Hyperreal estate: the production of new urban real estate markets



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Abstract

Recent years have witnessed a surge in the development of real estate data analytics platforms. These devices variously promise a revolution in investment and valuation, leading to a more transparent knowledge of market reality and more objective decision-making. To examine these claims, this research adopts a theoretical framework from STS and critical data studies to examine the ethnographic case study of one prototype data analytics product throughout the early stages of its development and marketing. This product, *Dashboard X*, was designed to provide large institutional investors with a way to better know which areas of London were currently undergoing gentrification for the purpose of investing in Build-to-Rent housing. This study was followed by a series of interviews and participation in several industry events.

By examining the actors emerging around this would-be 'market device', this research explains that *Dashboard X* and similar platforms are in fact producing and circulating entirely new, subjective, and distinctly situated forms of real estate values, knowledges, and even assets. Furthermore, it is argued *Dashboard X* entails a series of theoretical and political implications that range from the co-performation of planetary gentrification and the expansion of rentier capitalism, to a 'new urban colonialism' and the greater ontological politics associated with bringing new real estate assets and markets into being. The key theoretical contribution is that these data analytics platforms do little to objectively increase investor rationality in the sense of knowing reality, but that the use of these technologies can nevertheless powerfully control the future trajectories and possibilities of a global real estate market by circulating the values and knowledges needed for its realisation. Hence, these new urban real estate values can precede their realisation in material marketplace reality through data analytics platforms as *hyperreal estate*.

Acknowledgements

Over the past five years I have benefited from a great deal of inspiration and practical support from more individuals and organisations than I could list here. Nevertheless this especially includes my supervisors Mark and Danny; the Economic and Social Research Council; and my colleagues, friends and family from Glasgow, London, Manchester, the University of Oxford, the Alan Turing Institute and beyond. I dedicate the thesis to *Pub Y*, as the main reason why I got involved in any of this to begin with.

"Truth is like poetry. And most people fucking hate poetry."

— Overheard in a bar, from *The Big Short* by Adam McKay (2015).

Contents

List of Figures **xiii**

List of Tables **xv**

Terms & Abbreviations **xvii**

1 Introduction **1**

1.1 The market value of real estate 2

1.2 Real estate platforms and data analytics 4

2 Literature Review **13**

2.1 The construction of markets 14

2.1.1 The performativity of economic knowledge 18

2.2 Data analytics platforms and the circulation of value 22

2.3 The political economy of real estate 27

2.3.1 Fifth-wave gentrification 30

2.4 Hyperreal estate? 33

2.5 Research questions 37

3 Methodology **39**

3.1 Multi-sited ethnography 41

3.1.1 Participant observation: *Company X* 43

3.1.2 Interviews 49

3.1.3 Industry events 57

3.2 Data Collection 61

3.2.1 Fieldnotes 61

3.2.2 Interviews 62

3.3 Data Analysis 62

3.4 Ethics 66

3.5 Limitations and scope 70

3.6 Structure of findings 71

4 Building *Dashboard X* **73**
4.1 Context: *Company X, Garage X, Town X* . . . 74
4.2 *System X* . . . 81
4.2.1 Chasing triumphs . . . 85
4.2.2 Platform wars and new metrics . . . 91
4.3 *Dashboard X* . . . 102
4.3.1 Addressing the city . . . 106
4.3.2 Valuable narratives . . . 110
4.4 Calculative frames and their data artists . . . 126
4.5 Conclusion . . . 130

5 Selling *Dashboard X* **133**
5.1 Sales Strategies . . . 133
5.2 Meeting the clients . . . 137
5.2.1 Problematising gentrification . . . 139
5.2.2 Failure to enrol . . . 146
5.3 Renting story machines . . . 151
5.3.1 Poor performance? . . . 152
5.3.2 Renting a machine? . . . 154
5.3.3 Loss of boundaries? . . . 160
5.4 Emerging actors and the alethurgy of value . . . 162
5.4.1 What type of client actor does *Dashboard X* imply? . . . 164
5.4.2 What type of values does *Dashboard X* circulate? . . . 166
5.5 Conclusion . . . 168

6 Interlude: dissonance **173**
6.1 *Pub Y* . . . 175
6.2 Dissonance . . . 177

7 Knowing *Dashboard X* **185**
7.1 A global land registry . . . 187
7.1.1 Towards planetary real estate . . . 193
7.1.2 Doubling down on high modernism . . . 196
7.2 Perfect exchange . . . 201
7.2.1 Crises of commensurability . . . 204
7.3 Generation rent . . . 209
7.3.1 Market anxieties . . . 210
7.3.2 Build-to-Rent as emergent asset . . . 214
7.3.3 Metrics for a hipster *mētis*? . . . 216
7.4 The imaginary of data-driven real estate . . . 221
7.4.1 The expansion of rentier capitalism . . . 222
7.4.2 Real estate dioramas . . . 224

8 Seeing like *Dashboard X* **227**
8.1 Assembling *Dashboard X* 229
8.2 Making up assets 235
8.3 The hidden hand of the hipster 239
8.3.1 Performing planetary gentrification 241
8.3.2 Counter-performativities 247
8.3.3 Towards data-driven real estate 251
8.4 The politics of hyperreal estate 254
8.4.1 *Dashboard X* as post-political agencement 257
8.4.2 *Dashboard X* as device of new urban colonialism 261
8.4.3 Resisting the desires of hyperreal estate 267
8.5 Concluding discussion 272

9 Conclusion **279**
9.1 Emerging actors 280
9.2 Emerging values 282
9.3 Hyperreal estate and its discontents 284
9.4 Reflections on implications 286

References **289**

Appendices

A Interview consent sheet **329**

B Interview cheatsheet **333**

List of Figures

1.1 HouseCanary dashboard for analysis of residential real estate. . . . 6
1.2 DATSCHA dashboard for searching commercial real estate information. 7
1.3 Heatmap produced by Spatial.AI 10
1.4 Trulia's crime risk data. 10

2.1 Dow Jones advert (1964). 17
2.2 Illustration from *The Compleat Surveyor* (1653). 24

3.1 Research methods timetable and phases. 41
3.2 Operations of *Company X*. 48
3.3 Gephi visualisation of fieldnotes coding. 65
3.4 Chatting about anonymity. 68

4.1 The start-up punchbag. 78
4.2 Map view of central London. 82
4.3 Detail view for specific building. 83
4.4 Detail view on real estate owners. 84
4.5 Eye-balling floor areas. 94
4.6 Joking on Slack. 96
4.7 Xceligent employee testimonies. 98
4.8 Table from a Missouri District Court complaint. 99
4.9 Sketch of prototype dashboard. 104
4.10 Sketch of prototype dashboard (zooming-in). 105
4.11 Choropleth showing increase in "gentrification events." 112
4.12 Linear regression of "gentrification events." 113
4.13 Decomissioned ferry in Brooklyn. 117
4.14 Nightclub in Manchester. 118
4.15 More coffee shops, less crime? 119
4.16 Sketches relating gentrifiers to rent-gaps. 121
4.17 Calculative frame for gentrification. 129

5.1 Coffee shop sign in Forest Hill, London. 148
5.2 Prototype gentrification dashboard. 150

7.1 BtR units in London. 215

List of Tables

1.1 Real estate data analytics and market information platforms. 5
1.2 Valuation platforms for market insight. 9

3.1 Schedule of formal interviews conducted. 53
3.2 Participation in industry events. 59

7.1 Marketing copy from real estate data analytics platforms. 187

Terms & Abbreviations

API . . . . . Aplication Programming Interface.

GIS . . . . . Geographic Information Science.

REIT . . . . . Real Estate Investment Trust.

SFR . . . . . Single Family Rental (residential real estate asset class in United States).

IPD . . . . . Real estate market index owned by MSCI.

BtR . . . . . Build-to-Rent, an emergent class of new-build private housing designed for rent rather than sale. Typically built, owned and operated by large institutional investors.

RICS . . . . . Royal Institute of Chartered Surveyors.

STS . . . . . Science and technology studies' or 'science technology and society'.

ABS . . . . . Asset-backed securities.

ANT . . . . . Actor-network theory.

PUMA . . . . Public user micro area.

Python . . . . A programming language.

R . . . . . A programming language.

MIPIM . . . . The world's largest international real estate event hosted annually in Cannes, London and Hong Kong.

POI . . . . . Point of interest – a specific geographic point location, e.g. a hotel, an airport, a bus stop, etc.

Slack . . . . . A cloud-based proprietary team collaboration tool that includes instant messaging/chat functionality.

1 Introduction

It has been repeatedly reported in recent years that "thousands of extremely clever people backed by billions of dollars of often expert investment are working very hard to change the way real estate is traded, used and operated" (Baum 2017, p. 1). Or that a notoriously archaic and analog market, characterised by opacity, secrecy and a general lack of information, is currently being disruptively wrenched kicking-and-screaming into the digital 'data-driven' present. All thanks to innovative tech, Silicon Valley, and data science. As part of these changes, its problematic commodity forms are being transformed as part of a newly transparent trillion-dollar global marketplace—with almost unbounded opportunity to reform real estate as we knew it into a renewed and ever-legitimate global asset class. This chapter will introduce this research by charting some existing problems with real estate markets and valuation-practices, as well as the emergence of this brave new world of real estate data analytics platforms and the novel claims they are making. In doing so it will also explain why the popular linkage between such valuation problems and solutions might be more problematic than they seem, and why questions should be raised as to exactly how this data-driven disruption and transformation of real estate market value is occurring.

1.1 The market value of real estate

> "'Market Value' is the estimated amount for which a property should exchange on the date of valuation between a willing buyer and a willing seller, in an arm's length transaction after the property was properly marketed wherein the parties had each acted knowledgeably, prudently and without compulsion."
> —*The RICS 'Red Book' on Professional Valuation Standards* (RICS 2012, p. 133)

The process of valuation is typically concerned with estimating price in the marketplace for a single property or collection of properties. This is usually referred to as a property's 'market value' or 'rental value' (as appropriate). Identifying and appraising the value of property in some way is the foundation for economic decision-making in the practices of real estate, and in all markets generally (Fanning et al. 1994, pp. 5-7, Mankiw 1998). Regardless of the type of property or relevant sub-market (physical, legal, commercial or residential), such a valuation process is crucial in all market analyses for the purposes of buying, selling and profiting upon real estate. Hence, the multi-trillion dollar global real estate market as it exists could not operate without some form and practice of property valuation.

However, despite investors spending hundreds of billions of dollars annually on global real estate (Allen 2015), typically through large institution-managed funds, the property market and the process of property valuation itself are both notoriously characterised by uncertainty and a lack of transparency (French and Gabrielli 2004). It is also regarded as an extremely 'imperfect' market (Evans 2004), due in part to the heterogeneous and locationally fixed nature of property, the lack of information available and the quality or consistency of what data does exist (Meen 2001; McCluskey, Deddis, Mannis, et al. 1997), and the notoriously "oily" personal connections that drive the market behind closed doors (Minton 2017). Each issue calling into question any notion of "acting knowledgeably" in the quote above. And whilst some theorise that market prices and profits are generated by the simple concepts of supply and demand (Wyatt 2013), these are concepts that comprise some intensely complex phenomena and relationships (cultural, legal, social, political,

etc.). So, from the perspective of an investor, real estate is often regarded as an asset class with a wide range of unfortunate 'limitations' (Baum 2015), including illiquidity, physical deterioration, legal regulation, and lack of uniformity.

For example, in the case of basic residential or commercial properties, a plethora of variables contribute towards determining the market value of real estate, and there is always debate as to which are most important (Almond et al. 1997; Lawrance 1971). Internal factors might be said to include age, physical condition, the number of bedrooms in a house, or whether an office is connected to high speed broadband. External factors might relate to the broader economic and socio-economic aspects of location (Wyatt 2003), like whether you're in a certain school-catchment or whether the neighbourhood is over-run by hipsters (Fraser 2016). Such complexities are further compounded by uncertainties and subtleties surrounding the valuation practices themselves (Armitage and Skitmore 2003), which traditionally require the analysis of a range of often opaque and localised data (a bare minimum for large investment portfolios) alongside the physical human assessment of the site in question (almost essential in the case of individual or residential properties). Both processes take a lot of time and resources to do well, and are often executed in a highly subjective manner prone to human error or even purposeful manipulation (Eldred 2016).

> "There are three things that matter in a property: location, location, location."
> —Lord Harold Samuel, founder of Land Securities Group PLC
> (*allegedly*, see Safire 2009)

However, across most established models of real estate valuation (e.g. comparative, cost, residual, profits or investment—see Lawrance 1971), it is usually recognised that *location* in particular is paramount in the process of valuation. As modelling techniques have moved into more advanced areas from the 1970s onwards, a more detailed focus on location has been enabled through new technologies and techniques that include: geographic information science (GIS) (Wyatt 1996); geographically weighted regression (McCluskey, Deddis, Lamont, et al. 2000); value

maps (Wyatt 2003; Vickers 2003); the use of locational variables in artificial neural networks (McCluskey, McCord, et al. 2013); hedonic price modelling (Basu and Thibodeau 1998); spatial analysis and case-based reasoning (Christopoulou 2009). Throughout all of these techniques, the relevance of factors like 'neighbourhood quality' or distance from nearby transport hubs or the central business district have remained of great importance to an accurate valuation process. However, there remains debate as to which variables matter most, and the search continues for newer, more accurate and efficient location-based valuation models (Deddis 2002). Therefore, given the increasing financialisation of real estate (Harvey 1985, p. 64; Fields 2015) as 'just another asset class' (Loon and Aalbers 2017), and in an age of heightened risk management and mitigation (Beck 1992), it is unsurprising that the knowledge practices of real estate valuation might now turn to information technology and the 'data revolution' in search of innovative solutions to these problems and limitations (Kitchin 2013; Kitchin 2014b; Tiwari and White 2014).

1.2 Real estate platforms and data analytics

Today, newly emerging 'data-driven' real estate data analytics platforms are often referred to in the United Kingdom as being part of a new wave of 'PropTech' (Property Technology) (Hughes 2017). This broad term has recently emerged alongside numerous other fields of digital innovation, including FinTech (financial technology), ConTech (construction technology), CRETech (commercial real estate technology), and others. There is currently only one academic report that attempts to account for the present PropTech landscape of both start-ups and established corporations (Baum 2017), but this field seems to broadly include a variety of other real estate focused innovations such as peer-to-peer mortgages and crowd investing (e.g. LendInvest), automated landlord tools (e.g. FixFlo), more-established listing websites or marketplaces (e.g. Zoopla and AirBnB), and a range of smart building technologies (e.g. Nest). A critical overview of data analytics or data science as a component of this innovation is currently lacking[1], but the overall development of

[1] I have since published such analysis in the journal *Urban Geography*, see Shaw (2018)

real estate data analytics platforms arguably follows at the end of a common reading of computerisation history that has not escaped the real estate market (Yates and Van Maanen 2001; Markus et al. 2008; Kummerow and Chan Lun 2005; Jones and Benjamin 2013): advances in desktop computing (1980s—including accounting and customer relations management); Internet and broadband (1990s—including improving sales and market connectivity) and so-called 'smart' technology and the 'Internet of Things' (2000s onwards—connecting mobile devices, people and buildings, producing vast quantities of data). As a result, recent developments and trends in data science methods and processing power have come together in an of array platform-based products claiming to address many of the problems and limitations of real estate valuation described above.

Name	Product description	Functions
Beagle.ai	*"We sniff out the fine print so you don't have to"*	Artificial intelligence tool to automate lease analysis and inform portfolio strategy.
CompStak	*"Deal data straight from the source"*	Market information (valuations, sales, leases, etc.) sharing platform.
OpenSensors	*"Space is your most valuable asset. Use sensors and our data platform to understand if you are using it efficiently and forecast your future needs"*	Hardware (sensors) and software (dashboard and platform protocols) to monitor and analyse your building usage and asset management.
Placemeter	*"Quantify pedestrian activity at each of your potential locations to determine which will perform the best."*	Video and image recognition platform to analyse urban pedestrian and traffic activity.
Walk Score	*"Measures walkability on a scale from 0 - 100—and provides custom analysis of the impact of proposed development."*	A 'walkability index' that assigns a numerical walkability score to any address.

Table 1.1: Examples of real estate data analytics and market information platforms intended for use by those with interest in real estate as an asset. According to the start-up tracking website CrunchBase, all of these companies were founded in the last five years and have received investment totalling around $35m.

Whilst analysis of such newly-emergent platforms (for the purposes of market

information gathering and real estate valuation) in the real estate domain is scant, it is useful to consider some definitions from the emergent field of platform studies. Here platforms are defined variously as something like "digital infrastructures that enable two or more groups to interact", where 'network effects' are crucial to a platform's success and value as such (Srnicek 2016, p. 43). Or, "a foundation technology or set of components used beyond a single firm and that brings multiple parties together for a common purpose or to solve a common problem", where the platform's value increases exponentially as it offers more complementary products and services and gains new users (Gawer and Cusumano 2002, quoted in Jansen and Cusumano 2013, p. 18). And to complement these definitions, economic studies of platforms similarly focus on their practical connection of users as a component or site of a market (Nocke et al. 2007), or on the economic operation of the platform itself as such (Täuscher and Laudien 2017). Hence, platforms are often theorised in terms of their effective impact on business processes and institutional forms in terms of efficiencies and information exchange (Sundararajan 2016), as well as in terms of whether the platforms engender institutional shifts towards the organisational logics of markets, of hierarchies or states, or a material and machinetic hybrid of the two (Chandler 1977; Gurbaxani and Whang 1991; Bratton 2015, p. 41).

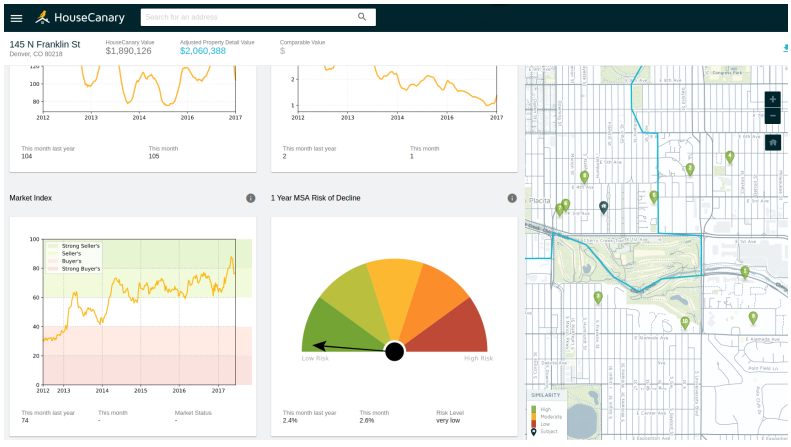


Figure 1.1: HouseCanary dashboard for analysis of residential properties and market information. Includes proprietary 1-year local market decline 'risk score' (visualised from green to red) derived from "a combination of fundamental and technical indicators".

However, the types of platforms in the domain of real estate are markedly varied

and not all concern the limitations of market information and valuation directly. To this end, it's useful to consider two schemas of platform categorisation by Andrew Baum and Nick Srnicek. First, although Baum (2017) relies upon buzzwords to describe 'PropTech' platforms, he clearly demonstrates that as much as half of these technologies are concerned with somehow tracking market information in relation to capital investment in property. To complement this, Srnicek's schema of platforms in general identifies five heuristic categories—advertising, cloud and data warehousing, industrial processes, products/services, and lean management—where real estate platforms designed for valuation and investment purposes are likely to cut across several of these, with a key emphasis on data warehousing along with products/services and lean management. There isn't reason or space here to focus on *all* real estate platforms, but some examples of platforms designed for intended use by real estate investors, developers and asset managers can be found in Table 1.1.

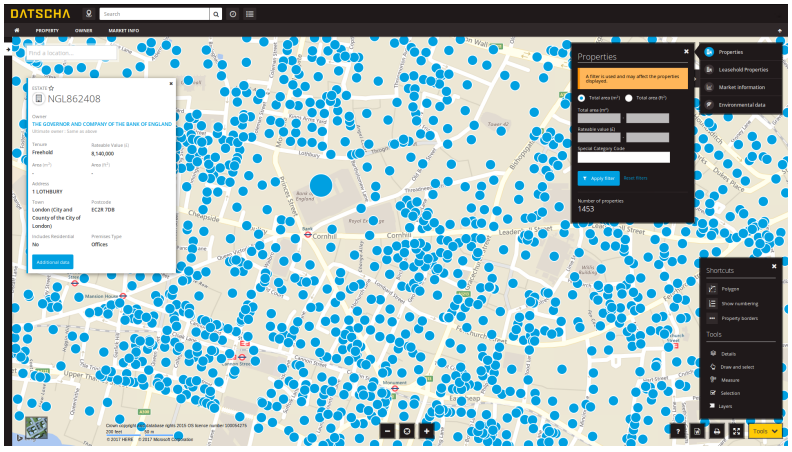


Figure 1.2: DATSCHA dashboard for searching commercial building ownership, transaction and valuation information: "a new way to view investment transactions data".

