-text is not changed in any way

The full-text must not be sold in any format or medium without the formal permission of the copyright holders.

[Note: Paper accepted for publication on 13/03/2020. Territory Politics Governance.

Final version]

Urban experimentation and Smart Cities: a Foucauldian and autonomist approach

Nuno Rodrigues, CEG, IGOT, University of Lisbon

Rua Branca Edmée Marques, 1600-276 Lisboa

nmdrodrigues@campus.ul.pt

Orcid <https://orcid.org/0000-0003-2727-2295>

Mário Vale, CEG, IGOT, University of Lisbon

Rua Branca Edmée Marques, 1600-276 Lisboa

mario.vale@igot.ulisboa.pt

Orcid <https://orcid.org/0000-0002-4548-2459>

Pedro Costa, DINÂMIA-CET, ISCTE-IUL

Avenida das Forças Armadas 36, 1649-026 Lisboa

pedro.costa@iscte-iul.pt

Orcid <https://orcid.org/0000-0001-9106-463X>

Abstract

This paper aims to provide an analytical framework capable of critically analysing the currently hegemonic phenomenon of *smart cities* in the contemporary metropolis, particularly concerning their assumptions and potential effects. Using a critical perspective through the scope of Governmentality Studies and autonomist literature, our

intention is to present an analytical framework that allows for the comprehension and critical analysis of the phenomenon in question. Both this theoretical review and the analytical framework will form the basis for a critical analysis of a case study in Dublin, taken as an example of the diversity of phenomena and issues to be addressed in this paper. The case study concerns a project by See.Sense, a company located in Dublin, which involved the introduction of 500 bike lights with IoT and digital technology in its urban space, this being an example of urban experimentation within smart cities. The article concludes by defending that the phenomenon in question constitutes not only a form of technological mediation and economic production, but also a transformation of urban space and its subjects and population, implying a structuring of social practices and relationships.

Keywords: Technology; Smart Cities; Metropolis; Urban Experimentation; Governmentality; Autonomism;

Introduction

The aim of this article is to present a critical and comprehensive analysis of the currently hegemonic phenomenon related to *smart cities*, especially the forms of digital ubiquity and mediation in the contemporary metropolis. This theoretical discussion aims to articulate studies on Governmentality with autonomist literature, considering both are linked and make a valid and critical contribution to the objectives of this paper. Regarding the concept of Governmentality, our intention is to explore its primary meaning and implications, much like Michel Foucault did (1988, 2007). However, we also aim to explore this concept while considering other theoretical contributions concerning more recent phenomena, as is the case of the concept of algorithmic governmentality. By using

autonomist literature, we can critically explore questions concerning the concept of Governmentality, and to intersect them with a political, economic, technological and territorial perspective. It is considered that the rationale produced by this perspective on urban space and metropolis is useful for a critical analysis of the transformation processes of urban and metropolitan spaces. Also, when combined with the reasoning highlighted in governmentality studies, it allows for the construction of an analytical framework considered useful for the comprehension and critical analysis of the currently hegemonic proposals and expressions regarding *smart cities*.

This discussion serves as the basis for the analysis of a case study concerning the use of the See.Sense ICON product in Dublin. This analysis allows us to exemplify and explore the ideas and hypotheses presented above. The project emerged from a collaboration between the See.Sense company, dedicated to technology and urban mobility, and Dublin's City Council. As a result of this collaboration, 500 cyclists from Dublin participated in a project for digitally mediated mobility in Dublin, with gains for both the See.Sense company and the public administration. The analysis of this project allows for a critical discussion of the relationship between forms of governmentality, urban experimentation and technological and digital mediation in the contemporary metropolis. The reference to the See.Sense case aims to explore the discussions presented in this article, rather than to describe the process itself, allowing for an exploration of the dynamics around the phenomenon of urban experimentation associated with *smart cities*. The article is structured into four main sections. The first addresses the concept of governmentality, exploring its various dimensions. The second introduces a set of post-Marxist and autonomist ideas regarding economics, politics and technology, forming a summarised vision of the perspectives in question and exploring their relationship with previous literature and with the objectives of this article. The third section is designed to

articulate the theoretical perspectives presented here with autonomist discussions about the metropolis and the phenomenon of *smart cities*, concluding with an analytical framework for studying smart cities. The fourth section presents the case study, offering both a contextualization of the urban policy of the city in terms of *smart cities*, and an exploration of this project through the lens of the main categories identified in the analytical framework.

The analysis of this case is based on the relationship between the theory presented and the empirical findings. On 22 June 2017, a semi-structured interview was held with a See.Sense employee, in Dublin. The interview focused on the key aspects of the See.Sense project in Dublin. In addition, a qualitative content analysis was performed on the See.Sense websiteⁱ as well as on the Smart Dublin institution websiteⁱⁱ. The purpose here was to identify and analyse meaningful information on these websites from the categories worked on in the analytical framework, and take into consideration the context and object of research, following the indications present in Kohlbacher (2006) about qualitative content analysis methods. This analysis was carried out at different stages, starting in May 2017 and ending in November 2019, to check possible website and project updates. The information available on the websites was triangulated with other information available in some other Irish newspapers/websites, as well as other institutions related to Smart Dublin and See.Sense. With this triangulation, it was possible to organise and structure information considered to be more consistent and meaningful to the objectives of this paper. By using such methods, it was possible to collect information about the See.Sense ICON product, the experimentation and collaboration project carried out in Dublin by See.Sense, as well as the intentions and gains of the See.Sense company and of the local authorities of Dublin.

Governmentality

The concept of Governmentality, introduced by Foucault and later developed in Governmentality Studies, has mainly been addressed in reference to historical processes, analysis of power technologies that affect individuals and/or populations, or in critical analyses of institutions and forms of government. Given the objectives stated for this article, our intention is to take a different approach and present another application of this concept.

Foucault's initial theoretical questions concerned the processes and arts of government from a historical perspective, referring to a process of "governmentalization of the state" which marks the history of Western modernity (Foucault, 2007). Even highlighting the various intersections and overlapping the different paradigms and historical periods in which they become hegemonic, the author approaches this process by setting out from its effects on the territory (*paradigm of sovereignty*), on the body of individuals (*paradigm of discipline*) and on the population (*paradigm of security*)ⁱⁱⁱ. This process of governmentalization of the state highlights the way in which, historically, the "introduction of the economy" occurred in the sphere of "political practice" and in the "reason of state" (Foucault, 2007). According to Foucault, this introduction led to a change of the very meaning of the concept of economics^{iv}, establishing a "field of intervention". This process is associated with a conception of government as "the right disposition of things" for certain ends (government, formation of subjects and populations, among other possible ends) (Foucault, 2007).

Nikolas Rose's interpretation of the concept of governmentality is useful for the objectives of this article, stating that "(...) governmentality concerns "the ways in which those who would exercise rule have posed to themselves the question of the reasons, justifications, means and ends of rule, and the problems, goals or ambitions that should

animate it” (Joyce, 2003, p. 3 as cited in Rose, 1996). Governmentality is considered to be a mechanism used to represent, interpret and intervene in reality in such a way that it becomes “accessible/docile” with a view to a given end and/or political/governmental program (Joyce, 2003, p. 3 as cited in Rose, 1996). However, considering the aim of the research proposed here, it would be necessary to establish not only the use of the economy and diverse apparatus as a means of government, but also the use of techniques and technology to this end. Essentially, it is questionable whether interventions in the field of *smart cities* and the forms of digital ubiquity and mediation arising in the contemporary metropolis do not also represent ways of conceiving and intervening – that is, *epistemes and practices* – in what is considered to be *reality* (Joyce, 2003). Thus, it is important to question the ways of representing and intervening in urban space, population, infrastructures and physical environment. And it is also important to contemplate possible rationales of instrumentality considering the objectives of economic competitiveness, technological innovation and/or ways of controlling and producing specific subjectivities. Taking this into account, the questioning presented in this paper relates to the possibility of economics not only constituting a form of exercising authority, but of it also extending to the forms of digital mediation that have intensified with the most recent transformations and technological innovations.