From the descriptions in Table 1.1 a number of functions can be observed that aim to deal with some of the asset limitations of real estate identified by Baum 2017. In the examples these non-exhaustively include: legal regulation and the time-consuming information processes of owning and investing in large portfolios are being approached using artificial intelligence in order to automate certain aspects of this

labour.[2] Second, the lack of market information that characterises the opacity of the real estate market is being alleviated through platforms where users can access and trade 'comps' (comparative market data) with one another. Third, the problematic materiality and fixity of space and real estate—including for example, as discussed in relation to the geography and urbanization of capital in terms of a 'spatial fix' by Harvey (1985)—and its physical deterioration are being approached with sensor technology and real-time monitoring tools to improve asset and space utilisation or maintenance (not to mention the increasingly flexible nature of leases and space through other platforms like WeWork or AppearHere). Fourth and fifth, the movement and behaviour of consumers can be better quantified to predict patterns of consumption or mobility, as can the value of space according to such phenomena.

Many more types of 'PropTech' platform could be discussed here—including those that approach issues of illiquidity, risk, planning regulation and labour—but it is the more specific examples in Table 1.2 that should now be focused on in relation to *valuation* specifically. This is because all examples include significant data analytics functions or components about which a range of novel and innovative claims are made in terms of how they can benefit their users. Including via increasingly heightened market intelligence and an improved accuracy and detail in the measurement of real estate value. For example, each of these platforms places special emphasis on novel sources of data (sensors, market data, tenant behaviour, information 'sharing' and social media), novel methods of processing that data (artificial intelligence, machine learning, advanced modelling), and novel presentation of that data (dashboards, APIs, real-time). Notably, almost all of which present themselves as being used or particularly useful in an urban context; the marketing of all five show maps or images of Central London and New York, and use-cases are almost always discussed in reference to highly urbanised areas and/or 'global cities' (Sassen 1991). And, it should be noted that all share aspects

[2]Whereas, some other real estate platforms might simply bypass regulation altogether, relying perhaps on a situation of *alegality* where adaption to these new technologies has not yet occurred (Bratton 2015, p. 176). AirBnB would be the most obvious example. And conversely, other platforms might improve efficiency on the regulative side, like automated conveyancing and blockchain technologies.

Name	Product description	Functions
Axiometrics	*"Determine optimal location, timing, amenities and pricing for new student housing."*	Dashboard analytics products for a range of sub-markets that use "often-inaccessible" data.
Proportunity	*"Building the world's most accurate real estate forecast—we use data science to understand neighbourhoods"*	Analytics dashboard that uses machine learning to model and predict property values.
REalyse	*"See the market, before the market"*	Market analytics dashboard that uses machine learning to model and predict property values.
Spatial.ai	*"Comprehensive social understanding of location categorized, quantified, and delivered to power any application or analysis."*	Location analysis platform that uses social media conversation (amongst other data) to spatially sort and rank urban areas.
VTS	*"Your entire portfolio, centralized for performance"*	Portfolio and lease management dashboard that includes comparative market data and analytics.

Table 1.2: Examples of valuation platforms designed to provide increased market insight at a granular urban scale. All but one were founded in the last five years, three are designed for the residential market specifically, and all have received investment backing of some type (from between $300k to over $100m.)

in common with platforms that originated in marketing and social media analysis, and which seek to quantify aspects of culture and sociality in a spatial manner (like PlaceIQ, HYP3R and Near.co). This includes dashboard interfaces and an emphasis on real-time quantification (and ranking) of previously unquantifiable social phenomena that can be related to the more elusive aspects of 'location'.

None of the examples in Table 1.1 capture the perfect essence of the emergent digital real estate data analytics platform, but in their shared characteristics and marketing copy there is a novel trend appearing that suggests the way in which real estate is valued and traded is changing: more objective; more rational; more transparent; less 'hidden value'; more democracy and access to the benefits and growth of the market; more stable; more liquid; and perhaps even transforming

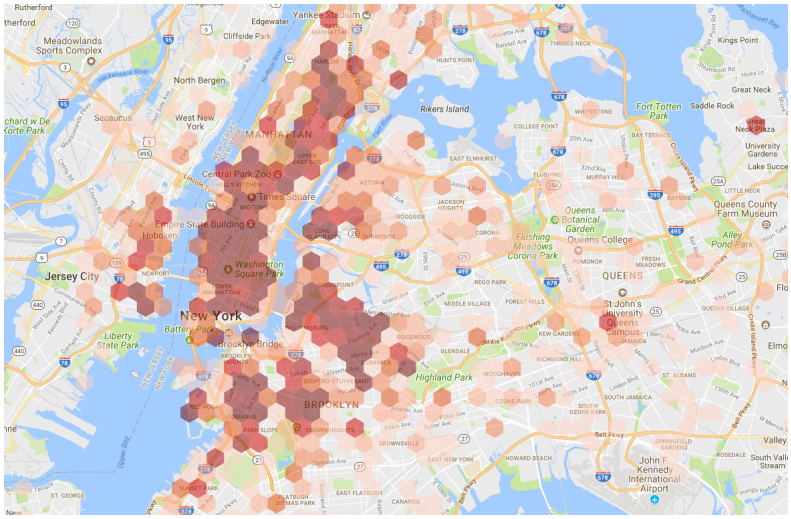


Figure 1.3: Heatmap produced by Spatial.AI that claims to have used "ethnographic practices and machine learning" to determine which areas of New York are 'hipster'.

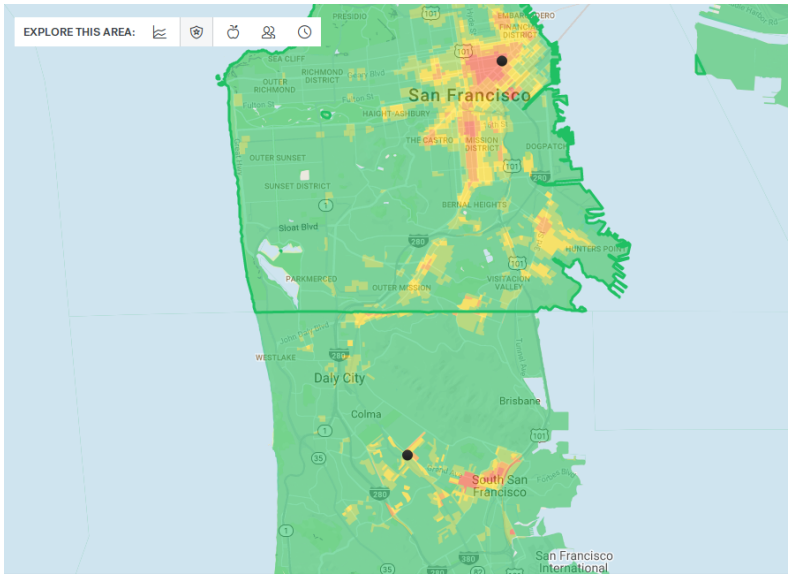


Figure 1.4: One of the USA's largest residential listing platforms Trulia presents crime risk data for San Francisco based on a proprietary metric generated by a third party company.

the real estate marketplace into less of "boy's club" (*JLL* 2018). Hence, in the context of a real estate market characterised by secrecy, information-guarding, opacity, 'gut instincts' and 'oily' connections (Minton 2017; Perry 2019; Sawyer et al. 2003), the trend's marketing promises are little short of revolutionary. Indeed many seem far-fetched, and despite massive investment in the technology (Shaw 2018) the widespread adoption of these platforms remains to be accounted for in

terms of any real market effects or changes. Will they really help investors 'see the market'? Will investment, buying, selling and redevelopment really be able to happen quicker? Or will any impact extend only to some added risk mitigation through performances of due diligence? What is the material difference between hiring a surveyor with a paper neighbourhood appraisal report (Eldred 2016) or getting an algorithm to do it for you? Or, if a surveyor is often 'little more than an estate agent in a Sunday suit' (Anon in Almond et al. 1997), then are these platforms any more than a nice hat to go with the suit? Who will benefit from any changes in the way valuation occurs, and who will lose out?

In a world still reeling from the 2007 global financial crisis (sparked by the failure of the US sub-prime mortgage market) (Mirowski 2013)—and amidst a global urban context of massive housing inequality, gentrification, displacement, and homelessness (Madden and Marcuse 2016)—the implications of these questions are very significant. Particularly, the adoption of new means (data analytics devices, metrics, etc.) by which to value real estate by large institutional investors[3][4] should be of interest and concern to anyone who might be impacted by the investment decisions they make. This is because such devices and methods, as well as the knowledges and forms of value that they produce and circulate, are also the means by which new real estate assets and markets can be realised. Along with the profits, losses, inequalities, possibilities and accidents that they come to bring about. In order to consider how these new innovations in real estate data analytics should be examined, the next chapter will outline a series of conceptual approaches and theoretical frameworks drawn from existing literature and research in related and complementary domains, as well as refining three key research questions with which to begin.

[3]For example, Real Estate Investment Trusts (REITs); pension funds; private equity funds; etc.

[4]It should be noted that whilst the relevance of these technologies to 'small investors' (e.g. Buy-to-Let, AirBnB owners, etc.) is very relevant, that this research will be chiefly concerned with these larger institutional investors. Hence the term 'investors' should be taken to be interchangeable with 'institutional investors' hereafter.

If Oscar Wilde didn't say that an economist is a person who knows the price of everything and the value of nothing, he should have.

— Philip Mirowski (1990, p. 689) in *Learning the Meaning of a Dollar.*

2 Literature Review

The claims being made by individuals and businesses developing real estate data analytics platforms are as bountiful as they are novel. On the one hand, they seem to indicate a revolution in how real estate will be valued and traded in the years to come, but on the other hand precedent suggests that the 'solutionist' promises of new technology should always be regarded with deep suspicion (Morozov 2013; Ofek and Turut 2013). To examine this transformation therefore requires a critical engagement with existing literature from related fields, especially in relation to the broad topics of markets, data analytics and real estate. Hence, this literature review is designed to outline three broad areas of existing research that can provide a theoretical position from which to critically evaluate the relevance, adoption and impact of these emerging technologies upon valuation and investment decisions in the real estate field. Each area will also outline key concepts and frameworks within the literature that will point to corresponding and better refined research questions.

This chapter will first consider literature on the construction of markets that takes up a theoretical position informed by Science and Technology Studies (STS) and Actor-Network Theory (ANT). This significant area of research (and sub-fields, e.g. the Social Studies of Finance), provides a critical-theoretical framework from which to examine the emergence of new technologies and the impact they can have upon wider market processes, practices and realities. Following this, a

brief consideration of overlapping literature on commensuration and valuation will lead to more contemporary work on data analytics in particular. This will cover research on data assemblages and the new forms of value that they can circulate in fields other than real estate. These two sections will then be followed by a consideration of some contemporary theoretical and political economic issues in real estate markets, largely informed by research in economic and urban geography. Including the contemporary relevance of literature on financialisation, urbanisation and gentrification. Following these discussions, a brief hypothesis will be introduced that builds upon the overlapping themes of innovation, information technology and knowledge that run throughout all three sections. The emerging research questions will then be formally introduced in terms of their relation to market actors, forms of value, and the theoretical and political implications of adopting new data analytics platforms within real estate markets.

2.1 The construction of markets

> "Prices are never set by a mere coming together of supply and demand. They are made, produced, and challenged by a multiplicity of actors in a market process. Some prices are produced to perform exchange for a limited time period, and still some are produced not to be used for exchange at all."
> —Koray Caliskan (2007, p. 242) in *Price as a market device: cotton trading in Izmir Mercantile Exchange.*

In trying to understand market processes and dynamics of value, economic sociologists like Michel Callon (1998) have emphasized the importance of studying market*places* over markets. In other words, there is an advantage in understanding markets *not* as abstract, ethereal, technical and natural free-floating entities that objectively exist 'out there' (and which we can know as such); but rather as material, corporeal, messy and *socially constructed* phenomena (Callon 1998b; MacKenzie 2009). As such, and following the broader trajectory of STS and ANT[1], the role of both human and non-human actors in the market should be considered crucial

[1]Not to mention roots in the Edinburgh School and 'Strong Program' theory in the sociology of scientific knowledge (Barnes, Bloor, et al. 1996; Bloor 1981).

in relation to the construction and reproduction of the overall market. Or, no one person or group of people 'make' a market alone; all are somehow enrolled in the process of reproducing the overall market as such. And this includes those *market devices* that constitute "the material and social assemblages that intervene in the construction of markets" (Muniesa, Millo, et al. 2007, p. 2): ticker tapes, calculating machines, gifts, and even the discourses by which we understand these artefacts (Knight 2013b; Callon, Millo, et al. 2007; Karl 2013). All provide the material means by which markets and their commodities or assets can be socially framed and practically understood, and when taken together they form the overall market as a material *assemblage* (De Landa 2006) of actors engaged in these processes. Here, *assemblage* or *agencement* can be broadly understood as a word play between the words arrangement and agency, where an economic actor can be understood not just as an individual human being but as something "made up of human bodies but also of prostheses, tools, equipment, technical devices, algorithms, etc." (Callon 2005a, p. 4). Or, as an *arrangement of agencies* where actors are embedded in a manner similar to the wider economic substantivist idea of economic actors being embedded in some form of group, institution or convention (Polanyi 1957; Granovetter 1985); but also distinct since there is a departure from the emphasis on individual human actors by emphasising technical linkages as well as social ones (Hardie and MacKenzie 2007, pp. 73-74).

This understanding of the construction of markets appeals to sociological theories of *framing* and *disentanglement* (Goffman 1975; Thomas 1991), where the accepted boundaries, borders and processes that make up a market and its commodities must be delineated (Callon 1998b, p. 18). Disentangling things (a commodity, a process, a value) from certain externalities (roughly speaking, aspects affecting others outside of the market transaction) is therefore the crucial process by which markets are made possible, because "no calculation is possible without this framing which allows one to provide a clear list of the entities, states of the world, possible actions and expected outcome of these actions" (Callon 1998b, p. 19). But such marketisation (e.g. of a commodity) is also a never-ending process that is always

(often problematically) 'overflowing' as different social entities and processes exceed the boundaries of the commodity or transaction (like the physical deterioration of a building). Despite debate around the ontology of these processes (Miller 2002; Holm 2007), these concepts have remained part of a useful framework to explain exchange in the marketplace. With Callon arguing that framing and overflowing can be regarded as more fundamental concepts than neoclassical alternatives like positive or negative externalities (Callon 1998a).

To demonstrate this, Callon has critiqued key neoclassical concepts such as Roger Guesnerie's 'calculative agency' (1996), which Guesnerie argues is a necessary part of a functioning market along with other concepts such as optimisation, organisation, competition, and price. In doing so, Callon demonstrates the manner in which concepts like calculative agency are actually part of a complex *collective* process and not one that is intrinsic or internal to market players (also see D'Andrade 1995). Or, that 'calculativeness' is culturally and socially (re-)constructed by market actors, all of whom form a complex actor world where agent cannot be separated from network (Callon 1998b, p. 12; Callon, Law, et al. 1986). Examples of this could include: the material relation to market devices and their role in how economic things become calculable (Desrosières 1998; Hopwood and Miller 1994; Power 1997); the agency of documents and instruments (Cooren 2004); the production and use of market price (Caliskan 2007), and the particular materiality of such economic settings and devices (Appadurai 1986; Beunza, Hardie, et al. 2006).

Whilst many of these examples concern smaller and specific market settings or devices, it should be noted that the power of this theoretical framework necessarily applies also to entire markets. For example, Alex Preda (2009) applies concepts of framing to explain the construction of modern financial markets as one which required myriad emergent actors to perform the socio-cultural shifts required to legitimise and disentangle certain processes. Hence, what was thought of as irresponsible *speculation* on stocks has now become regarded as responsible and legitimate *investment*, where indirect observation and co-ordinating devices (Barnes, Bloor, et al. 1996; Knorr-Cetina and Preda 2004, p. 15) facilitate the communicative

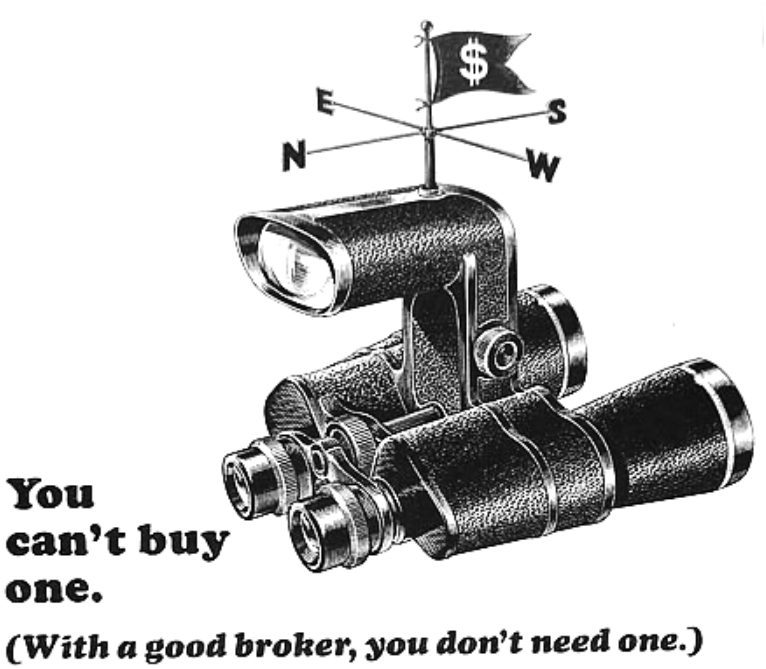


Figure 2.1: This 1964 advert for Dow Jones broker services from Time Magazine illustrates both the perennial fascination with scopic devices in financial markets, and the notion that some types of economic actor can or should be replaced by others.

boundary construction required for new markets to emerge (Bowker and Star 1999; Fleischmann 2006). Hence, markets are often described as a "sea of discourse" (White 2000, p. 118) that requires practices of legitimacy, status and scientific knowledge (Podolny 1993). By examining such 'boundary work' (Preda 2009a, p. 11) and 'strategic practical action' (Gieryn 1999, p. 23) a lot can therefore be said about how markets are anchored within society at large. And, whilst Preda was chiefly concerned with levels of boundary work in relation to the various existing *scopic* regimes of the market (Preda 2009a, pp. 17-19), the notion of looking at different levels of boundary work (micro-, macro- and kaleidoscopic)—as well as the 'boundary objects' between different actor-worlds (Star and Griesemer 1989)—can also be conceptually and heuristically useful in relation to how new market devices are designed long before they become adopted in practice. Hence, market assemblages are socio-technical arrangements with a capacity to both act and give meaning (or value) to action, and where no actor has a fixed ontology or inherent properties (Hardie and MacKenzie 2007, p. 58). And accordingly, to

reconfigure the market assemblage is to reconfigure agency itself. And to do so requires work (Callon and Caliskan 2008, p. 24)

One way to understand this work is as a process of 'translation' (Callon 1984), or the "mechanism by which the social and natural worlds progressively take form," and therefore where some entities or actors come to control and represent others amidst the market (Callon 1984, p. 19). Like a ticker-tape coming to represent price, and all the messy socio-technical relations beneath such a number. Here it is important to close this discussion by emphasising that such translation is a distinct theoretical framework within ANT that is juxtaposed to other more deterministic accounts of innovation. For example 'diffusion,' where "an idea, practice or object perceived as new" spreads in a more spontaneous manner that reflects the essence of the technology in question (Rogers 1995, p. 11). Instead, the process of translation can be thought of in four stages: *problematization* (definition of a problem, establishing certain obligatory passing points for other actors to solve the problem), *interessement* (locking-in of other actors), *enrolment* (the actualisation of roles defined in the previous phase), and *mobilization* (where a contraining network of relationships has finally been built). The process of translation can therefore be used as a complementary theoretical framework to explain technological innovation (and the 'disruption' alluded to in the introduction) that stands opposed to more deterministic accounts like that of technological 'diffusion' or 'essence' (Feenberg 1991). Hence, in order for a new market device to emerge in the area of real estate valuation, it's important to understand "how a few [market actors] obtain the right to express and to represent the many silent actors of the social and natural worlds they have mobilized" (Callon 1984, p. 19).

2.1.1 The performativity of economic knowledge

> "We must ask if the widespread use of the theory or model will make the world [and values] it posits more real or less real. If either is the case, we need to ask whether that world is to be desired or to be avoided."
> —MacKenzie, Muniesa, et al. (2007, p. 80) in *Do economists make markets?: On the performativity of economics.*

Whilst translation provides a broad framework for understanding innovation in actor networks, a more market-specific framework for understanding how markets change over time can be found in the so-called 'performativity programme' of economic research (Callon 2005b; Pardo-Guerra 2013; Samman et al. 2015). This field is focused on the notion that economic knowledge—manifest in models, devices, practices and so on—can somehow *perform* the world. That is to say, that economic knowledge is presented as having some sort of relationship with and/or effect upon the world's markets rather than just providing separate and 'objective' representations or interpretations of their prior reality. Building upon aforementioned work by Goffman, as well as J.L. Austin's work on 'performative utterances' (Austin 1962), this contra-positivist programme of economic research focuses not on the truth-value of 'utterances' or economic knowledge but on what certain statements, artefacts and other material embodiments of knowledge might do to the world. This provides the understanding that market artefacts are "not a truth about the world, but the spurious result of the particular procedures used in its production" (MacKenzie 2009, p. 9). In addition, this literature focuses on the necessary conditions of such performativitity: what are the 'felicitous' conditions for performances to succeed? One of the most-cited examples of this research in economics might be Donald MacKenzie's (2006) work on derivatives pricing indexes. Here MacKenzie illustrates with great technical rigour the manner in which the widespread adoption of the Black-Scholes-Merton derivatives pricing model initially caused the actual market prices to track the model. Thus the model became an 'engine' of the market, and not merely an objective representation of reality.

Influenced by the work of others in this area (Barnes 1983; Barnes 1988), MacKenzie has developed a framework of performativity (generic, effective, Barnesian, or counter- performativity) which reflects whether performative effects are benign or effective, and whether any particular form of economic knowledge makes the market look or operate more like itself or less like itself. Here, whilst economic knowledge could be any form of 'distributed cognition' (Hutchins 1995a; Hutchins

1995b) embedded in material market reality (MacKenzie, Muniesa, et al. 2007)—theories, models, concepts, procedures, data-sets, etc.—MacKenzie also emphasises that a proper analysis of performativity requires attention to the material and social factors amidst which these technical artefacts are used or operate. This might be the practical form of pricing books or the social context of the trading floor, both acknowledging Pierre Bourdieu's assertion that the conditions of felicity surrounding a performative utterance are also social conditions (Bourdieu et al. 1991, p. 73). Only by analysing these conditions can the difference between successful and unsuccessful performativity be understood (MacKenzie, Muniesa, et al. 2007, p. 69). (MacKenzie 2006a, p. 75; Merton and Bodie 2004; MacKenzie, Muniesa, et al. 2007, p. 76).

The emphasis on the social conditions for the adoption of a new technology or 'market device' is therefore an important part of this theoretical framework, but it's also important to be aware that MacKenzie's 'quite proper' Austinian-influenced theory of performativity has also been criticised and expanded upon by others (Zelezny 2014; Morris 2016). For example, Judith Butler's formulation of performativity (Butler 1988; Butler 1990; Butler 1993) and the social construction of gender emphasise that performativity is not a singular act that can be isolated at the moment of utterance. Rather, performativity can be thought of as a broader construction of context where the moments of such individual acts are better viewed as condensed historicities, which exceed themselves in past and future directions. This is therefore also related to the concept of hegemony in the sense that both emphasise the way in which the social world is made and comes to be as a historical process (Butler, Laclau, et al. 2000, p. 14). Examples of research that takes these more subtle processes of performativity into account might include the emergence of credit scorecards as devices that produce new market forms and mindsets (Poon 2007), or material examinations of the shopping cart's power to reconfigure both the shopper and the act of shopping itself (Grandclément and Cochoy 2006). Both of these devices are shown to display performative power in a manner that can produce new subjectivities and agencies, but in a manner that is less focused on their Austinian performativity and more related to their discursive or material properties,

as well as the relationship between the two (Goede 2012, p. 32). Interestingly, these more nuanced accounts of performativity also meet well with critical accounts of decision making (e.g. a particular real estate investment), where "the decision is not so easily located within the limits of a self-contained, sovereign subject, emerging instead as a distributed, relational process" (McCormack and Schwanen 2011, p. 2801). Furthermore, at least one other scholar has successfully applied a performativity analysis in approaching the more analogue 'assetisation' processes of real estate (Weber 2015). Therefore, whilst not without critique (e.g. Nussbaum 1999; Benhabib 1995, p. 67), Butler's observations do seem to lead toward a broader understanding of performativity which also emphasises that 'unhappy' and infelicitous conditions are also important domains where power can operate, and so the importance of consciousness and intent is challenged (Zelezny 2014). Hence there is a reason for also examining emergent and even failed performative rhetorics, since although many past technological promises might now be thought of as failures, so too are they enrolled in the construction of categories, commensurables, knowledges and disciplines inherited today (Light 2003; Barnes 1996; Barnes and Wilson 2014).

Therefore, the theoretical frameworks of critical economic sociology, including its origins in STS, ANT and performativity, are eminently useful to understanding the social construction, reproduction and performance of economic markets. They allow researchers to evaluate the ways in which new market cultures, processes and knowledges can give rise to new categories, values and market assemblages. Which can range across techno-social domains from the creative processes of technical finance (Lépinay 2011) to crowd contagion and social interaction itself (Lange and Borch 2014; Karl 2013). All of these examples raise parallel questions of how values could be reconstructed in real estate markets through the contextual discussion in the introduction above that cited the potential for novel quantification of phenomena like neighbourhood quality. Since if these processes are indeed occurring, then the changes brought about by such framing work will be accompanied by the emergence of new market artefacts and (especially) actors. And, as tense boundaries are reproduced, set in place, or changed by these actors, there are often tangible

controversies and resistances that will emerge surrounding the reconfiguration of assemblages and power (Latour 2005). Like the transference of authority and credibility from broker's body to ticker tape, or the deregulation of the 1970s options markets studied by MacKenzie. Therefore, although the work done in constructing boundaries around markets has never been easy to do, it should be equally possible in relation to contemporary events in real estate markets: "boundaries do not come from nowhere" (Preda 2009a, p. 21) ... "they are set in place from within markets by concrete historical actors" (Preda 2009a, p. 19). Therefore, the first research question is: **what actors are emerging around real estate data analytics platforms?**

2.2 Data analytics platforms and the circulation of value

Beyond the framing and disentanglement of markets or commodities described above, it is useful to consider a third related concept that provides a framework for valuation between commodities or markets: *commensuration*. Or, the "comparison of different entities [or qualities] according to a common metric" (Espeland and Stevens 1998, p. 313) in a manner that enables markets to exist and processes of valuation and exchange to take place (Preda 2009b). Or, that can offer new ways of 'sorting things out' (Bowker and Star 1999) which might concern an array of non-market social processes as well: value and division of household chores in the home and how this forms different understandings of gender (Hochschild and Machung 1989); the measurement of 'water quality' (Espeland and Stevens 1998); or the constitution of people and 'society' itself through statistics (Hacking 1986; Porter 1995). Indeed, as a transformative social process it might even enable the trade of commodities that do not yet exist (Cronon 1991), and so commensuration can also *bring things into being*. Commensuration is therefore understood as a social process that can demand vast resources, discipline and organisation. But it can also radically transform the world through the new categories and values it produces, and the relation of these new metrics to powerful organisations like banks, legislatures, or institutional investors in real estate. Here the implications of different

types of commensuration are therefore deeply important to the market's internal decision-making processes and organisational structures (Stokey and Zeckhauser 1978; Feldman and March 1981). Hence where these processes in real estate markets were previously considered relatively archaic or analogue (Baum 2017), then the practical and theoretical implications of digital 'mechanized decision-making' could be vast (Espeland and Stevens 1998). And whilst related issues have been discussed to a degree by real estate scholars over the years (Farragher and California 2008; Brown 2005; French 2001; Byrne 1996; Trippi 1989), they are usually regarded as largely technical matters with little emphasis on the social dimensions to commensuration (Espeland and Stevens 1998).

Commensuration (and valuation) is therefore also inherently political: it can reproduce relations of authority, create new political entities and establish new interpretive frameworks (Espeland and Stevens 1998; Beer 2016). This also holds true for historical accounts of property and real estate: projects of mapping and measurement were never purely technical processes, but have ultimately become bound up in the history of what is now understood as real estate that can be bought and traded in a market. In terms of spatial representation and techniques of ownership, this has both social implications for how subjects understand themselves in relation to real estate (Kain and Baigent 1992, p. 4) and political implications in terms of how space becomes territory (Corner 1999; Winichakul 1994, p. 22) or real estate commodity (Madden 2014; Lefebvre 1991). This is the case whether we consider the original surveying chain (Shaw 2018; Gunter et al. 1662), historical practices and knowledges of cartography (Harley 1989; Livingstone and Withers 1999; Pickles 2004; Foucault 2007), or specific land tenure and ownership systems (Cramb 1989; Morris 1976). Hence, the varied historical commensuration techniques of measurement and rationalisation of land or real estate, including the history of those lost or forgotten units which were/are replaced by new forms of measurement (Shaw 2018; Linklater 2013), are similarly not merely technical exercises. This process can also be "a means of making private property" (Linklater 2002, p. 14); it can reproduce particular hegemonies in scientific thought (Turkle and Clancey

2009); or it may even result in differential subjective conceptions of space itself (Foucault and Miskowiec 1986; Milner 2017, p. 18).



Figure 2.2: Illustration from William Leybourn's *The Compleat Surveyor* (1653) showing showing Edmund Gunter's (1662) surveying chain in use. In relation to the divine reverence with which the device was regarded by those concerned with land ownership—implied by the cherubs—it should be noted that such a tool was not merely a technical means of measuring land in commensurate units, but also "a means of *making* private property" (Linklater 2002, p. 14)

In other fields, there is therefore growing attention on new forms of description, classification and 'sorting things out' in the emergent digital domain of big data, data analytics, and platforms (Kitchin 2014a; Beer 2016; Srnicek 2016; Bratton 2015; Beer 2018). And within field of Critical Data Studies specifically (Iliadis and Russo 2016), there is also an overlap with the earlier literature on the construction of markets in terms of a desire to understand such new digital data analytics platforms as 'data assemblages' (Kitchin and Lauriault 2014; Dalton et al. 2016). Or "the technological, political, social and economic apparatuses and elements that constitutes and frames the generation, circulation and deployment of data" (Kitchin and Lauriault 2014, p. 6). This conceptually complements the economic sociology literature above inasmuch as it focuses on the "materially interconnected

and agentially-problematic nature of these socio-technical systems" (Dalton 2017), including the way in which they are implicated in "the production, dissemination and legitimation of knowledge" (Isin 2015, p. 26).

Amidst this field of study there is also a drive to understand the different forms and interactions of value (and valuation) that can emerge from data analytics platforms in different domains (Sadowski 2019b; Fourcade and Healy 2016; Arvidsson and Colleoni 2012; Arvidsson 2016; Smith, Hardey, et al. 2019). This is a large area of research, but such value forms might especially include the new *metrics* that these platforms produce and *circulate* (Beer 2016); the affective value of interfaces or data (Tkacz 2016; Cockayne 2016; Andrejevic 2011); the forms of value implied by the logics of the platforms themselves (Srnicek 2016; Bratton 2015; Täuscher and Laudien 2017); the underlying materialities supporting these assemblages of value (Dourish 2017); or simply 'data as capital' itself that is derived or appropriated from the 'datafication' of social processes generally (Sadowski 2019a; Mayer-Schönberger and Cukier 2013; Thatcher et al. 2016). Indeed, it also overlaps with other literature on commensuration and quantification in terms of its emphasis on the political implications of how new values are produced. For example, through the novel invention or reproduction of myriad social categories like race, immigration status or the definition of poverty (Turner Lee 2018; Amaro n.d.; Amoore 2013; Hacking 1986). Including using new methods for doing so, like machine learning and data science generally (O'Neil 2016; Boyd and Crawford 2012). This returns us to contemporary questions around the politics of platforms (Gillespie 2010) and the valuation work they have begun or claim to do in real estate markets (Helgesson, Krause, et al. 2017; Helgesson and Muniesa 2014; Grossberg 2010; Muniesa 2017), as well as the future possibilities they entail through the forms of value that they circulate. Hence, the rhetoric of quantification around new data analytics platforms for real estate should be examined from the perspective that it also inevitably contains certain normative assumptions about what should be quantified, how and why (Porter 1995). And the politics of disagreement and dissonance (Rancière 1998; Stark 2009) that can arise amidst different forms of value should be examined in

terms of Callon's translation. In other words, we should ask which few real estate actors obtain the right to express and to represent the silent "real estate many"? Or, who gets to control these new means by which to commensurate real estate value as a 'material order' (Rancière 1998; Foucault 2007)?

Hence, to better explain the notion of value 'forms' it's useful to return to the fact that real estate value is not simply a question of *price*, but is related to more complex dynamics that reflect the social and political nature of commensuration and the production of knowledge (Myrdal 1998; Caliskan 2009). In this sense, foundational literature in economic geography has long argued for taking a critical position towards understanding value theories themselves as assemblages of metaphors, meanings and models. Essentialist, monolithic constructs like Marxist labour or neoclassical utility are some prime examples (Barnes 1996). And, grounded in the notion that mind cannot "mirror the world" (Rorty 1980), a discussion of value theory should always be aware of how many theories of value often tend (in various ways) to leave things out or to pay attention to what is deemed incommensurable. Or perhaps to simply "steamroller geography as a colourless blanket" (Sills 1968, p. 264). Instead, the notion of value should be approached in a manner that critically rejects the scientism and rationalism of 'Enlightenment thinking' outright (Resnick 1987; Laclau and Mouffe 1985; Rorty 1980); instead embracing an understanding of commensuration as a social process. Therefore, to reflect on the literature discussed so far, understanding new forms of value produced by data analytics assemblages should not chiefly be concerned with the accuracy or 'false science' of such tools (Goede 2005). Instead, an understanding of how emerging data analytics actors are producing new forms of real estate value requires first an examination of the general production of facticity, and then an explanation of what social conditions of felicity exist within which new understandings of value could be observed to come into being and circulate or function. Evaluating commensuration as a social process, or the performativity of materially embodied economic knowledge, should therefore view data analytics methods and products as a social phenomena in themselves (Wilson 2014; Savage 2013). The objective is them to try and descriptively 'trace associations'

(Latour 2005) of such platforms in order to ask how the actors enrolled in these techno-social phenomena are producing new forms of real estate value. Hence the second research question: **how are new forms of real estate value being produced by the actors enrolled in emerging data analytics platforms?**

2.3 The political economy of real estate

Whilst the politics of commensuration may at times concern relatively innocuous matters of disagreement or dissonance around who gets to define value, it is hard to ignore the context of valuation within the global real estate market as something intrinsically related to the global economy at large. In many countries of the Global North (like the United Kingdom and United States) this includes its relationship to an ongoing housing crisis (Dorling 2014; Madden and Marcuse 2016), and the very significant lasting effects of the 2007-08 financial crisis (O'Hara 2014; Blyth 2013; Peck 2012). Both factors which will become especially relevant to the UK/US-focused case study used in this research. Hence, to build upon the literature above, this research should follow the call in STS research to approach the development of real estate data analytics platforms for institutional investors in real estate (e.g. private equity funds, pension funds, etc.) as a 'matter of concern' (Latour 2004): or where the production of knowledge occurs around issues of contemporary political interest. And, given that almost all real estate data analytics platforms imply a distinct operational focus on the city (as did the case study in this research), it makes sense to contextualise this matter of concern amidst the broader urban condition—one in which there are epistemic questions abound in the area of data analytics (Kitchin 2014b; Kitchin 2014c).

To begin it is useful to consider the long-established tradition of critical political economic analysis of the urban process under capitalism (Harvey 1985; Harvey 1982), which has been developed in dialogue with both complementary theory on urbanisation in general (Lefebvre 2003) and uneven development (Smith 1984). As part of this analysis, the built environment has been identified as a crucial component in the urbanisation of capital, and especially as a powerful regime of

accumulation in its own right—or, a "rational landscape for accumulation" (Harvey 1989, p. 23). Here, real estate is seen as a distinct secondary circuit of capital accumulation and an attractive "escape valve" for a global "wall of capital" on the "perpetual hunt for yield" (Fields 2018; Aalbers 2016; Christophers 2011; Fernandez and Aalbers 2016; Moreno 2014). Amidst this contextualisation, large-scale institutional real estate investment has therefore been regarded as increasingly relevant to the global flows and contradictions of capital across urban space and time (Weber 2002), and to urbanisation in general as a powerfully creative and planetary force (Lefebvre 2003; Brenner and Schmid 2012; Merrifield 2013; Brenner and Schmid 2014). And particularly since the 1980s, a number of historical processes (the rise of financial services, increased real estate investment, state redevelopment of city centres—see Fields and Uffer 2016) has led to many political economic theorisations of land and the built environment as a financial asset in its own right (Haila 1988; Harvey 1982; Weber 2002).

Whilst there are many debates as to the precise significance and function of real estate as a regime or circuit of accumulation (Christophers 2015), the notion of "circuits of capital" has lead to an increased focus on the aforementioned development of the financial sector in general as a fourth circuit of capital (beyond the three conceived respectively as production, real estate and social expenditures relating to the reproduction of labour) (Aalbers 2016). Or, finance as increasingly "decoupled from production to become an independent power, an autocrat over the real economy" (Cox 1992, p. 29). As a phenomena this has been labelled *financialisation*, or "a pattern of accumulation in which profit making occurs increasingly through financial channels rather than through trade and commodity production" (Krippner 2005, p. 14). And, despite criticism of the concept (Christophers 2015), many have argued for its utility in relation to real estate research as "a framework for exploring how different calculative practices are employed by local and international investors and result in different spatial investment strategies" (David and Halbert 2014; Murphy 2015), as well as the "growth of financial actors ... new financial tools ... and the increasing significance of financial firms in different areas of the

economy such as real estate" (Gotham 2009, p. 360). Not to mention, the lived experience of the spatial and material outcomes of real estate investment and the way in which it "channels the flow of capital onto and through land" (Kaika and Ruggiero 2016, p. 18; Harvey 1982, p. 361).

For this reason, research in urban geography has increasingly focused on the financialisation of real estate, and in recent years on the financialisation of housing in particular as a sector that had been relatively ignored pre-crisis (Fields 2018; Aalbers 2016). Here, reinforcing the notion that markets are not natural but constructed (Aalbers 2016, p. 7), this area of literature emphasises the importance of studying the new tools and actors of financialisation in relation to housing as an area of real estate that has recently undergone renewed 'assetisation' following the crash of 2007 (Fields 2018; Ward and Swyngedouw 2018). And, in overlapping further with the literature on critical data studies above, this research has recently begun to move beyond discussion of mortgage markets and housing sub-sectors and towards the realm of big data and platforms as the tools of newly financialised housing systems (Rogers and Fields 2017). This ranges from the automation of rental housing systems and the disciplining of new housing consumers (Fields 2019a) to the extraction of data from smart homes (Hall 2018) and the 'uploading' of real estate as a newly digitised investment terrain (Rogers 2016). Adding to this, I have also published related literature that offers a research programme on digital platforms and real estate markets in general (Shaw 2018). Each of these areas typically deals with how large institutional investors are pursuing newly financialised housing assets despite the boundaries that they meet. Such as poor market information, market fragmentation, management costs, risks relating to their tenants, and the absence of any comparables or track record for newly emerging assets (Berry 2000).

Hence, there is a growing body of literature that is starting to examine the theoretical and practical implications of financialisation for housing markets and their stakeholders or subjects. In particular, the research is beginning to look at the processes by which financialisation occurs (and with an increasing attention to digital platforms and data), and also the way in which new assets are performatively

constructed according to the frameworks laid out above. Or, how contemporary models, theories and beliefs around innovative data analytics technology are "actively engaged in the constitution of the reality that they describe" (Callon 2007, p. 318; Weber 2015; Weber 2016), and where there might be various reasons (e.g. social, cultural, technical, financial) why real estate actors *need* new forms of value and methods of commensuration. Additionally, this requires that the research examines the political economic implications of these newly financialised real estate assets for those 'unwilling subjects of financialisation' (Fields 2017), which includes: what actors/who refuses to pull in line with these processes; who may be harmed by them and therefore find their performative effects undesirable; and what sort of transformation of real estate cultures or markets may these processes perform overall. What opportunities or theoretical possibilities do they entail as a regime of accumulation, or as renewed crisis?

2.3.1 Fifth-wave gentrification

> "The Fund was established to give investors exposure to US residential property and is the largest Australian-listed property trust with a primary strategy of investing in freestanding and multi-tenant US residential property in the New York metropolitan area ... *the Fund focuses on investing within undervalued neighbourhoods experiencing growth and gentrification.*"
> —*US Masters Residential Property Fund Strategy* (2016, p. 2).

As a topic that is especially relevant to the case study of this research (*Dashboard X*), and one that has been recently connected to financialisation, this section should close by briefly discussing the contemporary spectre of *gentrification.* As a process that is arguably emblematic of capitalist urbanisation and uneven development (Smith 1982), gentrification is a (perhaps over-used) perennially popular and relevant phenomena in urban geography (Lees et al. 2016). Broadly speaking, it might be defined as "a process involving a change in the population of land-users such that the new users are of a higher socio-economic status than the previous users, together with an associated change in the built environment through a reinvestment of fixed capital" (Clark 2005). But it should not be forgotten that this also means

(in the most basic terms) that the market value of real estate in any gentrifying area also *goes up*. As a result it has also been understood a spatial economic process of (often extreme) injustice and displacement (Smith 2002; Harvey 2012; Angotti 2008; Davidson and Lees 2010).