Moreover, the way the concept of governmentality was subsequently developed by Foucault receives a new and a useful meaning within this article. Focusing its analysis on the processes of subjectivation, the topic of “technologies of the self” (Foucault, 1988) allows a different approach to be taken regarding the relationship between dichotomies such as those of agency and structure, individual and collective. Foucault identifies 4 major types of technologies used by human beings for knowing and taking care of themselves - technologies of production, technologies of sign systems, technologies of

power and technologies of the self. Highlighted among these technologies is the relationship formed between the so-called *technologies of power* and *technologies the self* – a relationship that, for the author, constitutes a form of governmentality. These are two processes that could be co-constitutive, and lead to the possible relationship between technologies of power created with the intention of structuring individual conduct towards a given end, and technologies of the self that can involve processes of subjectivation that may or may not fit with the assumptions and intentions of technologies of power. That is, it is possible to consider the way a given individual conduct can adjust to and/or reproduce a given hegemonic conception or a given inequality in terms of power relations. And, at the same time, following an immanent view of power relations, explore the possibilities of resistance that can be found even in hegemonic and asymmetric situations and relations.

Essentially, this is the continuation of the relational, positive and productive conception that Foucault had developed about the concept of power. For the author, power is not viewed as a thing, but rather as a process, a network where power circulates between things and in which “power is exercised only when it is put into action” (Foucault, 2005, pp. 21, 34-35). For Foucault, in force relations subjects are not the merely passive object of power, since power circulates between the subjects themselves because of their actions (Foucault, 2005 pp. 21, 34-35). Power is understood as relational and productive, acting on possibilities and structuring actions and subjectivities: “[i]t is a total structure of actions brought to bear upon possible actions” (Foucault, 1982, p. 789). Considering power relations as a potentially productive means, there is a necessity to consider its relational dimension, given that:

(...) a power relationship can only be articulated on the basis of two elements which are each indispensable if it is really to be a power relationship: that "the

other" (the one over whom power is exercised) be thoroughly recognized and maintained to the very end as a person who acts; and that, faced with a relationship of power, a whole field of responses, reactions, results, and possible inventions may open up (Foucault, 1982, p. 789).

This is an assumption that should be considered in the analysis of power relations, and which we will seek to take into account throughout both the construction of the analytical framework and the case study analysis.

Governmentality, Economy and Technology

Post-Marxism and Governmentality – a short introduction

The relationship between Governmentality and Economy, identified in the historical perspective presented by Foucault, is also present in various critical and post-Marxist economic perspectives.

An example that allows for a summary introduction to this line of research is the work of Pierre Macherey. By invoking the Foucauldian concept of biopower, the author highlights the way capitalism would not be possible without the "(...) controlled insertion of bodies into the machinery of production and the adjustment of the phenomena of population to economic processes." (Macherey, 2015). The author's argument is that the development of capitalism would not be possible without a form of governmentality based on a conduct of bodies, subjectivities and populations. A process that implies the continued use of technologies of power for the "optimization of strengths, attitudes and life in general" (Macherey, 2015), at the same time as seeking to ensure a continued accumulation and adjustment of the bodies to capitalism that implies a reproduction of unequal power relations. Therefore, it becomes possible to consider economics as a means to government ends, that is, as a form of governmentality. Macherey highlights the existence of an

“economy of forces” which is closely linked to an “economy of persons”, implying the structuring and control of the body of the subjects for the reproduction of such economic system. (Macherey, 2015).

General Intellect and Cognitive Capitalism

The reflections of Hardt and Negri (2001, 2004, 2009) and Matteo Pasquinelli (2013, 2015b) allow us to establish a connection between, autonomist thinking and its re-interpretation of Marx's thought, Foucault's work on governmentality, and a critical reflection on the role of technology in contemporary capitalism. To summarise, the key idea here is based on the disruptive potential of technological transformations and the emergence of what is known as “general intellect”. It is argued that there is a tendency in which the whole of society, including the diverse spheres of life, would be taken as the main means of innovation and production of economic value. Something intensified with technological innovations and which, following a Foucauldian perspective, implies a structuring of subjectivities, relationships and social practices considering the possible ends to be attained.

This question is analysed in depth by Hardt and Negri in their trilogy *Empire-Multitude-Commonwealth* (2001, 2004, 2009). According to the authors, what they call bio-political production (which includes the various dimensions of life and the above-mentioned “general intellect”) is spread throughout society, particularly in the contemporary metropolis. Essentially, it is the idea that economic production, by including aspects and dimensions traditionally considered to be outside of that sphere, is no longer confined to certain places (like the factory or the office), time (of work) or relations (traditional work ones, marked by the existence of a salary and a legally certified contract). In addition, such production is essentially collaborative and carried out collectively, in common,

while being dependent on affective, relational, immaterial and linguistic dimensions that cannot be altogether individualized. These dimensions move throughout society and the metropolis and are captured for the (re)production of value and capitalism in general. This is what Hardt and Negri (2004), regarding the concept of “general intellect”, call “immaterial work”, i.e., “(...) labor that produces immaterial products, such as information, knowledge, ideas, images, relationships, and affects.” (Hardt & Negri, 2004, p. 65). For the authors, this represents a tendency towards an essentially qualitative and not quantitative transformation of work and social relations, in which: “(...) the qualities and characteristics of immaterial production are tending to transform the other forms of labor and indeed society as a whole.” (Hardt & Negri., 2004, p. 65). According to this idea, it is necessary to recognize that the economic production that takes place in the contemporary metropolis implies the production of certain forms of life, subjectivities, practices and social relations - even if this occurs in an antagonistic way and always in a permanent constitution process.

Following the antagonistic perspective of autonomism and the relational vision of power proposed by Foucault, the contribution of this perspective lies not only in the offered diagnosis but also in how it is framed with contemporary social and political dynamics and processes - from the question of technology to the forms of economic production. Hence, what is described above should not be understood as a Machiavellian plan to control society or as a total social relationship able to determine all social aspects of life. Rather, the authors highlight the existence of an antagonism where both relationships of capture and of resistance are present and become possible. That is, it is considered that, even from this set of transformations, other possibilities can emerge – while constituting an extension of production in society, there is also an expansion of the possibilities for conflict and creation of something new in the whole social field.

Fragment on Machines

Most of these ideas are based on an interpretation of the chapter “Fragment on Machines”, in *Grundrisse* (Marx, 1858). In a very succinct way, Marx’s thesis defends the existence of a tendency in the development of capitalism of using technology, which represents a transformation in terms of surplus-value. The introduction and use of technology in the productive process would lead to a tendency towards a crisis concerning the law of value – a thesis that defends the existence of a law in the functioning of a capitalist economy that leads to a downward trend in the profit rate –, as well as the emergence of the hegemony of forms concerning relative surplus-value over forms regarding absolute surplus-value.