Originating in the work of Ruth Glass (1964)—and later refined further by many other scholars like Neil Smith (Smith 1979; Smith and Williams 1986; Smith 1996), Sharon Zukin (Zukin 1982; Zukin 1987), David Ley (Ley 1996) and many others—the concept has now long since 'gone global' (Atkinson and Bridge 2005) and become closely entwined with, and evaluated alongside, the concept of planetary urbanisation (Lees et al. 2016). And as part of this move towards understanding 'gentrification generalised' (Smith 2002) there have naturally been many debates as to the causes and explanations of gentrification in different localities. For example, one particularly popular area of research has been concerned with the social or cultural causes of gentrification (Ley 1994), or the 'consumption-side' explanations of gentrification as opposed to economic production-side theories. This research asks questions like "What sort of person or class of people cause gentrification?" And in this case, the preoccupation has ranged across the middle-class generally (Butler 1997), the 'new middle-classes' (Ley 1996), so-called marginal gentrifiers (Rose 1984; Mendes and Caldwell 2013), artists (Berry-Slater and Isles 2009; Harris 2012; Makagon 2010; Ley 2003), the Creative Class (Florida 2002; Florida 2014), hipsters (Grand 2018; Cowen 2006), or the denial that any such global gentrifier class really exists to begin with (Lees et al. 2016). Others might cite other factors like a cultural 'rediscovery of the urban' (Goonewardena et al. 2008, p. 293) or globalisation in general (Butler 2010b). However, rather than review the entire trajectory of this field it is the purpose of this brief review to simply re-iterate its relevance to real estate as being one which has now 'gone mainstream' in terms of its co-option by real estate investors themselves (as indicated in the quote above). Or, that institutional real estate investors have now developed a keen interest themselves in all of the above. Hence, although the importance of discussing foundational concepts like the 'rent-gap' (Smith and Williams 1986; Clark 1992; Slater 2015)

and planetary gentrification (Lees et al. 2016) should not be downplayed, these concepts will rear their head later in the research after their relevance to this topic has been better established through the case study in question.

Instead, for now it's important only to emphasise the recent overlap between the financialisation literature and the concept of gentrification. This section will therefore close by reflecting on the recent description of "fifth-wave gentrification"[2] by Aalbers (2019) as a result of the same dynamics at play in the financialisation of real estate in general. That is to say that fifth-wave gentrification is defined as the urban materialisation of financialised or finance-led capitalism (e.g. Boyer 2000). And, that this is enabled by a series of dynamics including: the institutional investment in real estate as "just another asset class" (Loon and Aalbers 2017); increased investment by transnational capital eager to switch into this secondary circuit (the 'wall of money' mentioned above); platform capitalism and touristification; global mortgage debt; lack of housing affordability; the role of the local state; and the subsumption of alternatives. Not to mention cyber-libertarian impulses and the very same naïve technological solutionism that this chapter began by referencing in the introductory paragraph (i.e. Morozov 2013, cited in Aalbers 2019). Amidst this context, the dominant actors and forces in urban development are not simply capital but financial capital—especially in the hands of large institutions. Hence, some argue that "financial actors can determine *when* cities grow ... as well as *how* and *where* they grow" (Weber 2015, p. 39). Hence there is a need to study the investment practices of big real estate capital to understand contemporary processes of gentrification.

This research imperative is therefore especially pronounced amidst a backdrop of myriad emerging data analytics platforms promising heightened insight and knowledge into the value of particular urban neighbourhoods or spaces. For example, the widespread engagement of some groups of urban individuals with location based services and platforms raises the question of how they are becoming enrolled in new measurement techniques (Ritzer 2013; Zukin et al. 2015; Payne 2018)—does Instagram or FourSquare data present new opportunities for real estate investment

[2]In reference to previous waves outlined by Hackworth and Smith (2001).

as part of fifth-wave gentrification (Boy and Uitermark 2017; Ozturkcan et al. 2014)? What about Yelp and TripAdvisor (Zukin et al. 2015)? Whilst this may seem far-fetched to some, there is already ample evidence that this approach to commensurating gentrification is occurring in the academic sphere (Hristova et al. 2016; Reades et al. 2019; Florida 2018; Bacchi 2019; Rodionova 2016), and the case study about to be presented in this research will provide evidence for why this is also relevant and timely to institutional investor practices in global real estate.

Therefore, at least in the context of the urban, there is ample reason to research the synergies between newly emerging real estate data analytics platforms, real estate value, the construction of markets, financialisation and gentrification from the STS perspective. Not only is it important and interesting to find out what sort of actors and forms of value are emerging, circulating or being produced in relationship to data analytics platforms in this field, but there are important theoretical and political implications to consider in relation to this as a 'matter of concern' (Latour 2004). Questions might include: what sort of performative effects do newly emerging data-driven investment practices have on processes of urbanisation and gentrification? What sorts of political economic implications do they entail? Who might suffer the consequences, and what impact do they have on any 'right to the city' (Lefebvre 1968; Harvey 2012)? The latter question may be especially relevant to other literature on large digital information monopologies and platforms (Shaw and Graham 2017). The third research question therefore becomes: **what are the political and theoretical implications of these new real estate values for established and emerging urban real estate market actors and stakeholders?**

2.4 Hyperreal estate?

> "In today's transnational, digitally enhanced market, housing is becoming ever less an infrastructure for living and ever more an instrument for financial accumulation."
> —David Madden and Peter Marcuse (2016, p. 26), in *In Defense of Housing.*

> "Future property software platforms will be powerful enough to use this Big Data to build an incredibly detailed psychographic profile of a consumer's lifestyle preferences and choices, and so create hyper-personalised portfolios of suitable neighbourhoods and properties within those neighbourhoods."
> —Future Laboratory (2016, p. 14), in *Property: a 20:20 vision.*

> "Present-day simulators attempt to make the real, all of the real, coincide with their models of simulation."
> —Jean Baudrillard (1994, p. 2), in *Simulacra and Simulation.*

As a departing theoretical hypothesis, Jean Baudrillard's account of a post-modern condition of hyperreality suggests that the world is now so reliant upon models, maps and other representational technologies that reality has almost disappeared. Reality increasingly imitates these models, and does so at ever-increasing speed in terms of how this reality is brought together as a system of signs (real-time dashboards, social media, surveillance). With few surviving distinctions between reality and representation, there is only simulacrum—the truth that conceals the lack of truth—where pure simulacra is the condition of hyperreality in which the original 'real' building or home has entirely disappeared in simulation (Baudrillard 1994). This condition is reproduced by the phenomena of media culture, commodification, multinational capitalism, urbanisation and ideology. Consequently this analysis has been applied to a range of related phenomena including: technical processes and political implications of financial accounting which "reinforce the absence of a market reality" (Bougen and Young 2012, p. 390); marketeers as 'symbol experts and managers' (Svensson 2001); and in relation to postmodern cities in general (Soja 1997), where public relations have ensured that "the image of the city becomes dissociated with reality, and the government [consequently] operates in a simulation of itself" (Zavattaro 2012, p. vi).

Therefore, as a meta-hypothesis,real estate data analytics platforms designed for valuation purposes could be considered as part of the precession of simulacra in real estate: *hyperreal estate*. This might imply a series of observable dynamics: the relative disappearance of 'real' buildings and even urban processes (like gentrification) and some form of their replacement or reconstitution with commensurate signs

of exchange value that simulate an 'original'; the valuation of all urban space through a real-time digital dashboard; more rapid capacity to exchange and trade upon real estate value; and abstract notions of 'houses' that are no longer material dwellings so much as they are symbolic digital containers that project a future rental value. Without an estate agent or surveyor, tenants can deal with 'automated landlords' through mobile applications and social media plugins (Fields 2016), and investors can deal with digital representations of buildings they have never visited in neighbourhoods they will never visit. The synergy between datafication (Mayer-Schönberger and Cukier 2013), gentrification and the urban as "an object of consumption" (Lefebvre 2014b, p. 203), multinational capital and financialised real estate (Aalbers 2016), and the language and ideology of data analytics (Beer 2018) therefore comes together in real estate simulacrum. Building upon the theoretical framework present in the literature above—branches of market-oriented and data-focused STS along with critical political economy of real estate—this meta-hypothesis provides an intriguing horizon for considering the implications of real estate data analytics. Is there a real estate reality that is somehow 'disappearing' and to what ends?

Here it is suggested that a final reflection should be given to literature (often critical of Baudrillard) that focuses more on the mechanisms of the reproduction of knowledge than perhaps the hyperreality thesis allows room for. In particular, some have criticised Baudrillard for not paying enough attention to the unequal social relations within which the production of hyperreality might be embedded (Rose 2012, p. 5); implying that although hyperreality is interesting theoretically, it does little for understanding the politics of any matter of concern. To this end, examining the way in which platforms are a social phenomena in themselves should pay attention to how they may be used to 'see' the world. Just like a state sees (Scott 1998), a Mars Rover sees (Vertesi 2012) or other market actors might see (Fourcade and Healy 2016). That is to say that, as an assemblage, it is useful to think about how real estate data analytics tools might represent a collection of actors engaged in the production of a new way of seeing that is associated with a

particular emergent knowledge of real estate. Or, how the 'data imaginary' might inform the 'data gaze' and vica-versa (Beer 2018), and how certain ways of seeing imply certain forms of 'situated' knowledges (Haraway 1988; Berger 1972). In other words, this research might not (yet) be about how data analytics platforms are currently having immediate material effects upon real estate or urban spaces 'out there' today, but more importantly about how these spaces are beginning to be commensurated, valued, *seen* and *known* as categories, metrics and things today (for actions tomorrow). What hyperreal estate do they precede? From this perspective, the political implications concern forms of power that are not just about direct repression, but also about how real estate things are becoming "traversed and produced" (Foucault 1980a, p. 119). This requires an explanation of what lies behind these technologies and the methods by which they see and therefore claim to know new real estate markets. Since as black boxes (Pasquale 2016), where a great deal of what calculates and commensurates value is rendered opaque by complex data assemblages, it is likely the case that the particular technological obduracy and 'measurement authority' they entail also reads and writes new real estate markets, assets and values in particularly new ways (Latour 1991; Beer 2016; MacKenzie and Wajcman 1999; Mattern 2017). Furthermore, as part of this explanation it must be asked who gets to control and interpret these 'indexing machines' and what sort of political economy do they serve (Lazzarato 2014)? These wider reflections will be addressed in the final two chapters of this research, including their relevance to the power/knowledge relationship (Foucault 1980a) and the ultimate urban political question of the "path to the possible" (Lefebvre 2003, p. 185). Or, what sort of real estate markets, values, processes and assets do these data analytics platforms enable through the knowledges they produce? And to return to the performativity framework, it is right to ask "whether that world is to be desired or to be avoided" (MacKenzie, Muniesa, et al. 2007, p. 80)?

2.5 Research questions

The literature review above has outlined a series of useful frameworks and sub-questions with which to address this research into emerging data analytics platforms for real estate investment. Via consideration of the social construction of markets and wider STS approaches to technological innovation, it is clear that the performativity framework offers a useful means to approach the research overall. This literature raises the first research question of explaining what actors are emerging around such platforms. Furthermore, combined with literature from critical data studies and the sociology of valuation, a productive extension of this literature raises the question of what new forms of values these actors are producing. This introduces implicit political matters of commensuration and value that have then been better contextualised with relevance to real estate markets specifically. This has demonstrated how contemporary research into urbanisation and the financialisation of real estate (which also complements the earlier STS literature) provides a political economic context with which to consider both the theoretical and political implications of real estate data analytics as an emergent 'matter of concern.' Closing on more philosophical questions relating to the production of knowledge, power and market reality in general, there is now a novel and timely series of research questions that will be answered by this research:

1. *What actors are emerging around real estate data analytics platforms?*
2. *How are new forms of real estate value being produced by these actors?*
3. *What are the political and theoretical implications of these new values for established and emerging urban real estate market actors and stakeholders?*

3
Methodology

The primary goal of this research was to enter and participate in the actor-world of real estate analytics in order to answer the questions raised in Section 2.5, and according to the theoretical framework outlined in the previous chapter. This was carried out with attention to the hypothesis raised in Section 2.4 generally: data analytics platforms as market devices that are producing new market values and/or facilitating the social construction of a *hyperreal* estate market. The research objective therefore required focus on how value-focused (pricing, market insight, etc.) data analytics products are currently being developed, adopted and employed by the real estate market.

Whilst empirical access to to the actor-worlds of markets for the purpose of interpretive analysis is not easy, it is clear that a pragmatic qualitative approach has been successful in the past (Beunza and Stark 2011; MacKenzie 2006b; Zaloom 2006; Zaloom 2003; Abolafia 1998; Abolafia 1996; Heath et al. 1994). And, as Callon (2005a, p. 5) states generally toward this goal: "the performativity programme starts with an ethnography of socio-technical agencements". Therefore, this research began with the assumption that it is possible to gain knowledge of the social construction of markets (and market devices) by directly immersing oneself in the material site(s) of their (re)production. And based upon this assumption, a multi-sited ethnographic case study approach was adopted as the broad method of investigation; with

three relatively distinct phases of data collection, and where in-depth participant observation provided the primary source of research data throughout (see Figure 3.1).

The first phase of research proceeded by gaining direct access and involvement with a 'PropTech start-up' (hereafter *Company X*, a real estate data analytics company) over six months as they (and I, as an employee) developed products that were designed to be utilised by real estate professionals making decisions around investment. As the research progressed this work became primarily focused on the development and sale of one analytics product in particular, that I and *Company X* developed as part of my employment: *Dashboard X*. The value of this overall approach is outlined in below in Section 3.1 as a multi-sited ethnography which 'followed' *Dashboard X* through three distinct sites of its production and constitution as an emergent market device. However, throughout these sites there was a continued focus on the London real estate market as a pervasive object of interest to all parties (colleagues, clients, competitors, etc.). This usefully provided an over-arching thematic continuity that was also beneficial to the research for reasons of scope, feasibility and London's important position as a 'global city' with great significance to the global real estate market (Sassen 1991; Aalbers 2012, pp. 7-8).

To further extend and develop an understanding of the actor-world around *Dashboard X* the research then engaged the wider world of real estate data analytics through a phase of interviews (Section 3.1.2), and a further phase of participant observation in related industry events (see Section 3.1.3 and Table 3.2). These two additional phases of research provided supplemental research data for the purposes of discourse analysis (e.g. marketing materials of competitors), including the way in which *Dashboard X* and similar products were understood by other key actors (Section 3.1.3). Hence, this three-part qualitative approach offered significant depth to the study and provided an opportunity to enter the networks that socially construct the global real estate market at the boundaries of *Dashboard X*. They also facilitated the emergence and understanding of three key sites around *Dashboard*

X: the start-up 'garage' (Gann and Dodgson 2016; Ries 2011)[1] where it was built, the client's boardroom where it was sold, and the conferences where both it and other products came to be known by the wider market.

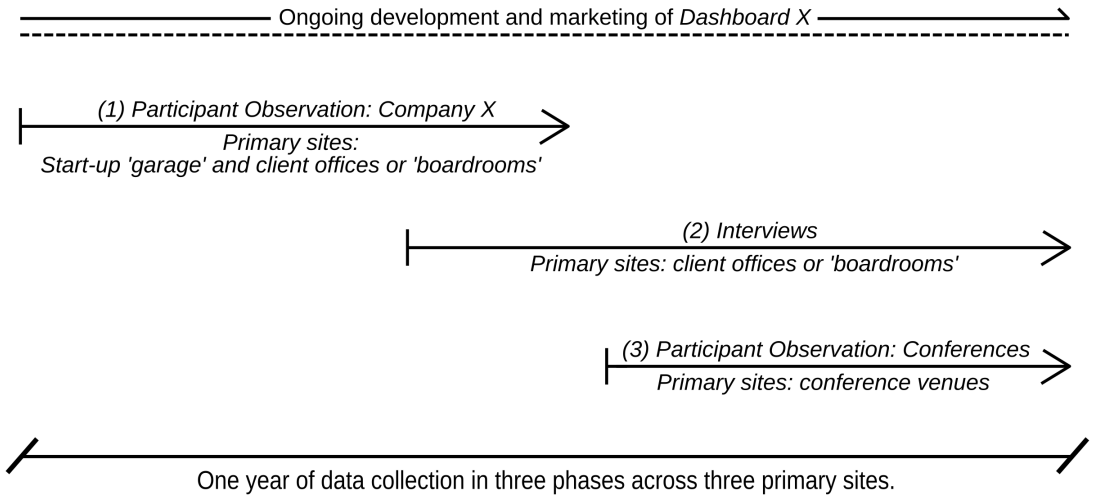


Figure 3.1: A multi-sited ethnography of *Dashboard X*. This diagram shows the manner in which around one year of data collection proceeded through three distinct phases. Each phase was primarily focused on *Dashboard X*, as it was produced, marketed or discussed throughout three different geographical locations (the start-up 'garage', the boardroom, and the conference or industry event).

3.1 Multi-sited ethnography

In common with much ethnographic work, the methodological disposition for this research began with the epistemological assumption that social interactions are 'embedded' (Robson 2006, p. 38). Or, that "man is an animal suspended in webs of significance he himself has spun," and where "culture ... [is] those webs" (Geertz 1976, p. 5). Consequently, the over-arching objective of this research was to obtain and analyse a thick description of those 'webs' that inform and interact with the actor-world of emergent real estate data analytics products and the wider field or market within which they are situated (Robson 2006, p. 186). However, it is important to note that I also retained an open-mind as to the gravity of the common

[1]The fable of the 'startup garage' has even spawned two programs at Stanford University called 'Startup Garage', designed and led by the 'Lean Startup' method guru and entrepreneur Steve Blank, who claims "a scalable startup grows from a garage into a Google" (Blank 2010).

emphasis on webs of culture as *symbolic*. And instead proceeded with a concerted reflection and consideration throughout that social interactions are also embedded in rather more complicated cultures and geographies which might be variously labelled hybrid (Sui and DeLyser 2011; Whatmore 2002), post-phenomenological (Ash and Simpson 2016), material (Dourish 2017; Ingold 2007), or cybersemiotic (Hayles 2005). Not to mention, that they might also be less exclusively focused on *man* than the quote above implies (either anthropocentrically, or in terms of gender). Nevertheless, in need of starting somewhere, the research began with the objectives of deep immersion and thick description of the research field as a beginning towards *an* ethnographic method.

From the beginning I also made the conscious decision that a distinct departure was required from the origins of the ethnographic method in the thick description of a field characterised by geographically self-contained or 'single-sited' cultures and communities. In particular, the research was conscious that the problematic and interconnected processes and spaces of globalisation and transnational capitalism (Wallerstein 1974) that typically characterise contemporary real estate markets (Forrest et al. 2017; Rogers 2017; Aalbers 2016) and the development of new digital technologies (Currie and Lagoarde-Segot 2017; Dyer-Witheford 2015) may pose a problem for research that focused on a single site alone. It was also acknowledged generally that research field sites concerning business operations or organisations are rarely ever single, physically-bound entities (Jordan 2003, pp. 6,46; Caulkins and Jordan 2012); that the ideas, people and artifacts constituting the actor-world of the real estate market circulate in a distinctly more global and rapid manner (Fortun 2009, p. 169); and where research would do better to focus on processes in motion rather than units in situ (Melhuus et al. 2010, p. 7). Therefore, based on these observations and the recommendations of other researchers towards how best to link theory with practice (Hine 2007; Burawoy 2001, p. 156), adopting a multi-sited ethnographic scope seemed most beneficial to this particular research topic (Marcus 1995; Marcus 1998; Melhuus et al. 2010). This could then include conducting the research via 'following' certain actors and objects of interest (Marcus

1995) as encountered within a field that extends across a multiplicity of sites, flows and circulations (Berg 2008).

As a consequence, benefit and practical requirement of the ethnographic method's general flexibility (Dewalt and Dewalt 2011; Agar 1996), it is also important to note that this multi-sited outlook was also developed and refined as the project developed. The project did not begin with any strong preconceptions as to what the field's most important phenomena would be. Since, although following a method chiefly laid out by Marcus (1995; 1998), this was executed in practice by adopting a strategy closer to Jenna Burrell's (2009) more nuanced approach to multi-sited ethnographic work: where the field site is understood as a network to be entered without preconceptions as to what the important objects, actors, categories or sites might be. Or in other words, I began the fieldwork without any strong preconceptions about which 'things' should ultimately be 'followed'. Because of this, the entry point of *Company X* was taken as a point of departure, and it was only as the research developed that it began to be conceived as a project to 'follow the thing' of *Dashboard X* in particular (Marcus 1995; Cook 2015; Appadurai 1986). This strategy ultimately led to a focus on three sites: the start-up garage where *Dashboard X* was *built*; the clients' boardrooms where it was *sold*; and the conferences and industry events where it (and related products) were discussed and came to be *known*.

3.1.1 Participant observation: *Company X*

As a core method of ethnography, participant observation in the development of data analytics was determined as the best way to get access to this research field for two reasons. First, because the method intrinsically guarantees a good chance of accessing everyday life and *enculturation* within the real estate data analytics world (Dewalt and Dewalt 2011, p. 4). Indeed, from the early anthropological fieldwork of Bronisław Malinowski (1922) to more recent theoretical examinations (Jenkins 1994), participant observation has often been deemed the *best* method to access the everyday life of a research field. Hence I saw participant observation as an opportunity to build up an understanding of real estate data analytics that

might be characterised as a 'child-student' relationship with the group members or informants (Agar 1996), where my participatory role in the research could help provide a justified account of the cultures and social processes surrounding the development of real estate data analytics. Second, participant observation could also be instrumental to the development of new contacts and rapport within the wider real estate profession, which proved extremely useful for later interviews. This was especially beneficial because the overall topic of research is relatively critical, and not necessarily of direct applied interest to many of the market actors. Therefore, following Callon's call for ethnographic research of material markets, participant observation undoubtedly offered a prime chance to address the research questions from the inside edges of the real estate market. This phase of the research was subsequently pursued by overtly seeking employment in a real estate data analytics business, who for purposes of anonymity will be known henceforth as *Company X*.

At the point of making contact with *Company X*[2], the company closely matched the definition and description of a PropTech start-up in one recent and widely-circulated report on the industry (Baum 2017). And according to the terms within the report, the company fell neatly within the industry definition of a PropTech start-up operating as a processor of market information; and within the domain of real estate financial technology (though the utility of these embryonic and oft-nebulous terms could be debated at length). At the time of this research the company's main offerings consisted of real estate portfolio tracking, management and valuation platforms. In other words, a small suite of automated data analytics for real estate investors and asset managers.

These services were delivered via premium dashboard services on a subscription basis, as well as on an individual basis for more bespoke projects and clients (e.g. some clients would also come to *Company X* for help on a specific project, such as analysis of where to develop a new logistics hub or where to buy more student housing). Hence, the company had a number of clients both very large and medium-sized in the areas of real estate investment and asset management. Both the clients

[2]I made contact with the company within the past five years (circa 2014-2018), but for reasons of anonymity precise dates will not be mentioned in the text.

and their assets were variously (but not evenly) spread around the world, requiring both a presence in London as well as some other major global cities. Following the initial contact with *Company X*, there was a series of discussions with their Business Development Manager and the CEO regarding any potential collaboration between myself and the company. This was explicitly framed (by all parties) as a two-fold opportunity: for the company to gain some expertise and labour from myself-as-employee (either via working on a specific project, or assisting generally in the company), and for myself-as-researcher to gain insight from the company by being able to keep an appropriately anonymised diary about their work as part of my ethnographic research into real estate data analytics.

After significant discussion and clarification it was agreed that the arrangement could be mutually beneficial on the basis of two potential projects the company was engaging with, as well as clarification of the ethical issues described in Section 3.4 (e.g. anonymity of individuals and security of intellectual property). I am grateful that this discussion was relatively (and perhaps surprisingly) straightforward, and this is testament to the honest approach from all parties. That said, I did suspect that there was also a significant appeal to *Company X* (who at the time were much smaller) in simply being able to indirectly advertise (to clients and investors) that they had an 'Oxford PhD' on the team—something that other PropTech companies seemed also to enjoy boasting when they could, and which I will discuss in later chapters[3]. Whilst I ultimately contributed almost entirely to the former project, it is useful to outline these two proposals as an indication of *Company X*'s broad area of operation (the following is paraphrased for anonymity):

> "We have made Joe an offer to work on two projects at Company X which are due to begin [soon]..."

Project 1: Residential valuation model

> "We are now beginning a proof-of-concept project for a major prospective client who are about to invest $?m+ in the private rental sector. The client would like us to test the feasibility of extending our current

[3]For example, in 2016 the website of 'real estate data platform' Reonomy boasted that their research and development team "uses PhD-level science to discern patterns humans can't".

> products to offer a tool that can assess the value potential for residential developments. Joe's role will be to work with ourselves and the clients in developing such a model for future use in [x global regions'] urban residential markets. This will make use of Joe's interests and experiences and can form the basis for Joe's PhD fieldwork."

Later, in the fixed term employment contract, this became:

> "Managing the development of a client-driven project to map and forecast urban regeneration."

Project 2: Dashboard development

> "We are also trying to develop the way we deliver our products to the end-user, including the way in which data is generated from the end-user and fed back to our valuation models. This ongoing development of our user dashboard is of interest to Joe in terms of how it will change the way valuation and investment occurs throughout the urban built environment. We believe that there is great potential for Joe to investigate the manner in which users engage with these dashboards (e.g. A/B testing) and how each user differs in their preferred view or understanding of property value."

Later, in the fixed term employment contract, this became:

> "Acting as the project manager for the development of an internal project to create an 'open valuation framework'."

In agreeing that a six-month contracted placement would be mutually beneficial, these two projects formed the initial basis for my engagement with the research site as a participant observer in real estate data analytics. Practically this was implemented with a four-day week paid at a rate commensurable with my last paid role in a London market research firm. Though the exact role and engagement developed throughout this time period, my involvement remained largely focused on the delivery of Project 1, which is referred to in this research as *Dashboard X*. This entailed working both alone and with other members of staff, as well as meeting with at least four client representatives and other company associates. This (field)work was carried out primarily from the company's headquarters—a small rented former

industrial space in a university town[4]—with the occasional trip to London required (e.g. to meet prospective clients). In this respect, whilst the research is focused on London as a key site for technology and real estate investment, it is also multi-sited in a manner that both reflects and challenges the materiality of global real estate market assemblages as discussed above. This multi-sited participant observation is detailed in Figure 3.2, which gives an overview of the general expanse of *Company X*, as well as my position within the organisation.

Finally, although this primary method was not without limitations (e.g. see Section 3.5) it was generally very successful as a method to participate in and observe the real estate data analytics world, as well as through which to obtain a 'thick description' of this experience. Since, not only did I learn a huge amount about a variety of relevant phenomena—e.g. how a successful start-up operates, how individuals respond to various software development management techniques, how not to write code—but I also became very socially attached to my work colleagues and the company as a whole. This was not just important from an outward perspective (e.g. observing others), but also in a reflexive and inward manner that meant I went through a range of my own transformations whilst working at the company, especially as I navigated the 'participant observation continuum' between going 'full native' and silent observer (Dewalt and Dewalt 2011). Therefore, this was also an extremely challenging journey, and one in which I certainly became more of the former than latter, and which eventually resulted in some of the ethical tensions described below in Section 3.4. Nevertheless, the whole experience was extremely rewarding overall, and I feel has resulted in a genuinely unique and valuable piece of research towards a beginning in understanding real estate data analytics platforms.

[4]For the sake of anonymity, the exact name and location of this town will not be revealed, but important aspects relating to its geographical and social characteristics will be discussed in the findings.

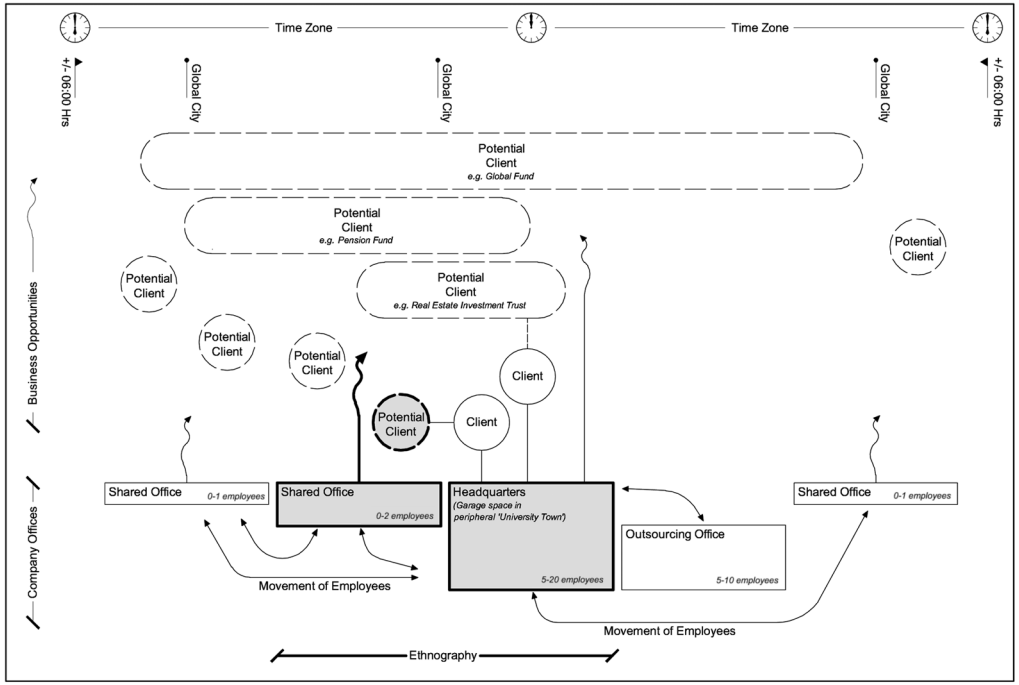


Figure 3.2: Abstract sketch of *Company X*'s operations across space and time. My engagement during the production and marketing of *Dashboard X* was limited to the headquarters, London sales office and environs (marked in grey).

3.1.2 Interviews

The second distinct research phase involved conducting 22 semi-structured interviews. This approach was taken to augment, triangulate and test different research observations from within *Company X*, and where possible would introduce and use *Dashboard X* in some way as a starting point for discussion. Ultimately these interviews therefore helped 'thicken' the description available from the earlier participant observation, especially in terms of how *Dashboard X* and similar data analytics technologies were understood by actors outside of *Company X*. And, this had at least three benefits for the research. First, where necessary it provided an opportunity to ask direct questions of equivalent subjects that were encountered during participant observation (e.g. does Software Developer 1 identify with issues raised by Software Developer 3?). Second, it provides contact with key subjects that might not have been encountered during participant observation (e.g. no valuation surveyors were directly encountered during participant observation, yet an account of their professional role and relationship to these products is important to the research). Third, it offers a chance to add further data and description to the initial fieldnotes after they have been coded. Therefore, interviews were also employed to directly access and engage with (and in some cases perhaps even co-produce) the dialogic 'life worlds' of real estate data analytics (Husserl 1970), and with particular reference to *Dashboard X*—the performance of which could then be further observed within the offices of London real estate professionals. Therefore, the interview phase was a natural extension of the ethnographic method inasmuch as cultural 'webs' are also "webs of interlocution", within which we (and *Dashboard X*) can also dwell and reproduce cultures or knowledges (Taylor 1989, p. 36; Tedlock and Mannheim 1995, p. 4). Hence from an epistemological perspective, the interviews proceeded in a constructivist manner that seeks description and interpretation of a socio-technical real estate world that might often be polyvocal and contradictory (Brinkmann and Kvale 2015), and no extreme commitment will be made here between interviews as research instrument or interviews as social practice (e.g. Brinkmann 2013, p. 40). This semi-structured and open-minded approach was

therefore applied to all interviews as a process that both built upon and extended the earlier phase of participant observation.

The groups sought for the interview phase included software developers, investors, surveyors and other sales professionals or entrepreneurs at similar companies. In effect, any group that could reasonably have some form of interest in *Dashboard X* (whether positive or negative in opinion, and whether as its producer, user or equivalent competitor) but whom had either not been encountered in the participant observation, or with whom certain viewpoints and ideas should be discussed. Each interview was completed under conditions of anonymity, and took an average of 45 minutes (but ranged between 30 minutes and 90 minutes depending on a variety of factors including how much time was practically available, or to what degree the conversation was interesting to either myself or the informant). A chart was kept (on an encrypted hard-drive) with all the names, contact information, professional details and date information surrounding the interviewees. This was useful to keep track of who had been approached and interviewed (or not) and reveals that some form of meaningful contact was made with over 140 individuals during this research.

In terms of sampling, these interviews were not designed to have any statistical significance, and therefore a combination of snowball sampling and direct selection (via seeking out the type of informant needed) were employed to cover the different profiles and groups required. This process was conducted in an iterative manner over the duration of the research, and only around ten individuals declined an interview (typically by not responding or suggesting someone else instead). The primary sampling strategy was to use contacts made during the participant observation in order to make contact with required interviewees (particularly elites where more powerful gatekeepers were in place). This resulted in seven direct contact interviews and one indirect contact interview (eight in total directly from the participant observation). Secondary strategies were then employed in order to pursue parties that were inaccessible in this manner, or to specifically move outside *Company X*. One secondary strategy included using a Python script to automatically scrape the online RICS member directory for chartered surveyors that had listed certain

keywords in their profile, including housing, technology and valuation. The results were manually reviewed before polite 'cold call' emails were sent, and this resulted in a total of four interviews (though interestingly, two of these interviewees knew individuals from within the participant observation phase, demonstrating just how relatively small the London real estate world is). Finally, conferences and other industry events were used to source four more individuals, and the remaining interviewees (six) were found through other, outside means. This included friends-of-friends and contacts-of-other-colleagues. Table 3.1 outlines the final list of interviews conducted and the names cited for quotation.

ID	Cited Name	Current Role	Previous Role (if applicable)
1	Consultant 1	CEO Real Estate Analytics Company	Financial Analyst
2	Consultant 2	Senior Consultant Multinational Consultancy	N/A
3	Entrepreneur 1	CEO Real Estate Analytics Company	Urban Planner
4	Entrepreneur 2	CEO Real Estate Analytics Company	Entrepreneur
5	Investment Manager 1	Investment Manager Private Equity Fund	N/A
6	Investment Manager 2	Asset Manager Private Equity Fund	N/A
7	Investment Manager 3	Asset Manager Pension Fund	N/A
8	Research Analyst 1	Senior Analyst Global Investment Manager	N/A
9	Research Analyst 2	Senior Analyst Global Investment Manager	N/A
10	Sales Executive 1	Account Manager Real Estate Analytics Company	Surveyor
11	Sales Executive 2	Director Real Estate Analytics Company	Web Technology
12	Sales Executive 3	Data Products National Land Registry	N/A
13	Software Developer 1	Backend Developer Real Estate Analytics Company	N/A
14	Software Developer 2	Frontend Developer Real Estate Analytics Company	N/A
15	Software Developer 3	Securities Management Global Bank	N/A
16	Software Developer 4	Data Scientist Real Estate Analytics Company	N/A
17	Surveyor 1	Surveyor Global Investment Manager	N/A

18	Surveyor 2	Director Real Estate Analytics Company	Surveyor
19	Surveyor 3	Director Global Investment Manager	N/A
20	Surveyor 4	Director Real Estate Analytics Start-up	Global Investment Manager
21	Surveyor 5	Senior Surveyor Global Investment Manager	N/A
22	Surveyor 6	Retired	Valuation Surveyor

Table 3.1: Schedule of formal interviews conducted.

Interviewing with elites

Whilst a proportion of the interviewees were contemporaries (e.g. software developers and others working around my career level), many others were conducted with informants who might be broadly defined as elites. Whilst the classic examples and definitions of elites in existing methods literature mainly focuses on elites in the strict political sense (Dexter 2006; Aberbach and Rockman 2002; Goldstein 2002), elites were considered here as individuals who might broadly have a more high-ranking status within the real estate profession than the researcher, i.e. elite in terms of power. This provided a more general definition of elite interviewing as 'interviewing up' rather than 'interviewing down' (Smith 2006). And, as a result of a focus on such power, this literature outlines the main challenges in conducting interviews with elites: gaining access, interview process challenges, and accounting for reflexivity, truth, emotion and power itself in terms of the informant's account.

In terms of gaining access, different approaches were used that ultimately led to relative success. First, by virtue of participant observation I already had a 'foot in the door'. This meant I could get referrals from colleagues and contacts that I made during the six months of participant observation. It also meant that some people likely wanted to speak to me to find out about the company, and some asked questions that I had to dodge myself around the inner technical workings and

practices of my company. This also reveals the fact that to some extent I became relatively more of an elite myself than I perhaps thought, and some interviewees were as keen to ask my opinions on data analytics and PropTech as I was theirs (again demonstrating the co-productive or dialogic aspects of interviewing). Second, a number of other more nuanced approaches to access were used that included framing the interview in an appealing way and making sure that I arranged the interview entirely at their convenience. However, I stopped short of the outright flattery or false promises seemingly recommended by some literature (Thomas 1993, p. 87), since my professional experience has taught me that honesty is not only the most simple and ethical strategy, but can also be a power 'equaliser' in its own right. For example, if you appear comfortable to disagree then this is often far more intriguing and novel to an elite than flattery. Finally, it is believed that the mode of recruitment might have had an effect on informant responses but this was not necessarily a major issue and was monitored and considered throughout. For example, as suggested by Buchanan (1993), an informant might be more responsive if contacted in a personal capacity, like meeting at one of the industry events in Table 3.2.

Beyond access, the next steps in elite interviewing are often regarded as just as important (Dexter 2006). To this end, I focused carefully on laying out the terms of the interview and how it would proceed (Ostrander 1993, p. 12; Thomas 1993, p. 88; Yeager and Kram 1990). This was largely successful but did fail once when a particularly senior valuation surveyor had forgotten the terms as agreed two months previously. This situation was easily recovered in terms of consent, but it took time to ascertain and he did not consent to an audio recording (instead I took extensive notes). Other aspects of the interview approach and dynamics often seemed to revolve around my own self-presentation (had I shaved, did I wear a suit, etc.). But given the relatively small number of interviews and the diverse participants, the effect of this strategy wasn't always clear, and was perhaps limited to its effect on my own confidence rather than rapport with the informant. For example, some might have expected me to somehow look like a 'scruffy student', but in some cases I might have felt better 'dressing-up' for the 'interviewing-up' anyway.

However, the most important issue for the interviews themselves was likely the mode of questioning. A semi-structured approach was taken in all the interviews, but in the case of more elite participants it was doubtlessly essential to be more open-ended since it is often the case that they might not like the "straightjacket of close-ended questions" (Aberbach and Rockman 2002, p. 674). Therefore, a conversational approach was taken, and was clearly communicated to the participant in both the initial setting-up of the interview and at the start of each interview. For example, one email reads: "It's really more of an open chat, between 30-45 mins. I have some themes and a few pre-decided questions but mostly it's just about gauging your observations and experiences in what is changing in real estate around surveying and data analytics."

Importantly, and beyond the exact mode of questioning, there remains a final challenge around the issues for discussion themselves. This is because real estate has always been, to some degree, a sensitive subject that might concern a number of highly charged questions. For instance, the morals of market speculation or the politics of gentrification. Broaching these topics with professionals—and perhaps in the material venue of their practice, like the fancy and expensive offices of global real estate funds or consultancies, or posh restaurants (Ostrander 1993, p. 19)—might thus be difficult inasmuch as they are 'hot topics in cool settings' (Yeager and Kram 1990). This makes access and meaningful work difficult, and special care is required to balance scholarly and applied objectives in discussing such issues. Therefore, I employed strategies suggested by researchers like Ostrander (1993, p. 23), which included utilising the language of the real estate industry itself, or using well-known situations like Brexit to frame my questions. This approach sometimes resulted in more open and frank conversations surrounding the technical mediation of agency in the real estate market and the broader socio-economic benefits (or losses) that this market resulted in. In general, a clear outline of my research interests (including the critical aspects) and an up-front communication of my CUREC status (with project information sheet, see Appendix

A, and clarification of participant anonymity) usually resulted in fairly open and collaborative conversations with a high level of rapport.[5]

Topics and Questions

Ironically, in paying reference to real estate's mantra of 'location, location, location', Aberbach and Rockman (2002, p. 673) begin outlining their approach to interviewing as needing to remember 'purpose, purpose, purpose' - or, 'what do I want to learn?' This emphasises the basic importance of discussion topics and questions in the study, and although the interview strategy was generally very open-ended, each interview did begin (where possible) with either a) a demonstration of *Dashboard X* and/or b) the pre-selection of a series of generative topics and questions. In the case of demonstrating *Dashboard X*, this was usually done in a manner that explained: the purpose of my PhD research, the role and work of *Company X* and then an open-ended walk through or 'live demo' of *Dashboard X*'s main features. This would naturally lead towards discussion of the product, the company, and the role of data analytics at large in real estate. Typically, through using open-ended questions like "What do you think of *Dashboard X*?", "Do you think *Dashboard X* could be useful to real estate investors?" or "Is this similar to anything you've seen elsewhere?". However, in cases where supplemental or more generalised questions and topics were felt necessary (e.g. where there was no demonstration of *Dashboard X*, or where the interviewee already knew about *Company X*), a series of themes and questions were generated from a systematic review of relevant literature. This naturally included literature discussed above in earlier chapters, but most specifically drew from literature on performativity in markets (especially concerning market devices or observational technologies) and some basic themes drawn from conventional real estate decision-making literature, including:

[5]That said, in the instance of some interviews with more elite and older professionals in London—especially those wearing signet rings, as discussed in Section 5.2.1—I felt that my northern British accent was unexpected for them, and possibly even suspicious or unappreciated in one or two instances. This topic will come up again in the findings.

Performativity literature: Preda (2009a) on the social construction of financial markets; Knight (2013b) and Knight (2013a) on market devices; Karl (2013) on 'bank talk'; Lockwood (2015) on risk and value in finance; and Butler (2010a) on performativity in economics.

Real estate decision making literature: Trippi (1989) on 'decision support systems'; French (2001) on real estate investment decisions; Atherton et al. (2008) on decision theory, appraisals and uncertainty in real estate development; Farragher and California (2008) on investment decision making practices; Clayton et al. (2009) on sentiment in valuation; and Sah (2011) on asset acquisition.

This review provided a long list of hypothetical questions that could be refined to suit the subject area and categorised into around four or five areas of conversation: the interviewee's own work; the practical application of data analytics to real estate; market dynamics generally; trust and/or risk; and some larger overall issues. These prompts were refined into a 'cheatsheet' of questions to ensure that the interview wouldn't go dry, but in reality the sheet was rarely needed, or would be referred to only once or twice in each interview (see Appendix B). Most of the time the live demo of *Dashboard X* led into a natural conversation of these themes where only small points of direction were required.