The shift, according to Marxist’s theory, from the hegemony of forms of absolute surplus-value to forms of relative surplus-value suggests that an increase in surplus-value would essentially be realized through the introduction of innovations – as could be the case of technological innovation –, and not so much through an increase of labour (as was the case of absolute surplus-value). This transformation is associated with the change from ways of formal subsumption to ways of real subsumption of society by capital, in which life and society tend to be fully integrated in the functioning and reproduction of capitalism. As Jason Read states: “[r]eal subsumption is the transformation of the technical and social conditions of the labour process. A transformation in which what is originally outside of capital, the social and technical condition of labour, becomes internalized.” (Read, 2003, p. 121)

This hypothesis is explored by Hardt and Negri (2004), who underline that it becomes particularly visible during the current phase of capitalism, given that various dimensions of life have come to be incorporated in the value production process and, therefore,

qualitatively alter the very ontology of contemporary work. According to the authors, in contemporary capitalism society is “put to work” and becomes productive itself – with dimensions such as subjectivity, language, relationships, affections being incorporated into the productive process. As Jason Read synthesizes:

Capital no longer simply exploits labor, understood as the physical capacity to transform objects, but puts to work the capacities to create and communicate that traverse social relations. It is possible to say that with real subsumption capital has no outside, there is no relationship that cannot be transformed into a commodity, but at the same time capital is nothing but outside, production takes place outside of the factory and the firm, in various social relationships. (Read, 2009, p. 33).

Nevertheless, and as stated by Matteo Pasquinelli (2013, 2015b), it is important to remember that, in Marxist terms, machines do not produce surplus-value. In this process, what happens is that knowledge (the “general intellect” spread throughout society) is transformed into fixed capital through existing forms of technological mediation (Marx, 1858; Pasquinelli 2013, 2015b). That is, social knowledge, not reducible to a single person and corresponding to a dimension considered immaterial, becomes technologically “objectified” (in its diverse forms and expressions, such as in the production and development of algorithms) for the organisation and production of surplus-value. Therefore, accompanying the theories here presented, it could be said that knowledge is appropriated and privatized within the dynamics of capitalism’s functioning. According to Marx, this is also a process that involves a structuring of society for the production of value (Marx, 1858, p. 706). To conclude, it could be said that what is at stake in conjugating such contributions, is the consideration that a transformation of capitalism implies, from the outset, a change and transformation regarding forms of life,

subjectivities and ways of social organisation in order to ensure its own reproduction - even if this always involves an antagonistic and never totalizing dimension.

Governmentality, Metropolis and Technology

Algorithmic Governmentality and Metropolis

The concept of metropolis will be worked here essentially using the reflections that result from the autonomist theory, even if they happen to be linked to some reflections of the theoretical body of Geography – for example, with the work of Allen Scott (2011). The autonomist thesis emerges not only from theoretical work, but also from the observations concerning the spread of production and social conflict in society, giving special emphasis on the space of the metropolis. From that, emerges the hypothesis that “*the metropolis is for the multitude what the factory was for the working class*” (Hardt & Negri, 2004). The metropolis is considered to be a space of antagonism *par excellence*, where processes of economic, social and political production occur. The metropolis is a space where technologies of power and possibilities of resistance and experimentation are in permanent conflict – without power being able to acquire a totalizing dimension. The autonomist perspective highlights the antagonistic dimension of this process, pointing out the existence and importance of a cooperative and common dimension of economic production, and how that process produces specific social forms and relationships that are subordinated to the end of value production. Hardt and Negri stress that this production, even when collectively carried out, is captured by capitalism as rent, forming a situation of exploitation and diminished potential of such relations, and of the production and sharing processes that take place in the metropolis (Hardt & Negri, 2004, p. 256).

For Stuart Elden (2007), there is a link between the organisation of the territory and the three models of Sovereignty-Discipline-Security introduced by Foucault. Focusing on the currently hegemonic technology of power – referring to the paradigm of Security –, it is possible to find similarities between the analysis of the apparatus of power in relation to the territory and the questions invoked in autonomist literature regarding the metropolis. It stands out that the way this technology of power concerns the territory is not so much a strategy of limitation and contention, of raising barriers – as occurred hegemonically in the paradigm of Discipline –, but rather one of minimum management and intervention of flow and circulation, aiming to stimulate such dynamics and allow actions and events to occur (Elden, 2007, p. 565). This rationale is associated with the neo-liberal *ethos* as identified by Foucault (2008) and with a conception of government as the management of effects (Agamben, 2015, 2016). This notion means the government would be focused not directly on the causality of problems, but rather on the immanent management of their effects - without necessarily having a solution in mind. For Agamben, security mechanisms are a permanent technology of government, essential to establishing and maintaining a given “*normality*”.

The concept of algorithmic governmentality is particularly useful for understanding the phenomenon and possibilities in question (Rodrigues, 2016; Rouvroy, 2011). Antoinette Rouvroy (2011) proposed the concept of algorithmic governmentality to highlight how subjects and the physical world are “taken as visible, endowed with meaning, assessed and produced” by automatic systems. From this notion, a new *episteme* emerges, created in an immanent and relational way through the collection and analysis of data and information. This *episteme* involves: 1) detection of the *normal*, that is, the detection of standards and common profiles, with the purpose of intervening in social practices and relationships in order to structure the possibilities of action; and 2) detection of the

“*abnormal*”, of something or someone that does not conform to and/or deviates from the common standard previously detected and, as such, must be subject to greater attention and control (Pasquinelli, 2015a; Rodrigues, 2016; Rouvroy, 2011). In the *episteme*'s first form, when detecting the *normal*, the observed technology of power is associated with the paradigm of security, whereas when detecting the “*abnormal*”, the aforementioned technology of power is associated instead with the paradigm of discipline – there is, therefore, a conjugation of both paradigms. Such forms of governmentality act towards applying a “conduct of conduct”, ways of acting, considered or calculated to a greater or lesser extent, which are designated to act on the possibilities of action of other people, according to a conception of government focused on “(...) how we conduct ourselves, how we attempt to conduct others, and how others attempt to control our conduct.” (Rouvroy 2011, p. 7-8).

Smart Cities and Governmentality

There is a growing line of research that combines the study of smart cities with studies on governmentality. To exemplify, Vanolo (2014) highlights the emergence of a "Smartmentality" as the new normative view of what a "good city" should be, thereby influencing knowledge and practices of urban planning. Gabrys (2014) uses the concept of environmentality in order to analyse how "(...) citizenship is articulated environmentally through the distribution and feedback of monitoring and urban data practices, rather than as an individual subject to be governed." (Gabrys, 2014, p. 32). These two perspectives are related to the reasoning of this paper. In an attempt to present the link between the concept of governmentality and the phenomenon of smart cities, the works of Söderström et al (2014), Kuecker et al (2019) and Kitchin et al (2017) also stand out, with the first two focusing on the issue of normalisation associated with the emerging

possibilities and effects of smart cities. This paper is more in line with the ideas presented by Kitchin et al (2017) on governmentality. As the authors refer, and in line with Foucault's claim on the Sovereignty-Discipline-Security relationship, there is more an overlapping than a total replacement between technologies of power.