3.1.3 Industry events

Following the 6 months of initial participant observation (and alongside the interviews), independent participation in industry events was undertaken as a method to gather additional data from beyond the offices of *Company X* and their clients. The events attended are listed in Table 3.2. The reason for engaging with these events was based on research which reveals the role of such industry activities as being beyond basic sales events: trade shows, conferences and similar events are also key sites of knowledge production that shape market realities (Bathelt et al. 2014; Menon 2014). These events are also places in which market knowledge is

reproduced and exchanged, and where new technologies, innovations and market opportunities are developed, discussed, theorised and come to be known (Rinallo and Golfetto 2011; Berne and García-Uceda 2008). And, as 'Field Configuring Events' (FCEs)—or, "temporary social organizations such as tradeshows, professional gatherings, technology contests, and business ceremonies that encapsulate and shape the development of professions, technologies, markets, and industries" (Meyer et al. 2005)—such phenomena often contribute significantly to the construction, reconfiguration and legitimacy of new fields (Anand and Jones 2008; McInerney 2008). Especially by serving as information exchanges and spaces for the enactment of new technological possibilities (Garud 2008), and as venues where *Dashboard X* could be discussed with a variety of new research subjects.

Therefore, two major property conferences, two hackathons and a business breakfast were attended in London as part of this final data collection phase. Including MIPIM UK, FUTURE:PropTech and an event run by the media group BisNow (see Table 3.2). The original MIPIM conference (held in Cannes, France) is the largest property conference globally (over 20,000 participant) and the London 'local' edition is the largest in the UK (4,000 participants). It is a private event costing between £300-600 per basic ticket, with tight security and a controversial history that includes protests and disruption (Minton 2017; Wainwright 2014). FUTURE:PropTech is much newer and focuses exclusively on new technology in the property sector, but is no less expensive to attend. Finally, BisNow run a series of regular business breakfasts for real estate professionals in London with guest speakers and networking sessions.

Event Name	Event Type	Location
MIPIM UK	Conference	Olympia Exhibition Centre London.
#PropTech2017	Conference	nr Clerkenwell, London.
BisNow: various themes	Business Breakfast	Central London.
Hacking Real Estate	Hackathon	West London.
Hacking Rent	Hackathon	nr Shoreditch, London.

Table 3.2: Industry events participated in as part of this research (some names and locations approximated to obfuscate exact dates).

Due to the cost barrier (nearly £1,000 for three days of conferences) both MIPIM and FUTURE:PropTech conferences were accessed for low cost either by using 'free passes' connections made in the field or by participating in hackathons that were part of the conferences. Since such events are also where "institutional entrepreneurs seek to shape fields and influence the institutions that govern them" (McInerney 2008, p. 1089), the co-presence of hackathons in the programmes of such conferences provided interesting sites for data collection. Especially since hackathons have recently been revealed as prime rehearsal sites for 'entrepreneurial citizenship' and "emblematic site[s] of social practice where techniques from information technology production become ways of remaking culture" (Irani 2015, p. 799). Furthermore, like the start-up, hackathons can also be windows into the discursive and material construction of data itself, and its political implications (Thornham and Gomez Cruz 2016). Therefore, the trade shows, business breakfasts and hackathons are all potential sites for the production and distribution of those justified accounts which perform and re-make markets, or: "narratives that describe the way work in the field ought to be done ... and attempt to persuade powerful actors in the field to adopt them as conventions" (McInerney 2008, p. 1089). Finally, as well as overhearing and/or exchanging market stories, all three types of industry event were also good places to gain contacts and actively participate in the spirit of the wider field of real estate technology. This was both because of, and despite, the

sales pitches at such events; the power politics of exploitation in the hackathons (which were also informative in their own right); and the inevitable and eccentric false informants encountered throughout all events (Agar 1996).

Discourse analysis

In order to retain a critical eye amidst the sea of marketing material present at such trade shows—and rather than simply describing the data analytics products available—the broader approach and technique of discourse analysis was employed during this phase of the research. Whilst influenced by the work of Michel Foucault (1977) and others, the method of discourse analysis employed here does not claim be as extensive as Foucault's work on entire historical periods. Instead it aims at the narrower task of critically examining the discourse and 'discursive formations' around the PropTech field, and real estate data analytics in particular. Therefore, whilst this is a strategy that still aims very much to examine that which is thought to be 'without history' (Foucault 1977, p. 139) (e.g. categories, widely-held beliefs, assumptions and other 'truths'), it's a method that will draw precedence from smaller and narrower past projects like Judith Williamson's (1983) *Decoding Advertisements*, Adam Greenfield's (2013) *Against the Smart City*, and other studies of textual and visual marketing content (Metz 1975).

Whilst discourse analysis is largely without a commonly accepted system or routine of method, the process followed here was kept to a fairly simple and systematic programme: establishing context, identifying the sites (and sources) for consideration, sourcing the data (chiefly marketing copy at industry events or on company websites), and then coding the data based on the theoretical considerations at hand. Whilst a lot of this material could be dismissed as "marketing hype", far from "breaking a butterfly on a wheel" Greenfield (2013), this type of critical analysis helped build-up a more analytic account of the current real estate data analytics field in terms of what these companies claim to believe and what their intended audience will absorb Greenfield (2013). Or, to establish what these products claim

to do, as well as what sort of data imaginaries and 'gazes' (Beer 2018) they both espouse and reproduce as actors in their own right.

3.2 Data Collection

3.2.1 Fieldnotes

As part of the participant observation and interviews, the research's key objective became to 'map the scene' (Dewalt and Dewalt 2011) around *Dashboard X* in order to build up a thick description of the field. Given that the main participant observation phase involved fully immersive employment within an active business, it was undoubtedly challenging to continually and consistently produce fieldnotes on a daily basis. Indeed, this is often cited as a mundane but highly significant practical challenge for other participant observation research (Dewalt and Dewalt 2011; Agar 1996). However, this issue was navigated carefully through a combination of careful practice and basic discipline. In terms of practical processes, writing short-hand notes and keywords throughout the day both on paper and in a text file was the most simple but effective way to keep an initial record. As was the use of screenshots, images or copy-pasted text that might somehow refer to or represent key moments in the research. For example: bugs I might have been wrestling with in my code; news articles shared in the office; or data visualisations. I also collected a significant amount of printed materials from industry events (including flyers and business cards), most of which were used to either remember and record field encounters at the point of write-up, or as sources of discursive material (either textual and visual).

However, the most important aspect to a successful data collection and notation process was likely discipline when it came to writing up the notes from each day into an extended diary, and this was generally done each evening where possible. Naturally this was often constrained, either by the nature of my job (for example, social engagements with work colleagues) or by other pre-existing demands outside of my work. As a result, a diary of over 60,000 words was produced from the first six months of participant observation (an average of approximately 500 words per day), which was then extended by a further 20,000 words from subsequent

industry events and ongoing commitments. All research data (including fieldnotes and images) was digitally stored and accessed using on-the-fly encryption software, VeraCrypt.[6] In the following chapters it should be noted that wherever speech marks are used without a citation (or in the context of some otherwise identified source, like an interview) then it taken directly from my fieldnotes.

3.2.2 Interviews

The process of data collection for interviews was relatively simple and involved digitally recording the interview whilst taking notes, and then transcribing the recording into text. The original sound recording was later deleted and the transcripts would be redacted for purposes of anonymity, and all data was stored using VeraCrypt (as above). However, the transcription process was extremely time consuming to do properly[7] and resulted in over 140,000 words of interview transcripts. Nevertheless, being able to use this data in order to fully search and index the interviews was ultimately extremely useful when it came to retrieving quotes later.

3.3 Data Analysis

The analysis of fieldnotes and transcript data followed a common strategy of data reduction, display, interpretation and verification (Miles and Huberman 1994). Given that a process of reduction has effectively already begun at the point of producing the field notes—i.e. through choosing what data and observations were most relevant (Dewalt and Dewalt 2011)—it is worth outlining only the methods used for data display, interpretation and verification. This proceeded through the use of plain text files (either one per day of fieldnotes, or one per interview transcript) and the RStudio CAQDAS package RQDA.[8] RQDA was chosen due to its simple interface and the versatility it offered in being able to query the data via an SQLite database in R, or output the data for exploratory visualisation in

[6] https://veracrypt.fr

[7] Although it is common to 'outsource' transcription, I felt that undertaking the entire transcription process myself was also an important part of reflecting upon the content of the interview and also learning how to improve my own interviewing technique.

[8] http://rqda.r-forge.r-project.org

Gephi.[9] Combined with an audited version trail of modifications made to the analysis (e.g. changes in the codebook), this was a practical method by which to access, analyse and use the research data in raw format (with references in the text to accompanying images where necessary).

Due to the intensive nature of the participant observation, the majority of the formal analysis and coding necessarily took place towards the end of this period, albeit based upon notes and memos taken during the research which would be used in the first steps of analysis. As the interview phase proceeded, a preliminary codebook was drawn up with eleven hierarchical categories that represented different aspects of my work with *Company X* and *Dashboard X*. This included top-level categories like 'Data Analysis', 'Products' and 'Conversations and Events,' and within each of these were between four and twenty sub-codes or topics that were used to iteratively code all fieldnotes and interviews (adding and removing labels when necessary). These codes were then used to retrieve, examine and categorise data for more conceptual purposes relevant to the theoretical framework as more analytic topics were developed (e.g. as per Richards 2009).

Here it is important to note that although this process was iterative, and although the process of abstracting and interpreting the ideas and relationships contained within the coded data aimed towards the widely-cited grounded theory approach (Glaser and Strauss 1967; Corbin and Strauss 2008), that the use of CAQDAS software was primarily exploratory in purpose and served to familiarise and re-examine the data at different points. This was especially useful because of the huge volume of data. Therefore, whilst the emergence of analytic themes at later stages in the analysis process (for example, when examining data around the discursive themes in chapter 7) aimed at a grounded theory approach, the primary practical purpose of using CAQDAS software was to explore relationships and common themes in an iterative and ad-hoc manner in the earlier stages of the findings. This allowed emerging concepts and categories to be reflected on whilst continually refining the theoretical trajectory of the thesis in a manner roughly consistent with

[9] https://gephi.org

a process of 'working up' from the data (Richards 2009, p. 84). One example of this includes using Gephi to examine the coded data for key overlapping relationships. For example see Figure 3.3, where network modularity analysis displays the three main preoccupations in the data of the initial six month's participant observation at *Company X* (personal and social elements, labour elements around data, and marketing elements around the business and its clients).

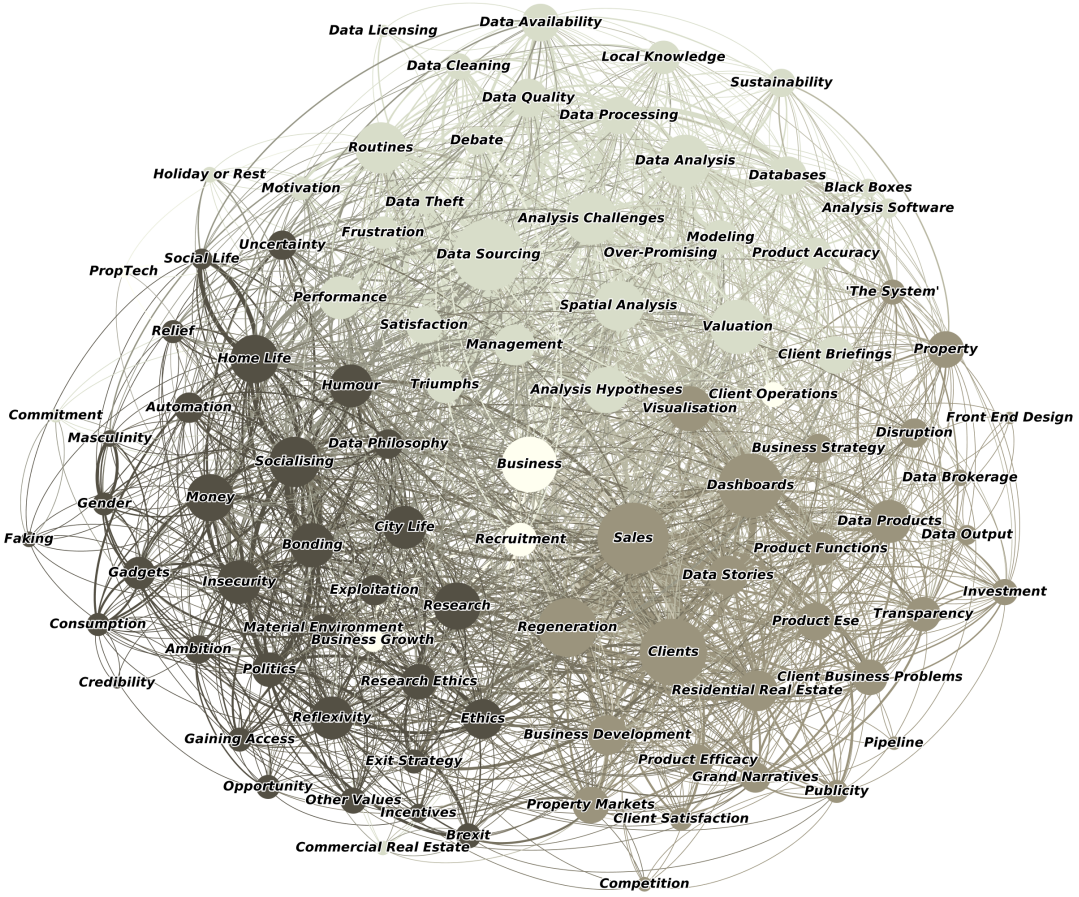


Figure 3.3: Visualisation of topic code modularity according to most common clustering of coding in the fieldnotes from *Company X*. This diagram shows the three common areas of overlapping activity covered in the fieldnotes overall: at the top is a cluster that represents the day-to-day labour of building *Dashboard X* and working on other projects for *Company X*; to the left is a cluster that represents my own internal, personal or social experiences during my employment; and to the bottom right is activity primarily associated with business strategies and selling products like *Dashboard X*. Whilst this diagram is not designed for any quantitative explanatory power, using Gephi and R to regularly review my data and the coding framework was an extremely useful exploratory exercise, which often gave me cause to re-think the relationships between different activities and experiences in the field. This might include considering proximity between my insecurity as a researcher trying to form meaningful relationships in the workplace. Or, that the greatest satisfactions, frustrations and 'triumphs' of the work were closely related to the accumulation of data.

3.4 Ethics

I conducted this research with the perspective that good ethical conduct was not just intrinsically valuable, but that it also has important instrumental function for the quality of the research itself (Tracy 2010). Hence I endeavoured to pay consistent attention to ethics throughout the project from a variety of procedural, situational and relational perspectives. For example, a CUREC approval (Ref: SSH_OI_C1A_16_018), detailed consent sheet (see Appendix A), and careful explanation of the research purposes in-person ensured that all interviews proceeded in an ethical and trouble-free manner. And, in accordance with the open-ended, discursive and collaborative interview strategy, such an honest and up-front approach was the only appropriate process, situation and relationship that I and the interviewees could reasonably proceed with. However, despite the relatively clear procedures and relationships involved in an ethical interview process, the ethical conduct of ethnographic research has often been regarded as a much more difficult subject. A minority of researchers even claim that participant observation is somehow inevitably unethical (Punch 1994) because it is "interactionally deceitful" (Ditton 1977, p. 10). And whilst such claims are rejected by the vast majority of ethnographers (Dewalt and Dewalt 2011), the existence of such extreme views do point to the fact that paying attention to the ethical conduct of ethnographic research must be "an ordinary, not extraordinary" part of the research from start to finish (Fluehr-Lobban 1998). And where naïvety about its challenges are unacceptable (Miles and Huberman 1994, p. 288).

In this case, it was crucial to conduct the research in an overt manner: clearly stating that I was an ethnographic researcher interested in the performativity of real estate data analytics (and from a critical perspective with some normative concerns around their use), and where necessary explaining these terms in a manner that could be understood by participants. Thankfully, at few stages in the research did this pursuit of informed consent through overt self-presentation raise any issues, since the majority of those around me were well-educated and quite reflexive about their work. Indeed, a surprisingly large amount of individuals that I worked closely

with quickly understood my angle of research, and many were eager to discuss these wider issues of data analytics, performativity, automation and real estate. For example, one staff member that joined the team as I was leaving—and who is not quoted otherwise in this study—raised such a philosophical question directly over the general Slack channel: "The intern asks: What actually happens when all major investors make decisions based on the same information? Apart from us doing a very good job?" Hence, it was generally possible that I could easily, readily and practically explain that I was keeping an ethnographic diary of my experience of working at the company where we built and sold these technologies in order to gather data to understand more about these more philosophical and sociological issues. In other words, that this research also went beyond simply seeing if we could technically 'detect gentrification' (though some individuals with a more quantitative background or education took a while longer to understand this nuance). Added to the fact that no individuals quoted in this research could be considered vulnerable in any ethically significant way, the process of establishing informed consent with an understanding of the risks involved for participants was relatively easy.

However, one challenge that did arise around the situational process of establishing consent for my work was the practical issue of navigating the participants' anonymity, as a process full of methodological, theoretical and ethical tensions (Thomson et al. 2005; Corti et al. 2000). Given that I had committed to keeping the staff, clients and subcontractors of *Company X* anonymous, this process required significant investment on my part both in the field and during write-up. [10] The process of explaining and re-affirming this requirement of the work was particularly laborious, and at times I was concerned that it threatened the sense of rapport around my work. For example, not appearing on the company website, excluding myself from team photographs (I would take them!), and limiting my connections with individuals on social media were all necessary steps, but were sometimes

[10]Even through not everyone present in the research seemed concerned about remaining anonymous, it was nevertheless necessary to treat all as equally anonymous to prevent any overall compromise of identity for those that did—following processes outlined in Corti et al. (2000) and AAA (American Anthropological Association) (2013).

difficult to engage with either due to feeling like they might damage my rapport, or simply because I became relatively close with many of my colleagues. Figure 3.4 is an example of a Slack conversation with the office manager several months into my contract, re-explaining that I could not appear on team photographs or the company's website and social media. In this instance I eventually did attend the photo shoot but instead acted as the photographer (in a slightly awkward parallel of the researcher-subject dynamic where I was photographing all of them). Nevertheless, through paying close attention to this throughout the fieldwork, and being careful to erase or obfuscate certain details at the write-up stage, I am confident that my obligations in this respect have been fully satisfied. And therefore, that no significant harm can come of my work either to *Company X* as a whole [11], or to any individuals mentioned in the text. In short, an approach of overt self-presentation throughout this research, along with a serious consideration of preserving anonymity, went a long way to avoiding any ethical issues that might have arisen otherwise.

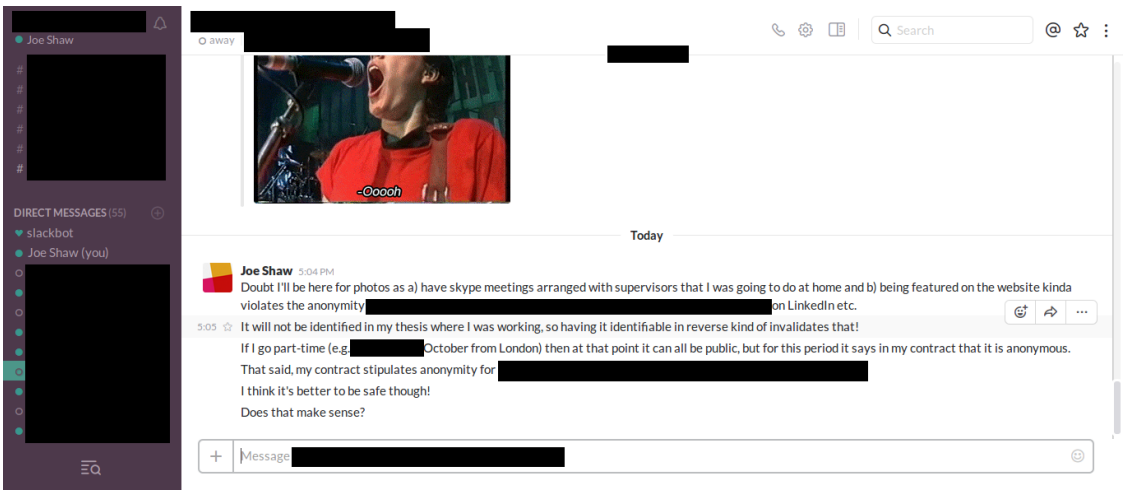


Figure 3.4: Messages from myself to the office manager on Slack explaining that I couldn't be in team photographs or featured on the company website or social media (with anonymity it was "better to be safe").

[11] That said, my contract stated my ethnographic research was not to be legally impeded or prevented by my otherwise contracted role as an employee, hence discharging aspects of this as an ethical or legal issue. Indeed, it does not technically state that I absolutely must keep *Company X* anonymous, but in order to maintain an appropriate overall level of anonymity this is more desirable and ethically secure. Not to mention more comfortable to me as a researcher with personal connections to the research field.