It could be said that these forms of governmentality, when associated with the assumptions and forms of intervention of currently hegemonic *smart cities*, take the urban space (including its population and subjects) as subject to analysis and management, by monitoring and programming the urban environment (Foucault, 2007; Gabrys, 2014; Kitchin, 2014; Kitchin *et al*, 2017). The possibilities of knowledge and intervention associated with the use of diverse digital technologies allow for the creation of databases with geographical patterns as well as a time series referring to various dimensions and territorial contexts, updated in real time (Gabrys, 2014; Kitchin, 2014; Kitchin et al, 2017; Scanell, 2015). Therefore, the *epistemes* created from such databases, generally employing a mix of diverse data and information, allow for the subsequent production of algorithms and applications that potentiate a more efficient analysis and management of the urban space. Said management implies the production of specified urban spaces and environments, populations and subjects, as well as structuring of their conduct (Gabrys, 2014; Scanell, 2015). However, this does not constitute a situation of total control and impossibility of resistance.

Smart Cities and Metropolis

This article defends the hypothesis that the contemporary metropolis, considering the state of digital ubiquity and the set of technological and socio-economic transformations it has been subject to, relates and significantly updates autonomist theses about the metropolis. As a result, it is possible to establish the existence of a more significant

blurring of oppositions, such as physical and virtual spaces, or between spaces and times of work and non-work. Given that several mechanisms currently allow for new forms of mediating and/or collecting and sharing data and information regarding ~~the~~ various dimensions of life, the possibilities of bio-political production and real subsumption are intensified and the metropolis is completely transformed into a place of work in all its scale. Negri states that in these circumstances, and highlighting the potentialities associated with automation and the emergence of forms of control through algorithms, there is “(...) a higher level of real subsumption.” (Negri, 2018, p. 167).

However, it is important to recognize that such a situation is always dependent on the context of its implementation and emergence (Rossi, 2016), and that it doesn't mean it will become absolute in terms of power relations. This phenomenon does not represent a state of total control or means it is free from any potentially emancipatory perspective, and it is not experienced in the same way by the population – rather, it is felt in a differentiated and unequal way. Therefore, and even if we consider that the whole population contributes to a collectively carried out bio-political production, and considered it to be essential to the current processes of innovation and economic production, it is possible to speak of “inclusion by exclusion” (Agamben, 2014, 2015). A situation in which, due to the real subsumption of work, the metropolis and life as a whole are integrated in the processes of production of value. However, that might occur in an unequal and not typified way, by means of a contracted and remunerated relationship. As stated by Negri:

In the productive metropolis, disjunctive inclusion is understood as that which includes the entire population of the metropolis – regarded as a productive space – and distributes it therein according to mobile and flexible functions that are basically precarious in the construction of value (...) (Negri, 2018, p. 98).

Finally, it is important to highlight a critical aspect underlined by Pier Aureli (2017). The author also emphasizes that the history of the factory cannot be understood as a delimited space, but rather as a set of relations between various social spaces, flows and processes, in permanent transformation. That is, for Aureli, the metropolitan space, at least since the beginning of capitalism, could be considered as a space that expands the extraction of surplus-value from practices and social relations taking place there. As follows, this would not be exclusive of contemporaneity - even though it might be more intense today. Basing his theory on Tronti's findings (1976), and highlighting the precursor and constitutive dimension of social struggle within the dynamics of capitalist development, Aureli stresses that the historical transition from the hegemony of absolute surplus-value to relative surplus-value (even if subject to different phases) implied the integration of all moments of life within capitalist production. Therefore, and even highlighting the specificity of the processes and dynamics that currently occur in the metropolis and contemporary society, the author emphasizes that the structuring of life and society according to the objectives of production and reproduction of capitalism is not exclusive to the present day.

Metropolis and Urban Experimentation

In a rather schematic way, and given the processes of digital mediation and ubiquity, it is possible to approach the effect of such transformations on the metropolis from two different angles, considering both their forms of intervention and production. A first approach focuses on the emergence of new digitally mediated business models – examples being *Sharing Economy*, *Open Innovation*, *Living Lab*, or *Big Data* -, which, while not being exclusive to or totally dependent on urban space for their development, find in it the ideal room for development, given their dimension and complexity

(Rodrigues et al, 2015). The fundamental idea implies recognising the metropolis as an enormous entity that produces data, information, algorithms and applications, with possible effects on the co-creation and production of knowledge and innovation (Chesbrough, 2006; Schaffers et al, 2011; URBACT II, 2015). This problematization is related to a line of research in economic geography concerning the territorialisation of economy and innovation, as well as the prominence given by Hardt and Negri on how economic production in the contemporary metropolis is dependent on the exchange of ideas, communication, knowledge and relational dynamics in general (Hardt & Negri, 2004, p. 249).

Another approach concerns the possibility, regarding digital ubiquity and mediation, of the metropolis becoming, in its entire scale, a space of production and work. This transformation refers not only to a possible reconfiguration of the working and non-working time and space, but also to the ways of value production within current society and economy, that can be extended to everyday life, which is taken as a decisive extension of value creation in contemporary capitalism (Hardt & Negri, 2009; Laing, 2013, 2014; Negri, 2018; Scott, 2011). This particular line of thinking is directly associated with some of the phenomena previously presented – notably the processes of *Open Innovation* and *Urban Living Lab* that occur in contemporary urban space (Carvalho & Vale, 2019) -, but with a greater emphasis on the processes of urban experimentation related to “*test-bedding urbanism*” or “*urban experimentation*” (Cugurullo, 2018; Evans et al, 2012; Halpern et al, 2013), as well as the territory’s infra-structuring associated with these interventions (Easterling, 2014). According to Evans et al (2012), urban experimentation tends to be taken as a potential and alternative instrument in terms of urban policy. Part of this potential is related to the possibilities of experimentation and integration of populations in real projects of urban intervention, thus acquiring a potentially

transformative character (Evans et al, 2012). However, Evans et al (2012) also stress the need to consider the context in which such experiments are conducted in order to avoid the reproduction of unequal power relations. In those cases, the metropolis, or at least a limited area of it, is taken as a space of experimentation in a real context, where diverse technologies and solutions can be tested – similar to what was identified by Gabrys (2014) concerning the programming of urban space and the environment, something that might imply as well as reproduce asymmetrical power relations. This paper argues that this aspect is an essential dimension of today's smart cities intervention logic, which will be explored in depth in the following section by analysing the See.Sense case.

Analytical Framework

As follows, we propose an analytical framework with the following dimensions: Governmentality; Urban Technologies and Metropolis; and Urban Experimentation (Table 1). The proposed innovative framework allows for a critical analysis of this topic by conjugating different bodies of literature that have not yet been integrated. For all of these dimensions, a critical analysis of the ways of intervention and mediation of urban space and of society in general is sought. Like so, the great advantage and novelty of this analytical framework is its relational and critical dimension, having to also consider the diversity of urban phenomena prone to being analysed.

The theoretical review and discussion presented so far serve as a theoretical basis for such dimensions. With the dimension of “Governmentality”, we intend to underline and analyse the way in which certain economic, technological and urban interventions and transformations are directly associated with social changes and the structuring of the sphere of life. More specifically, it is important to consider the relations between technologies of power and technologies of the self – something which is also present in

the autonomist perspective, particularly in the way it highlights the antagonistic dimension of social processes and relations. With the dimension “Urban Technologies and Metropolis”, we aim to analyse the introduction and use of several technologies in the contemporary metropolitan space in order to understand their scope in the mediation and structuring of such space. Thus, it is important to consider said introduction and mediation of technologies in the urban environment, emphasizing how they turn into a central entity within urban space in all its different dimensions - especially given the situation of digital ubiquity and the possibilities that emerge with it. In like manner, it is also important to consider the antagonistic and asymmetrical power relations that can be verified in such processes, particularly at the level of production and transformation of urban and metropolitan space - whether economic, urban, subjectivities and life forms. Finally, the “Urban Experimentation” dimension aims to analyse how the metropolis, or certain urban spaces, are the target of experimental processes in a real context and at various levels. That is, it is necessary to consider how urban space is taken as a “test bed”, especially given the current technological possibilities, and how it is combined with its context and urban policies that may be associated with it. For all the above-mentioned dimensions, there is a critical perspective of possible arguments on instrumentality regarding the intervention and use of urban space. Such forms may be due to economic, technological or urban processes - considering that, given their multidimensionality and centrality, contemporary metropolitan space concentrates and integrates these processes and phenomena relationally. For instance, it is important to emphasise the links between the subcategories “Technologies of Power”, “Power relations and structuring of the urban and metropolitan space” and “Urban space as test-bed”.

(Table 1. Analytical Framework // *table 1 should be placed here*)

Experimentation in Dublin – the case of See.Sense ICON

Context

An example of urban experimentation is the See.Sense company's project in Dublin, created in collaboration with the city's local authorities. Based in the United Kingdom, See.Sense is a technological company specialising in urban mobility that especially focuses on cycling. The company has projects in other cities (also in collaboration with their local authorities) and sells its products in more than 50 countries. One of these products, See.Sense ICON, is presented by the company as a "*bike light*" that reacts to the environment and uses "advanced sensor technology" in order to detect "changes of speed", being able to "flashing brighter and faster at roundabouts, road junctions and filtering in traffic"^v. The product can be connected to the cloud through an app. As is clear from the description, the product allows for the collection of automatic and geo-referenced data and information, referring to the various dimensions of urban space and its users (but with guarantees of anonymity)^{vi}. See.Sense ICON is the product implemented in the above-mentioned project.

See.Sense was awarded one of the "*Open Challenges*" prizes promoted by the Smart Dublin institution - an "*Open Challenge*" related with urban mobility and aimed at encouraging bicycle use in Dublin^{vii}. With this purpose in mind, the See.Sense project was implemented. Smart Dublin is the entity responsible for coordinating *smart cities*' projects in Dublin's four local authorities, like Dublinked, Dublin Dashboard and Smart Docklands. However, it is an entity with a marginal position within the structure of Dublin's local authorities (Coletta et al, 2017). It should be noted that this is a structure with little range and resources (both human and financial) (Coletta et al, 2017). Thus, its main role is to mediate and articulate various interests (Coletta et al, 2017). This makes

Smart Dublin very dependent on Dublin's private sector initiative, which has a large diversity of projects and companies – however, it is necessary to note that Dublin serves as the basis for the European headquarters of most of the world's major technology and digital companies.

This is in line with Dublin's general urban policy guidelines. As pointed out by several authors, the orientation of Irish urban policies, and of Dublin in particular, was influenced by a neoliberal orientation (Kitchin et al, 2012; MacLaran et al, 2014). Since the 1990s, the principles of the so-called urban entrepreneurship, with the participation of private actors and a market orientation, have shaped the definition of policies, in accordance with a shift that has also taken place economically. As Kitchin et al (2012, p. 1302) point out: “In the 1990s Ireland embraced deregulation, entrepreneurial freedoms, and free-market principles and aggressively courted high-valued-added export-oriented FDI (see O’Riain, 2004).” This model of development was questioned due to the urban, economic and financial crisis that occurred in Ireland after the crisis that emerged in 2007-08 (Kitchin et al, 2012). However, most of its elements have remained the guiding principle of public policy, both in Dublin and in all of Ireland. It may be noted that smart cities’ policies currently being implemented in Dublin fit into this strategic orientation and are taken as an urban and economic response to such a crisis.

As mentioned in the interview with a member of the company, the SeeSense project consisted of providing 500 “*bike lights*”, which were used by employees of Dublin City Council and by workers of technological and cultural companies in the Docklands district^{viii}. The Docklands district makes for the current technological/digital and economic centre of Dublin, having undergone a major process of urban regeneration and transformation in recent years - as such, one can guess the purpose for which this product is used in the area. We stress that, according to Heaphy and Pétercsák (2018), there is a

long history of transformations and interventions in this district. Recently, another project called Smart Docklands^{ix} was announced, aiming to turn the district into a major urban experimentation for IoT and *test-bedding urbanism*. Promoted by Smart Dublin and *Connect*, a research centre, this project aims to, among other things, transform Docklands into “the world’s most connected business & living district”^x.

See.Sense ICON – Analysis

Governmentality

These projects and urban interventions structure urban space and its environment, endowing it with the technological means necessary for a situation of digital ubiquity, and allowing urban experimentations to take place there. Out of this scenario emerges a structuring of actions and subjectivities - as could be the case for the cyclists involved in this project.

Cycling is a common practice for thousands of people in Dublin, each displaying immaterial and subjective dimensions. Thus, cycling is clearly digitally represented and mediated for diverse purposes. Cycling is something that could be extremely varied and is not completely reducible to external objectives and/or actors. However, this is an experiment for the cyclists themselves, who are, to a degree, voluntarily using both this product and the bicycle in their daily lives, and a situation of possible instrumental use by See.Sense and the local authorities in relation to them. That is, there is a relation between a *technology of the self* and a *technology of power* – a situation of governmentality.

This was observed through a variety of data that was collected on the cyclists and their practices, as well as on traffic and the urban environment in general. The use of the See.Sense ICON product by the cyclists, particularly the data and knowledge emerging

from said use, allows both See.Sense to improve the development of its product, and the local government to define new urban policies. This knowledge may alter the behaviour of cyclists, given their interaction with it^{xi}. And it may also alter the urban space itself, a change that is due, not only because it is necessary for present use, but also for possible future uses structured around the knowledge obtained from the experiment. This project enabled See.Sense to, among other things, identify the primary mobility patterns, and some of the main difficulties that cyclists faced on the road when studying their cycling behaviour - it becomes clear, therefore, that this goes in line with the notion of paradigm of security, encouraging and allowing subjects to act, in this case, by giving their data. Furthermore, and given the relevance of accessing subjects' subjectivity, as well as the various dimensions of life that go beyond workplace relationships, the autonomist analyses of the contemporary economy and metropolis have obvious relevance. It may be considered that the forms of value production and urban experimentation analysed would not be possible without introducing the various spheres of life in the forms of economic, technological and urban mediation and production. This situation corresponds to a structuring of possibilities carried out through different forms of economic and algorithmic governmentality and an intervention in the territory.

This is something that, even if not implying a totalizing situation, influences and mediates the experience of urban space for the population of Dublin, and the users of See.Sense ICON. The interventions, knowledge and effects created by both See.Sense and Dublin's City Council may alter, even if slightly and not always in a necessarily negative and totalizing way, the practices of the individuals who participated in this project, as well as other cyclists and citizens in Dublin, and even other users of See.Sense product in different places.

Urban Technologies and Metropolis

This case is an example of a process in which the metropolis could be thought of as a space for mediation, production and even experimentation, enhanced by interventions, by the territory's infrastructure and by digital ubiquity – the sensors in See.Sense ICON are mobilized through bicycle use, and the various technological mechanisms mediating the urban space of Dublin. See.Sense ICON, as a product that allows for the collection and production of data and reacts as well as influences urban environment, could be seen as an object capable of co-constituting and mediating the relations between Human and urban space.