The remaining and most difficult ethical aspect of this work undoubtedly arose around issues relating to both my exit strategy and the so-called 'limits to participation' (Tracy 2010; Dewalt and Dewalt 2011). Whilst hard to separate, the former of these was the most difficult to personally navigate, and was largely a result of my immersion in the field site and the fact that certain events arrived unexpected (although often useful from the perspective of the overall research experience). This included being informally offered continued employment if I left my PhD, becoming personally responsible for the ongoing *Dashboard X* project (discussed in the findings), and growing close to many of my colleagues. That said, all of these ethical issues were issues that chiefly concerned harm to the researcher (and never the participants) (Dewalt and Dewalt 2011), and it had always been clear that I was on a limited fixed-term contract with clear overriding aims and objectives as a PhD researcher. Indeed, this issue could be reversed as an ethical question of my own exploitation as a dependent researcher needing data. However, I choose to regard any such power imbalances as an important aspect of the work itself—issues that required attention throughout, but which are absolutely not ethical indictments of the research. Nevertheless, these were still difficult situations, dynamics and feelings to navigate in the field, and which undoubtedly left a sense of anguish on my part as the research came to an end (Mosse 2005; Neyland 2008, p. 148). And, the only significant impact these matters had upon the research itself was probably the time required to get over the 'reverse culture shock' of exiting the field (Dewalt and Dewalt 2011).

Finally, the remaining tricky issue that continually re-appeared throughout the research was my involvement in the production of technologies that I necessarily had a critical disposition towards, and which I had reason to believe might not be deployed 'for the common good'. This is undoubtedly the most complicated ethical issue, and is not one I can claim to have resolved. Though, it does not seem to concern other academics who are currently working towards demonstrating similar concepts and tools (Rodionova 2016; Hristova et al. 2016). Essentially, it could be expressed by asking whether it is better to have some research about the production

of potentially harmful technologies or not, when/if this research required some participation in their production? This question didn't have a clear answer until the end of the research, and became most troublesome when I was seconded to work on a small project to value a portfolio of British public houses where to my genuine anguish my own 'regular' pub was in the dataset. This will be discussed at more length as an important part of the findings, chiefly in Section 6, but ultimately I feel that the importance of the research merited the struggles around this topic.

3.5 Limitations and scope

At the beginning of this research, there were at least three significant limitations to this research. The first issue was that the emergent nature of real estate data analytics platforms gave rise to concern that they were merely *vapourware*.[12] However, this concern was offset in the first instance by the fact that the field was still attracting billions of dollars of venture capital. However, as part of this hype, it should also be noted that an interpretative and theoretical assessment of this technology is both possible and useful regardless of any actual widespread adoption. This is because Callon's (1984) 'translation' process begins with a 'problematization' of a situation by different actors, or that "translation is at first an endeavour ... later it may be achieved" (Callon, Law, et al. 1986, p. 25). This means that the widespread nature of the technology's discussion alone could prove as significant to this research (or at least as interesting) as its active adoption, since it would still present findings for understanding how market actors were responding to these technologies.

The second limitation results from this research being concerned with only one case study product—can *Dashboard X* explain all data analytics platforms for real estate investors? Obviously the answer is no, but in offering two additional research phases (in addition to participant observation) as a way to try and draw out some wider generalisations around the research questions it should be noted that this is quite a deep study. To this end, it is argued that whilst a single case study is

[12]Roughly speaking, this term refers to forthcoming technologies which are promised and 'hyped' but ultimately never fully materialise.

not meant to aim at any high-level of prediction (Flyvbjerg 2001), and that you can regardless find many important generalisations from single cases that speak to larger phenomena (Flyvbjerg 2006, p. 224).

The third significant limitation concerns the empirical focus of this research purely on a case study that almost exclusively concerns London, with a secondary focus on New York City. This means that a range of concepts and terms that are useful to this research—for example, 'gentrification'—in fact refer to a distinct and specific set of processes that might differ wildly depending upon the city in question (Lees et al. 2016). In this instance it is argued that the research has been conducted in a manner that remains pragmatically reflexive about this limitation as an important part of the findings (in particular regarding *RQ3*). And, that whilst this case study concerns real estate data analytics for valuation and real estate investment in global cities of the global north (typified by both London and New York), that the influence and importance of these particular global cities to a global flow of capital through circuits like real estate is nevertheless very significant (Sassen 2005). Following this, some important reasons will be cited in the findings (especially Chapter 7 and 8) to explain why the development of real estate data analytics around these key global cities also has consequences nevertheless for the Global South.

3.6 Structure of findings

In line with 'following the thing' (following *Dashboard X*), the structure of the findings chapters roughly mirrors the key sites through which I passed alongside *Dashboard X*: the start-up garage (Chapter 4), the boardroom (Chapter 5), and various quasi-public spaces like industry events, hackathons and the interview phase (Chapter 7). Additionally, whilst all chapters contribute to the research questions in different ways, they are also ordered in accordance to how they relate to the overall enquiry. Therefore, Chapter 4 focuses on the start-up garage where *Dashboard X* was *built*, and deals with the context in which this product was designed, and explains what actors, values and logics became crucial to or part-of *Dashboard X* at the point of production. This begins to answer both RQ1 and RQ2 ("What actors

are emerging around real estate data analytics platforms ... and what forms of value are being produced by these actors?"). Following this, Chapter 5 focuses on the board rooms and offices where *Dashboard X* was *sold* to clients, and considers how different actors and processes were crucial to its successful adoption in the market, and what sort of market actors its adoption necessarily implied. This adds further explanations and detail to both RQ1 and RQ2 above. Chapter 7 then 'zooms out' to draw together experience from both the former sites and the the industry events and quasi-public spaces where *Dashboard X* came to be *known* by wider market participants. This wider discussion also considers other data analytics products, like *System X* (*Company X*'s main product) and competing products, in order to examine wider discursive formations and types of knowledge in the real estate data analytics field. This sets up some important observations, context and concepts for consideration as part of RQ3 ("What are the theoretical and political implications of these new values for ... urban real estate actors and stakeholders?"). After this broader conversation, Chapter 8 then approaches RQ3 more directly to explain what sort of theoretical and political implications emerge from this case study of *Dashboard X* via consideration of how *Dashboard X sees* the world. Overall, this case study approach aims to provide a 'nose-to-tail' understanding of how data analytics products are currently emerging in the real estate market via a continuous ethnographic case study of *Dashboard X* (i.e. throughout all sites and phases of the research). And therefore, a context within which to ultimately theorise its involvement in material urban real estate market practices as *hyperreal estate*.

4

Building *Dashboard X*

This chapter will begin to explain what key actors are emerging around real estate data analytics platforms during the process of their design and production, and how the design of these platforms can also begin to lead to the production of new real estate values. The chapter will focus on the first six months of fieldwork spent employed by *Company X* at their headquarters, a former industrial space in a small university town, during which I participated in and observed the production of two platforms in particular. The first of these was *Company X*'s main platform, *System X*, which was encountered mainly as an observer but nevertheless allows some points to be made about actors involved in the production of digital real estate platforms. This context and more general discussion of building digital platforms for real estate data analytics forms the first part of the chapter, in Sections 4.1 and 4.2. This will allow certain observations to be made regarding the cultures of labour involved in producing these platforms as well as their relationship to other platforms, data and the wider world of real estate. By doing so, it will demonstrate why the design and production of new metrics and calculative frames are a crucial part of the success for new real estate data analytics platforms. And, in a way that precedes any contact with the real estate market as both a factor of the competitive and masculine environment in which they are produced, as well as by virtue of the

fact that metrics can obscure the often-unstable foundations upon which they rest (like poor, re-appropriated data from other competing platforms).

The second part of the chapter, in Sections 4.3 and 4.4, will then narrow this focus in more detail upon the design of *Dashboard X* specifically. This will include consideration of the technical processes that made it possible, and the values and rationales that went into its the production of its own particular metric (the Gentrification-index). The chapter will conclude by explaining that although *Dashboard X*'s successful design within *Garage X* was in many ways a very creative technical achievement, that it was also contingent on a number of crucial social conditions and processes. And that the most important aspect of this was my own narrative work in explaining and fleshing out the component's of the calculative frame that had very little to do with quantification. Indeed, the 'triumph' of building *Dashboard X* was (by my own colleague's account) as much a part of my performance as a 'data artist' as it was through any discovery of a gentrification 'reality.' And hence the uncertainties of the 'marginal gentrifier' narrative it deployed (just like the discourse of 'responsible investing' around *System X*) also give critical reason to wonder why anyone would really want to adopt such a device as part of their investment strategies in the first place. Especially since, as calculative frames, these devices contain such a significant imprint of the cultures, logics and social conditions from which they emerged. Or, in other words, are very far from the single epistemic mirror of the market that most real estate data analytics platforms might claim to be. Overall, this chapter will then inform the next chapter which considers the practical adoption of new platforms and any subsequent circulation of these new values beyond the walls of *Garage X*.

4.1 Context: *Company X, Garage X, Town X*

Company X could be described as an archetypal successful tech start-up for both good and bad reasons. In just a few years it would go from business plan to a minimum viable product (a basic platform for comparing different real estate assets), and ultimately a significant venture capital investment allowing it to scale

its operation and better develop its core product offering. Along the way it would gain a number of lucrative clients, who were mostly large real estate investment funds and asset management firms, but also some banks, public sector organisations and private companies. To have worked at this company from a point where it had around only a handful of full-time employees and two offices (a headquarters and a co-working hot desk in London), to another point where it had dozens of employees and a presence (of some type) in several countries was both extremely interesting and fortuitous in the view it afforded of a young real estate data analytics company. However, not all of this experience and observation is relevant or consequential to the research questions concerned, and that's also partly because *Company X* was so archetypal. Therefore, this initial introduction to the social and material setting of *Company X* will attend only to a basic context which allows the reader to visualise where this fieldwork took place, and within what environment and social conditions *Dashboard X* began to emerge.

Company X was founded by several young men in *Town X*, a small and relatively suburban university town. *Town X* was chosen as a strategic location for the business that was within commutable distance of London and provided a useful recruiting base. It was also said to share many "traits and values" with the company, but not all of which were regarded as positive. For example, one senior colleague explained to me "the student population is quite male on account of it being a STEM-focused university". But whilst most of the "awkward and geeky young men" are usually forced to change when "they leave and go off to discover the world", some also "never leave *Town X*" and were jokingly said to be within our presence. To match this context, during the majority of my time with *Company X* there was only one permanent female member of staff present (who worked in a non-technical administrative capacity), and even after reaching around twenty-five employees only a further two women were recruited in full-time roles. Although this gender imbalance was seemingly acknowledged as a problem of some sort—it was often recited in team meetings that "we need more women!"—there were also a number of more unpleasant incidents that reinforced a sense that *Company X* was ultimately

a definitively male environment. For example, one of the founders made a joke that the only two women present were gossiping in the kitchen because "that's what women do". Whilst this comment did not surprise at the time, since it faded easily into a general background of raucous banter and debate that characterised the day-to-day environment, the comment did, on reflection, lead me to believe that the founders were not particularly concerned about this gender imbalance, except from the perspective of keeping up appearances as a liberal and progressive workplace. The comment did not really stand out because amidst this noisy masculine backdrop it was the norm.

The educational background of my almost-entirely male co-workers was varied but highly technical, clustering around a few specific disciplines like computer science, architecture and geography. Almost all were aged between 18 and 40, and on average around 30. And as well as being a noticeably young and male environment, the social context was also markedly middle-class and had a suburban sensibility that manifested itself in a range of ways. For example, only a couple of staff members claimed to genuinely like or feel comfortable in big cities, with many bemoaning crime, overcrowding and pollution. This sentiment often ran quite deep: one colleague who had briefly grown up in a poorer urban area claimed that even if he had to live in a city for work, that nevertheless he "never wanted to live anywhere bad again in case it hurt him or turned him bad." The team's hobbies and interests were interesting and diverse but seemed to be relatively individual niche or specialist pursuits that probably required equipment, including climbing, making sushi, or flying drones. To my disappointment, both football supporters and footballers were often derided as stupid or boring. Finally, it seemed the company's ample pay packets were enough for most of the permanent staff members to indulge in team lunches, specialist craft beer and generally live what appeared to be a very comfortable life—which I benefited from and enjoyed as well.

Contrary to this relative homogeneity, however, the office was noticeably diverse in respect of race. This was due to a number of interns (and later several full-time employees) who were migrants or visitors from a range of other countries including

Asia, the Middle East, and both North and South America. Most of these had migrated to study, but in a few instances I can imagine life in the region of *Town X* was also a much more secure situation than their country of origin. That said, the founders and senior staff were entirely white and the company did receive one unpleasant review on an online career information website that referred to a racist experience during an interview, and one immigrant colleague mentioned that he was worried about not getting a contract because the law "always protects the locals first." Therefore, in addition to discussions in the next chapter, although things often appeared largely happy, equal and friendly to me, there were nevertheless some unexpected incidents that lead me to conclude that overall, this social setting was, like many tech start-ups (Shevinsky 2015; Kwapisz and Hechavarría 2018; Brooks et al. 2014; Davidson 2015; Shih 2006), undeniably dominated by a senior team and culture that was young, male, middle-class and white. And, I am confident that anyone who didn't fit these attributes would have felt uncomfortable at some point, particularly because of the regular "anything goes" banter in the office; where even I was mocked for regularly visiting the "old-people café" nearby (a small café mainly visited by builders and other manual labourers, many of whom absolutely weren't that old, but definitely didn't work in tech start-ups). However, this apparently more class or generational-based banter was minor compared to how I might have felt at times as a migrant or woman in this otherwise seemingly prosperous and happy work environment.

The headquarters of *Company X* was a small former industrial space (*Garage X*), where almost all full-time staff members were typically based on a daily basis. Seemingly following the 'myth' of the start-up garage by the book (Gann and Dodgson 2016; Ries 2011), it was also clearly presented as such: polished concrete floors; minimal white trestle tables; a few shelves showcasing books with titles like 'Buildings as Systems' and 'Think like a Lawyer'; an espresso machine; some framed maps of America's natural resources and geography from above ("Ansel-Adams-meets-data-viz"); and a full-size, regularly-engaged punch-bag next to a coffee table covered in copies of *PropertyWeek* and *Wired*. Indeed, despite the

fact that the CEO would typically spend much of the week in London, and only existing clients or prospective investors seemed to be allowed or invited to visit, this 'casual' environment was in fact itself highly staged like a property for sale (Lane et al. 2015). This included occasionally preparing it for visits with what appeared to be a degree of choreography as to who would answer the door and how our 'culture' was presented (perhaps by inviting our associates to Friday 'cultural lunches' where foreign staff members would take turns to cook 'their own' cuisine, or taking them to a company paintball session). Post-investment this start-up garage myth was stepped up a gear and the sole full-time female employee was immediately instructed to order several extra-large bean bags.

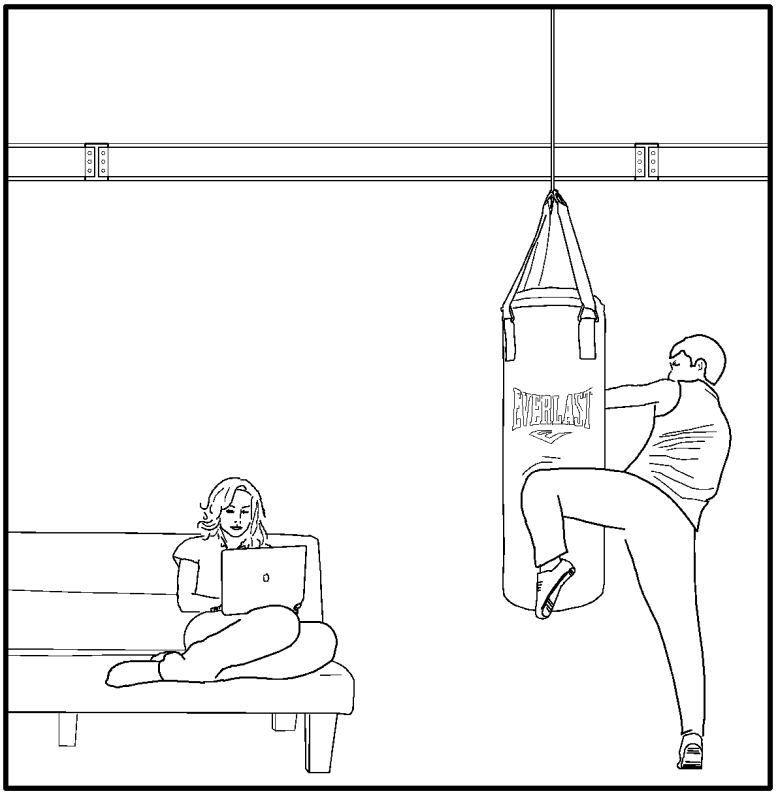


Figure 4.1: "During the course of the day, the guys would aggressively hit the punchbag at intervals as they walked from their desk to the espresso machine, in a way that was often incredibly awkward to the point of comical. The most cringing aspect was that a few of them appeared to hit it the hardest if [the sole full-time female employee] was sat near it, but she seemed to avoid acknowledging this."

But this environment was also performatively staged in particular ways for us as workers, and this would occasionally reveal much less visible social hierarchies

and inequalities amongst the team. These were especially interesting given that we supposedly shared the common start-up trends of a 'horizontal' organisation (Ries 2017; Wasserman 2012; Ostroff 1999), including a lack of hierarchy ("we should all lead together"), Agile management practices ("come on it's time for stand-up!"—where the whole team would stand in a circle each morning to explain what we were doing), and flexible hours ("if you felt down, you could just stay home and not get ill"). For example, the return of the CEO was often hailed with a meeting, where stories of potential clients and pipeline work would be proclaimed and re-told in vivid, charismatic and emotive language ("We're going on a roadtrip to Dubai and if we capture the top ten [clients on the list] that's his bonus!"). Such events were interesting not only because they carried information about how we were evolving as a business but also because of the ways in which it was received differently by different members of staff, roughly corresponding to their seniority or level of personal connection to the company (e.g. founders and key employees having shares in the business). If the CEO had attended a big meeting or event (perhaps briefly meeting Elon Musk or Richard Branson) then the youngest interns would likely be most interested in casual banter about whether the "so-hot" celebrity tech-businesswoman Jessica Alba was there (a constant and increasingly awkward joke), and which other famous entrepreneurs he had interacted with or perhaps even verbally "roasted" at private Chatham House rule events with other tech C-Suite businessmen and journalists. The middle range employees who kept the company's technology running would be more interested in what false promises had been made ("How many buildings you said we have [in the data]?!"), and the most senior members seemed the only ones significantly interested in the ultimate profit-driven goal of capturing the world's top funds as clients. Meanwhile, I often felt like the solitary full-time female was working hard to feign an interest in all three.

Indeed, rather than being an actually-existing horizontal workplace, these performances and banter generally seemed to reveal that leadership and hierarchy was ever-present but just operated in less transparent or traditional ways. Between the absence of permanent job-titles (which was regularly joked about—"What's

your *actual* title?... I've had about four I think!") and the fact that few team members seemed to work anything but the minimum hours of a full-time job, there was something more akin to a constant state of uncertainty which exercised its own type of power over the company. Within this, it seemed like one key means to wielding power was through engaging with the banter and and hubris of the social setting, and demonstrate that as an individual you were happy and thriving within the exciting dynamism of a start-up environment ("you have so much freedom!"). Despite the inequality, insecurity and risk that characterised this workplace overall, e.g. see Neff (2012).

Therefore, it's important to understand that as actors we were operating according to a specific set of logics that applied to our working environment, where a capacity to be noisy and heard through the means of personality and performance were the best way in which to fit-in and be successful amidst the overall logic of 'charismatic domination' that typified the setting (Gerth and Mills 2014, p. 79). Hence *Garage X* was also a socio-cultural setting that was evidently tied to a type of 'hacker ethic' (Himanen 2001) in the sense that hierarchy did not come from organisational or bureacratic arrangements so much as from the personal qualities and 'charismatic components' (Preda 2009b, p. 52) of those individuals within *Company X*, including their competences and 'gifts of grace' on the job (Gerth and Mills 2014, p. 79). Or, where values like *passion*, *freedom* and *openness* were socially elevated above traditional understandings and performances of inequality and formal hierarchy. All three of which were manifested in the noisy banter of *Garage X* (Himanen 2001, pp. 139-140), and thus obfuscated many of the actually-existing hierarchies and inequalities that existed in this workplace. To this end, it was an often celebrated value of hacker-learning (Himanen 2001, p. 79) and great competency that our CEO had dropped out of university and yet was still "really good at business", and other young and promising developers in *Garage X* had also shelved their studies for *Company X* as "something more exciting" (i.e. with more rewarding social value beyond just money). Towards the charisma of these would-be 'dropout heroes' (Bort 2018), the first reason cited in conversation as

to why I should remain with the company after my initial six month contract (and abandon my PhD) was that they had decided that they "think you're a good guy and we like having you around" (sadly more a reflection of my charismatic graces than technical competency, but both of which were important!). The next section will now consider how these social and cultural dynamics of *Garage X* played out in relation to our labour. This discussion will begin with *Company X*'s main product, *System X*, before moving on to the specific case of *Dashboard X*.