As already stated, such a process also reveals the importance, in a context where digital technology becomes ubiquitous, of accessing the subjectivity of subjects, meaning their incorporated knowledge as a potentiality for innovation. In this case, this is shown through the cyclist's knowledge in relation to his or her use of the bicycle and of urban space. This is something that exemplifies the emergence of digitally mediated processes of co-creation and innovation which extend beyond a situation of traditionally typified work relations. Subjects are considered to be the producers of data concerning various dimensions – urban space, everyday life, and even the See.Sense ICON product itself. This is clear with the recent release of See.Sense ICON2^{xii}, as well as with the usage of this new product in a similar project that also took place in Dublin, besides Manchester and Antwerp. The new project, SynchroniCity^{xiii}, makes use of the possibilities available in the new product, and was able to collect a bigger variety of data - such as locations, road condition aspects, mobility patterns, braking situations, collisions and near-miss events, speed and cyclists' profiles, among others. This highlights the importance of subjectivity, social practices and relationships for economic production, technological innovation and knowledge production for public policies. A knowledge created from a

common dimension, related to spheres of life and of the metropolis, which could be used for multiple ends - sometimes without the consciousness of the subjects, and even may be used for processes that may be antagonistic to them. However, even if not forming a totalizing situation, reducible to an instrumental dimension, this is a process in which users may not be completely aware of their contribution to innovation and value production.

Urban Experimentation

As already stated, this introduces a logic of experimentation at various levels. Firstly, regarding the product, the use of See.Sense ICON by cyclists allowed See.Sense to test the quality of and response to this *bike light* in real time. See.Sense accompanied the cyclists who participated in the project. As established by one of the heads of See.Sense in an interview^{xiv}, that is the fundamental difference between this project and the retail sale of the See.Sense ICON product. See.Sense collected the cyclists' feedback as well as the data regarding their routes using multiple variables – time, speed, traffic, roads, environment, etc. This does not happen with retail sales of See.Sense ICON, but with experimental projects, like the case we are currently studying. The collection of such data and information is essential for understanding the enormity and complexity of data that this product, or others like it, may collect in the future, in other cities and in different contexts. As a result, this project of urban experimentation is also a way of optimizing the See.Sense ICON product and its potential, that is, a case of knowledge production and technological innovation, something visible in the release of See.Sense ICON2.

Policies such as the “*Open Challenges*” and projects such as SmartDocklands, given their rationales and forms of intervention, consider and use urban space as a space for experimentation and production (of knowledge, value, etc). The introduction of 500 *bike*

lights in Dublin's urban space, even with the objects in question having a mobile dimension, structures the territory and influences its experience and mediation – especially in the Docklands district. The urban space itself, and particularly the areas considered more important in economic and technological terms – as is the case of Docklands -, is considered to be a suitable environment to test new products, as well as an entity open to intervention and knowledge production in a potentially instrumental way.

This is also an example of urban experimentation regarding urban policy. The logic of “Open Challenges” is one of experimentation, in which the public administration launches a tender so that private companies can respond to problems identified by the local authorities. In this case, See.Sense presented a solution for a previously identified problem, and that solution was tested in a real context. The benefits for Dublin's City Council, the local authority directly associated with the project, correspond essentially to the possibilities of the knowledge generated and potentially used for urban planning. Highlighted among these possibilities are: the creation of “*heat maps*” and other types of knowledge regarding urban mobility patterns; the collection of miscellaneous data about the urban environment; and the monitoring of the state and quality of road surfaces and cycle-tracks. Some of the results of this project can be found on the webpage of the project^{xv}. Among several aspects, the results indicate the main mobility patterns concerning the use of the bicycle, the time periods in which the bicycle is most used, and the identification of sections of road surfaces in poor condition. In this sense, it could also be noted that this case illustrates an attempt to include the population in urban policies and intervention projects, even if the ends and ways of such participations are criticized.

Urban Experimentation in Dublin - synthesis

It can be said that the introduction of the See.Sense ICON product in Dublin's urban space, particularly in areas considered to be economically, technologically and digitally more developed (as is the case of Docklands), is an example of two things: the intensification of forms of algorithmic governmentality applied to the territory, and the validation of autonomist theses related to the metropolis. The intervention and transformation of Dublin's urban space involved the introduction of various mobile sensors placed on bicycles as well as the dissemination of various forms of digital ubiquity. This project serves as an example for urban experimentation, as well as an example of an actually existing smart city (Shelton et al, 2015). The See.Sense ICON project allowed us to point out some of the limitations and potentialities of experimenting of new solutions in real contexts. On the one hand, it allowed for the creation of knowledge used for the development of a product and for a better understanding of the dynamics of mobility in Dublin, which are essential to defining new public policies. On the other hand, the project reveals some of the difficulties and contingencies of the public administration at the level of the management of the contemporary metropolis, and also lets us point out possible situations of instrumentalization and reproduction of asymmetric power relations when such experiments are carried out.

This case also enables us to ponder the evolution of the implementation of a smart city project, and its possible collateral effects, revealing the unpredictable and accidental nature of urban experimentation projects. Because of a project related to urban mobility and the use of bicycles in urban environments, some of the cyclists have become mobile data producers - and their status as cyborgs could be questioned. Additionally, the city of Dublin, through other implemented projects, goes from an accidental smart city to an articulated smart city (Coletta et al, 2018). As follows, something as simple as the use of

the bicycle ends up becoming connected with external objectives, such as focusing on data production and product innovation, developing more Smart City projects and asserting Dublin as a Smart City, among others. However, this is not a totalizing power relation. Cyclists continue to use their bicycles for varied reasons - simply because it is a practical way to move through the urban environment, for ecological and/or health reasons, for the love of cycling, or the importance of aesthetic and symbolic elements mobilized by the individual as factors of social and cultural distinction. Moreover, the very aims and intentions of the actors who promoted this project could be questioned – with not anticipated data and forms of knowledge arising and other uses for the bicycle and of See.Sense ICON product, representing another type of change in urban environment. Given the complexity of the corporeal activity and the urban experience, Tironi and Valderrama (2018) state that there are more and more ontologies that are not and cannot be represented by data.

Conclusion

In this paper, we argued that both the currently hegemonic transformations concerning *smart cities* and the forms of technological and digital mediation in the contemporary metropolis represent a form of governmentality that is, at the same time, economic and algorithmic. Therefore, we maintain that such interventions in urban space tend to have as their objective not only a form of economic production, but also a transformation and structuring of territories, populations and subjects. The introduction of the ICON See.Sense product in Dublin is an example of how certain types of urban experimentations, given their logic and technologies of power, could constitute a form of governmentality. And even though this is not exclusive to the aforementioned phenomenon, it is argued that, given the situation of digital ubiquity and the diverse forms

of digital and technological mediation in the contemporary metropolis, such interventions represent an updating and intensification of the autonomist theses related to the metropolis and the forms of bio-political production occurring in it.

Thus, we consider that this theoretical discussion, arising from diverse perspectives, forms a useful and relevant reference to the construction of a critical and comprehensive analytical framework. While recognizing that there are several critical analyses of *smart cities*, we believe that the one presented here could not only improve the understanding of the phenomena directly associated with technological and digital transformations, but could also frame them in a set of more general phenomena and processes, such as those related to technological mediation and to forms of contemporary economic and urban production. This perspective allows us to synthesise and connect various social, economic and territorial changes, which grants a deeper understanding of such phenomena.

The analysis of the See.sense ICON project, in its various aspects, allowed for a critical and global understanding of the urban, social and economic phenomena discussed above. Said analysis showed how a variety of processes was combined and how it contributed to the transformation of urban space, to mediating and structuring the practices and social relations of certain subjects, as well as to the technological innovation and economic production of See.Sense ICON.

However, in future research, it would be important to explore in depth the specificity and ontology of urban space within processes of technological and economic mediation and transformation. Assuming there would be a change in urban ontology, it would do to explore the *machinic* and infrastructural dimension of what is specifically urban in terms of the mediation and the structuring of life and society within the contemporary metropolis.

One other thing that could be done in the future would be to not strictly follow the tendency that is characteristic of autonomist analyses (Negri, 2018), and, instead, study the socio-spatial inequalities associated to such phenomena. Recognizing that people's day-to-day, in terms of bio-political production in the metropolis, is unequally mediated and experienced, it could be relevant to apply a different type of methodology to address said inequalities. Perhaps, such an analysis could confirm the hypothesis that urban centres are more technologically and digitally mediated than certain urban peripheries, or that there are differences in the possibilities of use by different subjects.

Equally relevant for future investigations is the problematization of proposals for different uses of technology and contemporary urban spaces. It could be stated that the main challenge is in maintaining most of the technological innovations and mediations currently used for governmentality purposes, without them giving rise to situations of control, to the structuring of possibilities and the reproduction of inequalities. It is a question of the relationship between *technologies of power* and *technologies of the self* as identified in this article, as well as the wide-ranging debate about the neutrality of technology – even if assuming, from the outset, that technology mediates and produces effects. A possible research hypothesis could explore the potential of an “ethical-political use” (Agamben, 2016) of technology, considering that such reflection implies forms of subjectivation and creation of forms-of-life that are critical to situations of instrumentality and exteriority in relation to the self. It would also be important to identify and analyse current forms of use of *smart cities* and forms of digital mediation in the contemporary metropolis that could go in a contra-hegemonic direction to the one identified, thereby highlighting the possibilities of resistance currently found in such situations. For example, and referring to the case examined above, it could be interesting to study the uses of the bicycle or of the urban space itself. Also, studying the forms of digital mediation of

See Sense ICON that are not in line with the rationales and purposes anticipated by the actors involved in the project could also be noteworthy.

Acknowledgements

We appreciate the valuable comments and suggestions of the reviewers of this article. We are also grateful for the support of Federico Cugurullo, who welcomed and accompanied the fieldwork carried out in Dublin. We would also like to acknowledge the moments of discussion and collective learning about these topics, which were promoted by informal groups such as UNIPOP or Recreativa dos Anjos, of which author Nuno Rodrigues was a member. We thank the support of the Foundation for Science and Technology through the Grant SFRH/BD/105162/2014 and the funding allocated to CEG-ULisboa (projects UIDB/00295/2020 and UIDP/00295/2020).

References

- Agamben, G. (2014). What is a destituent power?. *Environment and Planning D: Society and Space*, 32(1), 65-74. <https://doi.org/10.1068/d3201tra>
- Agamben, G. (2015, May). Por uma teoria da potência destituente [For a theory of destituent power]. *Revista Punkto*. <https://www.revistapunkto.com/2015/05/por-uma-teoria-da-potencia-destituente.html>
- Agamben, G. (2016). *The use of bodies*. Stanford University Press.
- Aureli, P. (2017, March 17). O regresso da fábrica: território, arquitetura, operários e capital [The return of the factory: territory, architecture, workers and capital]. *UniNômade*. <http://uninomade.net/tenda/o-regresso-da-fabrica/>

- Carvalho, L., & Vale, M (2019). From participation to startup urbanisation? Re-situating open data in Lisbon. In Karvonen, A., Cugurullo, F., & Caprotti, F. (Eds.) *Inside Smart Cities: Place, Politics and Urban Innovation* (pp. 211–226). Abingdon: Routledge.
- Chesbrough, H. W. (2006). *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business Press.
- Coletta, C., Heaphy, L., & Kitchin, R. (2017). From the accidental to articulated smart city: The creation and work of ‘Smart Dublin’: The Programmable City Working Paper 29. <http://eprints.maynoothuniversity.ie/9238/> (last accessed 08 April 2020)
- Cugurullo, F. (2018). Exposing smart cities and eco-cities: Frankenstein urbanism and the sustainability challenges of the experimental city. *Environment and planning A: economy and space*, 50(1), 73-92. <https://doi.org/10.1177/0308518X17738535>
- Easterling, K. (2014). *Extrastatecraft: the power of infrastructure space*. Verso Books
- Elden, S. (2007). Governmentality, calculation, territory. *Environment and Planning D: Society and Space*, 25(3), 562-580. <https://doi.org/10.1068/d428t>
- Evans, J., Karvonen, A., & Raven, R. (Eds.). (2016). *The experimental city*. Routledge.
- Foucault, M. (1982). The subject and power. *Critical inquiry*, 8(4), 777-795. <https://doi.org/10.1086/448181>
- Foucault, M. (1988). Technologies of the Self: A Seminar with Michel Foucault, eds. Luther H. Martin, Huck Gutman, Patrick H. Hutton. Foucault, M. (2007). Security, territory, population, trans. *Senellart, M., Ewald, F. and Davidson, AI New York: Palgrave Macmillan*.
- Foucault, M. (2008). The birth of biopolitics: Lectures at the Collège de France, 1978–1979 (G. Burchell, Trans.). *Basingstoke, United Kingdom: Palgrave*.
- Foucault, M., 2005. *Em Defesa da Sociedade [Society Must Be Defended]*. 1ª ed. São Paulo: Martins Fontes.

- Gabrys, J. (2014). Programming environments: environmentality and citizen sensing in the smart city. *Environment and Planning D: Society and Space*, 32(1), 30-48. <https://doi.org/10.1068/d16812>
- Halpern, O., LeCavalier, J., Calvillo, N., & Pietsch, W. (2013). Test-bed urbanism. *Public Culture*, 25(270), 272-306.
- Hardt, M., & Negri, A. (2001). *Empire*. Harvard University Press.
- Hardt, M., & Negri, A. (2004). *Multitude: War and democracy in the age of empire*. Penguin.
- Hardt, M., & Negri, A. (2009). Commonwealth Harvard University Press. *Cambridge MA*.
- Heaphy, L., & Pétercsák, R. (2018). Building smart city partnerships in the 'Silicon Docks'. In Coletta, C., Evans, L., Heaphy, L., & Kitchin, R. (Eds.). *Creating Smart Cities*. Routledge.
- Joyce, P. (2003). *The rule of freedom: liberalism and the modern city*. Verso.
- Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal*, 79(1), 1-14.
- Kitchin, R., Coletta, C., & McArdle, G. (2017). Urban informatics, governmentality and the logics of urban control. <https://osf.io/preprints/socarxiv/27hz8/> (last accessed 08 April 2020)
- Kitchin, R., O'Callaghan, C., Boyle, M., Gleeson, J., & Keaveney, K. (2012). Placing neoliberalism: the rise and fall of Ireland's Celtic Tiger. *Environment and Planning A*, 44(6), 1302-1326. <https://doi.org/10.1068/a44349>
- Kohlbacher, F. (2006). The use of qualitative content analysis in case study research. In *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research* (Vol. 7, No. 1, pp. 1-30). Institut für Qualitative Forschung. <http://dx.doi.org/10.17169/fqs-7.1.75>

- Kuecker, G. D., & Hartley, K. (2019). How smart cities became the urban norm: Power and knowledge in New Songdo City. *Annals of the American Association of Geographers*, 1-9.
- Laing, A. (2013). Work and workplaces in the digital city. *Center for Urban Real Estate. Columbia University, USA*.
- Laing, A. (2014). The emerging workplace is urban. *Work&Place*, 3 (1), 11-14.
- Macherey, P. (2015, October 31). The productive subject. *Viewpoint Magazine*.
<https://viewpointmag.com/2015/10/31/the-productive-subject>
- MacLaren, A., Kelly, S., & MacLaran, A. (Eds.). (2014). *Neoliberal Urban Policy and the Transformation of the City: Reshaping Dublin*. Springer.
- Marx, K. (1858). Fragment on machines. *The grundrisse*, 690-712.
- Pasquinelli, M. (2013, October 13). Machinic Capitalism and Network Surplus Value: Notes on the Political Economy of the Turing Machine.
<http://matteopasquinelli.com/?p=2872>
- Pasquinelli, M. (2015a, January 29). «Anomaly Detection: The Mathematization of the Abnormal in the Metadata Society». <http://matteopasquinelli.com/anomaly-detection/>
- Pasquinelli, M. (2015b). Italian Operaismo and the Information Machine. *Theory, Culture & Society*, 32(3), 49-68. <https://doi.org/10.1177/0263276413514117>
- Read, J. (2003). *The Micro-Politics of Capital: Marx and the Prehistory of the present*. Albany: SUNY Press.
- Read, J. (2009). A genealogy of homo-economicus: Neoliberalism and the production of subjectivity. *Foucault studies*, 25-36. <https://doi.org/10.22439/fs.v0i0.2465>
- Rodrigues, N., Vale, M. & Costa, P. (2015). Dinâmicas e processos territoriais de inovação: a emergência de sistemas multi-locais [Dynamics and territorial processes of innovation: the emergence of multi-local systems]. In *Os Valores da Geografia : Atas do*

X Congresso da Geografia Portuguesa: X Congresso da Geografia Portuguesa(pp. 542-547). Lisboa, Portugal: Associação Portuguesa de Geógrafos.

Rodrigues, N. (2016). Algorithmic Governmentality, Smart Cities and Spatial Justice. *justice spatiale-spatial justice, 10*, <http://www.jssj.org/article/gouvernementalite-algorithmique-smart-cities-et-justice-spatiale/>.

Rossi, U. (2016). The variegated economics and the potential politics of the smart city. *Territory, Politics, Governance, 4*(3), 337-353. <https://doi.org/10.1080/21622671.2015.1036913>

Rouvroy, A. (2011). Technology, virtuality and utopia: governmentality in an age of autonomic computing. In *Law, human agency and autonomic computing* (pp. 135-156). Routledge.

Scannell, J. (2015). What can an algorithm do. *Dis Magazine*. <http://dismagazine.com/discussion/72975/josh-scannell-what-can-an-algorithm-do/>

Schaffers, H., Komninos, N., Pallot, M., Trousse, B., Nilsson, M., & Oliveira, A. (2011). Smart cities and the future internet: Towards cooperation frameworks for open innovation. *The future internet*, 431-446.

Scott, A. J. (2011). Emerging cities of the third wave. *City, 15*(3-4), 289-321. <https://doi.org/10.1080/13604813.2011.595569>

Shelton, T., Zook, M., & Wiig, A. (2015). The ‘actually existing smart city’. *Cambridge Journal of Regions, Economy and Society, 8*(1), 13-25. <https://doi.org/10.1093/cjres/rsu026>

Söderström, O., Paasche, T., & Klauser, F. (2014). Smart cities as corporate storytelling. *City, 18*(3), 307-320. <https://doi.org/10.1080/13604813.2014.906716>

Tarí, M. (2017, May), Vinte teses sobre a subversão da metrópole [Twenty theses on subversion of the metropolis], Revista Punkto. <http://www.revistapunkto.com/2017/05/vinte-teses-sobre-subversao-da.html>

Tironi, M., & Valderrama, M. (2018). Unpacking a citizen self-tracking device: Smartness and idiocy in the accumulation of cycling mobility data. *Environment and planning D: Society and space*, 36(2), 294-312. <https://doi.org/10.1177/0263775817744781>

Tronti, M. (1976). *Operários e capital [Workers and Capital]*. Porto: Afrontamento.

URBACT II (2015). New urban economies: How can cities foster economic development and develop 'new urban economies'. URBACT

Vanolo, A. (2014). Smartmentality: The smart city as disciplinary strategy. *Urban studies*, 51(5), 883-898. <https://doi.org/10.1177/0042098013494427>

ⁱ <https://seesense.cc/> (last accessed 08 April 2020)

ⁱⁱ <https://smartdublin.ie/> (last accessed 08 April 2020)

ⁱⁱⁱ As stated, Foucault presents three major paradigms in his historical analysis of governmentality, each associated with different periods - Sovereignty, Discipline, and Security. Despite these historical periodization, it is important to note that these different power technologies overlap and not simply replace each other. As Foucault (2007, p. 144) said, governmentality is conceived as a form of power that has as its objective the population, the political economy as its main form of knowledge (and, arguing here, at the present time, also technology as a main form of knowledge, particularly in its cybernetic and algorithmic variations), and apparatuses of security as principal means.

^{iv} It is recognized that the meaning of the concept of economics is not exhausted in the perspective presented, and it may have other uses and meanings according to the

paradigms involved. However, this study follows a Foucauldian perspective of the concept in question.

^v <https://seesense.cc/pages/benefits-of-icon-two> (last accessed 08 April 2020)

^{vi} This product is related to the concept of smart velomobility (Behrendt, 2016), which refers to the way in which cycling practices and experiences, when digital mediated, allow a fusion of digital and physical aspects - taking the cyclist as a cyborg figure. In the case study referred by Behrendt, it was verified that there was a change in the intention and behaviour of the users due to their interaction with digital dimensions - in that case, the data visualization of their routes and other users` routes.

^{vii} <http://smartdublin.ie/see-sense/> (last accessed 08 April 2020);
<http://smartdocklands.ie/project/see-sense-smart-bike-light-pilot/> (last accessed 08 April 2020)

^{viii} In this project the anonymity of the workers data was ensured, and the data were later aggregated for pattern analysis.

^{ix} <http://smartdocklands.ie/> (last accessed 08 April 2020)

^x <http://smartdocklands.ie/> (last accessed 08 April 2020)

^{xi} As stated by Tironi and Valderrama: “(...)based on the works of Foucault (1988) on technologies of the self, self-tracking devices could be considered a continued radicalization of the Greek principle “know thyself,” a technique of verbalization and disclosure of the self in order to more profoundly expose and subject individuals.” (2018, p. 298-299)

^{xii} <https://seesense.cc/pages/see-sense-icon2> (last accessed 08 April 2020)

^{xiii} <https://seesense.cc/blogs/hub/synchronicity> (last accessed 08 April 2020)

^{xiv} <http://uxpod.com/connected-bikes-in-the-smart-city-an-interview-with-irene-mcaleese/> (last accessed 08 April 2020)

^{xv} <https://seesense.cc/blogs/hub/making-cycling-better-in-dublin> (last accessed 08 April 2020)

<http://smartdocklands.ie/project/see-sense-smart-bike-light-pilot/> (last accessed 08 April 2020)