4.2 *System X*

As *Company X*'s core product, the platform referred to here as *System X* was the main preoccupation of the entire business. Designed primarily as a tool for large real estate fund managers, but also used by some banks, financial services companies and lenders, *System X* was (at the time of this research) subscribed to by a handful of clients that represented at least £130 billion of real estate assets under management [1]. Whilst smaller bespoke projects were also undertaken for clients at a one-off cost (e.g. to analyse locations for new logistics warehouses, map flood risks, and the development of *Dashboard X*), developing and increasing client subscription to *System X* was essentially the ultimate long-term business plan for the company. And it was the intention that eventually all side-projects and functions would be able to interface with one another as part of the *System X* platform.

From the clients' perspective, *System X* was typically encountered as a browser-based dashboard, but there were also ways to access the core database directly via an API. There dashboard typically offered four types of view: a map with several filters that showed the location of buildings; detail pages for entities like buildings, individual owners (usually a fund) or cities; an analysis tool for querying the available data on these entities; and a comparison view for different details (e.g. building x and building y). Indicative examples of the map view, building detail and and owner

[1] Event for the clients, this figure is extremely hard to estimate accurately—and arguably therefore does not mean much in itself aside from "a large amount"—but it is based upon the most recent fund reports available at the time of writing. Also, it does not take into account the product's use by banks, and is therefore likely to be much higher.

detail can be found in Diagrams 4.2, 4.3 and 4.4, but some aspects of its functions have been either removed or adjusted in order to maintain anonymity of the business. In addition, some features changed significantly over the course of my employment and others have also changed dramatically since (or disappeared entirely).

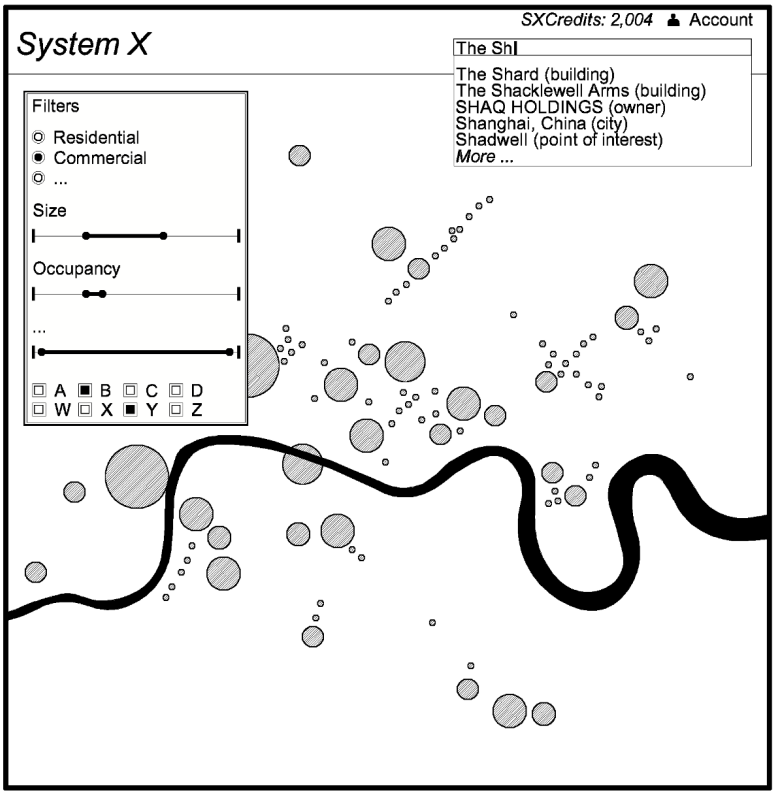


Figure 4.2: Map view showing buildings in central London, according to certain filter settings.

The type of data and metrics available on different buildings or owners included building size, occupancy information, several proprietary 'overall quality' scores (based on data like distance from public transport, green space and so on), and sustainability information (including a carbon model that estimated a buildings' energy consumption). The precise functions, features and metrics of *System X* were in perpetual development but had also recently been augmented with an improved automated valuation model, the development of which was an increasing priority of the business. There was also a constant drive to use *System X* in various popular risk analysis scenarios like Brexit (i.e. click a button and see what happens to the London's real estate sub-markets after Brexit), and the long-term goal was

to integrate such scenario-planning into the platform as standard for all sorts of different market risks (environmental, political, macroeconomic, etc.).

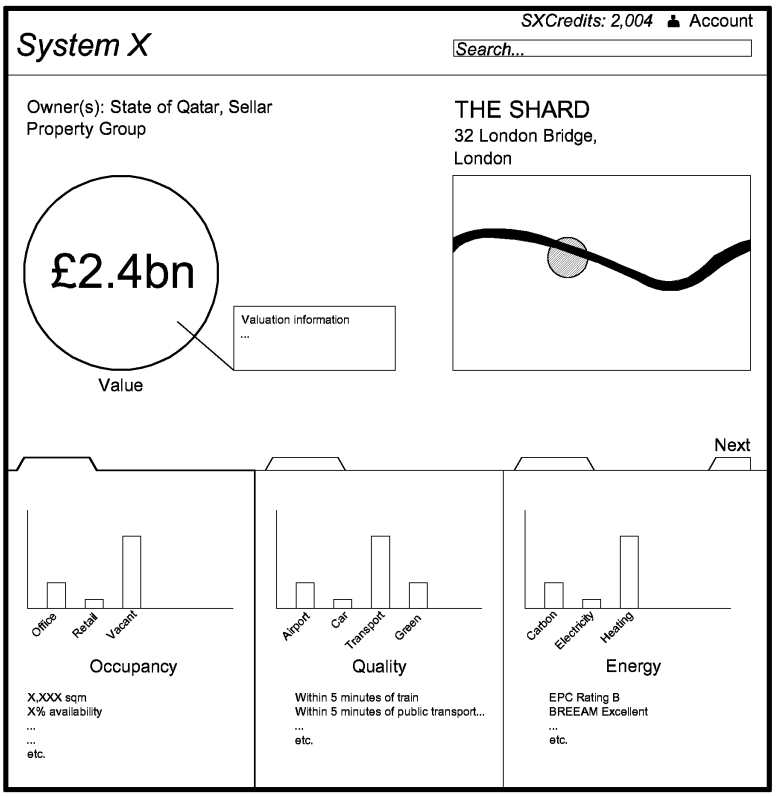


Figure 4.3: Detail view showing information on a specific building.

The main business goal for *System X* was to position it as a key tool for all the world's top real estate funds. Whilst this would include using it for a range of activities like finding investment opportunities or performing market analysis, one of the ultimate aims was to position it as a valuable tool for portfolio benchmarking by institutional investors that could offer reliable and real-time appraisal (right down to the building level) for the purposes of asset management. This would give all asset managers a significant information advantage in their engagement with both existing and potential investments, and it ties into current market rhetoric and strategy around portfolio construction and 'responsible investing' (Hebb et al. 2010) in real estate that have arisen since the financial crash of 2007-08. These strategies might include active management, ESG-integration (focus on the environmental-social-governance ratings of investments), more rigorous risk control,

and especially diversification (by geography, by sector, by occupant, etc.). But all whilst simultaneously "creating consistent alpha" (*NN European Real Estate Strategy Brief* 2018) (i.e. profit). All of these are processes and trends that have been gradually imported from other areas of financial asset management, and appear to support the conclusion that real estate is in the process of becoming 'just another asset class' (Loon and Aalbers 2017, p. 221). The unique selling points of *System X* therefore included: large amounts of standardised data about buildings, instant automated valuation using advanced machine learning (i.e. not the usual regression models of the 1980s onwards), proprietary quality scores concerning amenities or sustainability, and a capacity to benchmark entire portfolios and conduct all sorts of analysis right down to the individual building level.

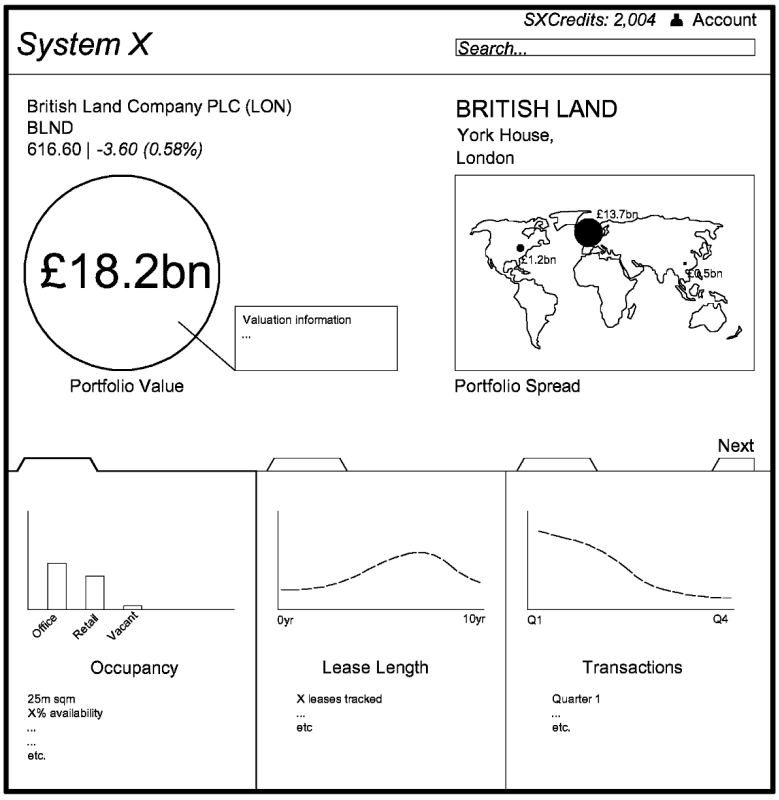


Figure 4.4: Detail view showing information on a particular property fund/owner.

Unfortunately, the precise subscription costs for all clients were not known but were likely to vary between clients (early adopters and investors in *Company X* may have had significant discounts) and were not advertised on our website. However,

fees for future versions of the main dashboard product were often more publicly discussed at prices far above £100k annually per seat/user. Generally speaking, free trials with limited functionality could usually be accessed in liaison with a Business Development Manager on a credits-based system (where credits were used up depending on how much data you viewed, e.g. per building, fund/owner or city). It struck me that the main purpose of such free trials was to show how much data the platform had accumulated and how it was presented, rather than the reliability of the metrics and valuations it displayed—or to prompt and play into a client's data imperatives (Fourcade and Healy 2016) and "impetus for objectified numbers" (Loon and Aalbers 2017, p. 221)—but this will be discussed more in the next chapter.

With a contextual view of both *Company X* and *System X* in mind, the remainder of this section will now consider two types of actor and process emerging around *System X*: the work and labour that went into its production, and the relationships it had to other platform businesses and technologies. This will afford a context that will build towards understanding *Dashboard X* and the overall process of developing digital real estate platforms as something which can lead to the production of new real estate values through the labour, technologies and narrative processes that came together in *Garage X*.

4.2.1 Chasing triumphs

For the most significant and regular section of *Garage X*'s employees, the general, day-to-day labour of working towards the development of *System X*, *Dashboard X* and other projects was almost entirely focused on the collection, processing and cleaning of data relating to buildings and places all around the world. Whilst the proportion of employees working on front-end design and technical implementation of functions and features seemed to vary as *Company X* grew (often with freelancers contracted for specific projects), this commitment of resources focused exclusively on simply getting data into *System X* was a constant priority. Given that the process of developing *Dashboard X* would also rely upon collecting sufficient data with which to build a prototype, it was within this block of employees that I spent the vast

majority of my time. A block of employees that mostly constituted a middle or lower seniority in the office (i.e. without shares, some with relative job security but others with much less), but upon whose labour the business and its core operations relied. Typically, I would interface or collaborate with employees working on this aspect of the business multiple times every day. Given that this represented so much of the labour that it took to produce these products, the nature of this work is a logical starting point for discussing the actors emerging around digital real estate platforms.

In the case of *System X*, the data we were collecting would usually relate to a given fund's portfolio (what buildings did they own, where they are, what they are—all of which was often discoverable through their website, albeit not in a format ready to go into our database). Other data included a range of 'point-of-interest' (POI) information like transport hubs, bus stops, and amenities. In the case of portfolio data this almost always required a web scraping approach, but for other data it could have been almost anywhere: from government open data APIs to bartering and exchanging data with our partners and clients. For *Dashboard X* this public POI data was also important, but due to the nature of the project my work was typically engaged with social media data relating to music, arts and nightlife venues and the events that they hosted (this will be discussed later). This required use of APIs (e.g. Foursquare, Google Places, Yelp) and an array of web scraping techniques to access smaller or more bespoke sources of information like gig listing websites. Hence the overlap in skills amongst those concerned with sourcing data was significant and we all worked quite closely together.

Looking back on these processes, one surprising aspect of this work was the degree of emotion and materiality with which my own experience of the work was recorded. Far from being an abstract or immaterial technical process, dealing with all this data is discussed in a way that was variously "grueling", "crunching", "whizzing", "ploughing", "furious", "intense", "thirsty", "buzzing" and "mammoth". Scripts and processes had to be "wrestled" or "nurtured" into "health", and only then could we "smash it" and "get all the data". And at times my work became completely immersed in this process of accumulating data in any way possible: web

scraping, social media APIs, free trials, student access agreements, and tapping-up old contacts and colleagues. Indeed, it seemed commonly accepted that we would all do "whatever was necessary" to acquire what was needed. As a result I became hooked on tasks like "trying to trick as much data out of Foursquare as possible" to the point of not wanting to go home—some days flew by and I'd realise by the evening that I'd done nothing all day but "write shit Python and eat shit biscuits". And, for much of the first half of my employment, the vast majority of my screenshots in my diary are of failures to get around rate limits on APIs, being blocked by websites, or struggling to convert and clean data elsewhere (in other structures, other encodings, other coordinate formats, etc.) into data we could accumulate, clean and use in *Garage X*. But for the most part when these small goals and challenges were hit it was always worthwhile. As one colleague said, "yeah, it's one of those triumph moments... the guys have them and throw their arms up and punch the air!" Often these moments arrived when a new chunk of data had been acquired in the face of technical adversity, but it also included points where data was visualised and provided the desired result that validated the endeavour. And at these points I "safely sat back" with great satisfaction, because "I could see the world coming into view", and "it felt great to see it come to life" in the "thrill of looking at it visualised" ... "at my fingertips". This would likely be followed by sharing the 'triumph' with colleagues on Slack.

Although this work entailed hours hunched over my own crumbling laptop (that is, until the day of outside investment meant we could all "unbox 4k [resolution] screens like it was Christmas"), this challenging and often mentally exhausting process of wrangling data was therefore also not a lonely one. It was fed by a constant dynamic of collective and individual challenges, where individual competition came together in building a team mentality that we could indeed get whatever data was necessary. Showing-off our competency-through-triumphs to one another was part of this And although I felt disillusionment and shock on day one that they merely had "two guys with [*a proprietary piece of web scraping software*]," by the time I left *Company X* there was something much closer to an entire pipeline of data ingestion

written in numerous programming languages and with a range of processing and quality checks. Along the way, small (and often stupid) moments of individual achievements and competitive showing-off—like setting up a new scraper which could handle browser cookies and thus feign user logins to access data, making a loading bar for my terminal from an animated rabbit, or linking my processes to an error handler that used Twilio to send me an SMS out-of-hours if I needed to tend to anything—were the ways in which this otherwise potentially banal work became rewarding, and the way in which it got driven forward beyond just another pay-cheque. And, all of these moments embodied the paramount value of the aforementioned 'hacker ethic': *creativity*. These were absolutely all creative material triumphs in their own right, and the constant labour towards them provided the crucial motivation upon which *System X* and *Dashboard X* could be feasibly built. Most importantly, these triumphs were the moments that could off-set the very real concerns around the risk of being employed in a start-up. Indeed, the relief "I wasn't being ripped off" when my first salary payment arrived came against a backdrop of wondering for a month whether I was doing "speculative test work for free" in a company where "nothing was certain". Most importantly here, it was being reassured along the way by several distinctly triumphant moments that kept me buoyant and able to contribute to the overall exuberance of *Garage X*. Since each moment brought approval and assurance in my competencies from the founders and my colleagues based upon prototype visualisations of the data I was working with. Therefore, it was a linkage between this creative thirst for our 'hacker triumphs' and our own position within the company that came together in the particular work ethic that drove the development of *System X* and *Dashboard X* forward. And each time we brought a vision of the world into view from the data we had wrangled, and brought it forward with exuberance and charisma, our own social standing and position within *Garage X* was validated and strengthened.

However, although this exciting, competitive and undoubtedly *creative* environment characterised much of the labour in *Garage X*—and glimpses of this (minus the messy realities of web scraping) would undoubtedly have passed to the select

few clients that visited us—the notion that *Garage X* was our headquarters where "all the magic happened" also obscured a huge amount of labour going into *System X* elsewhere. For example, one of the key aspects to our data ingestion pipeline was cleaning and checking the data, but one of the original key staff members charged with this was based (alone) in another country. Likely, as one colleague joked, because they were cheap. In addition, by the time I left *Company X* an entire labour operation had been opened in another economically-peripheral country for the express purpose of ramping up our data collection. In effect, the parts of our work that would gradually become routine and pedestrian to the core employees that developed the original means, methods and standards by which we collected data (from within within *Garage X*) would all eventually become outsourced to a cheaper labour force. And so, as the tasks which originally required creative problem-solving and 'hacking' skills became routine and programmatic they would be delegated (and relegated) to a context that was cheaper for the business and likely far less socially-rewarding for the worker—the tasks were now routine, and the workers' resulting lack of hacker charisma effectively meant they were of lower rank.

The ultimate personal example of this was where, two months into my job, I realised that in order to pull-off a particularly interesting triumph of matching my venue data (mostly bars and restaurants) to information that could provide an indication of its original opening (social media reviews), that I would struggle to fool Google into providing the data (it was inaccessible via API, and the scraping technique required would take days to develop if it could be done at all). The only way to get the information fast enough was by manual means. As a desperate solution, and in effect mimicking the business practices around me, I too hired a freelancer online from the Middle East using my own money (at a rate commensurable with UK minimum wage after platform deductions) and without informing any of my colleagues. This worked and the data ultimately provided the basis for the prototype of *Dashboard X*, not to mention some kudos from colleagues for how well it worked. But it was just another example that without grainy Skype calls and instant messages to countries in the economic periphery we might not only

struggle to develop our platform with the capital available, but the work would become much more dull and exciting as a result. Hence, in the open jokes and fantasies from my colleagues about having "a button to press to automate everything" there was also a strong relation with our private thoughts about the more boring side of the work ("it was a bit crushing to think I'd have to do something manually"). And this situation also helped mask the reality that amidst an exploitation and risk-relationship we felt 'from above', there was at least a fantasy that we were doing the most interesting work that involved a monopoly for us on the triumphant moment at which "the world came into view." Without such cheap labour, the work that was not valorised by any hacker ethic might not have been done, since no job title could justify such mundane data entry as anything like a creative endeavour.

This overview of the human labour involved in producing digital real estate platforms reveals a rich variety of ongoing motives and practices. However, the key point is that the most important actors of labour emerging around the present development of digital real estate platforms are subjects operating according to a distinctly material, creative and often exuberant work ethic. This entails principles that broadly correspond to the notion of a hacker work ethic; where values of creativity, freedom, openness and a networked context of passionate performance often trump traditional social values of hierarchy and job security. These principles inform and dictate the social processes that inform the methods upon which the most basic processes of producing digital real estate platforms relies (chiefly, via the technical labour processes by which large amounts of data can be sourced and fed into a large database). And whilst we were isolated in a remote suburban context together (as a group of young men with technical skills to offer), it was the firm conviction that we were doing something new and creatively challenging in bringing back information about the outside world that kept us going. And, which kept us able to muster the additional necessary labour from outside *Garage X* to keep the project moving forward and developing. Although many of us had our own precarities—interns, those on uncertain contractual terms, immigrants—we were able to put these on pause because the task at hand was attractive and immersing

enough that by bouncing off one another we moved forwards with great camaraderie and exuberance. The triumphs of "getting an entire website" or "taking the lot" meant we were like a band of pirates, and being able to sit back and look at the booty was the ultimate reward available, even if we didn't all have shares in the ship.

4.2.2 Platform wars and new metrics

The account above of the labour in *Garage X* has also raised some implicit but important points about the significantly early developmental stage of *Company X* and *System X* as a digital platform in general. For example, that we were scrambling (and often struggling) to obtain data as a sort of *raw material* in itself reveals just how young we were as a part of so-called *platform capitalism* (Srnicek 2016). The fact that this process was so full of friction, challenges and often virtual 'data theft' (a constant theme in my fieldnotes) belied the degree to which we were initially operating in a manner far from the platform ideal—for example, that a platform should reap the rewards of network effects to generate masses of its own primary data. However, in our quest to become a sort of "Bloomberg of real estate" it was informative to observe the numerous frictions that did arise as we followed a logic by which we needed to expand our data extraction and position ourselves as a gatekeeper to this data. And presumably by which, someday, market participants would require our services as a means to acquire market knowledge. Before moving onto the specific case of *Dashboard X*, it is useful to consider these frictions of data accumulation in relation to this context because they also reveal the logics by which we would need to adopt certain strategies to become a successful real estate platform. This includes a general need to demarcate and disentangle ourselves from other platforms as a coherent entity, and the fact that one important way to do this is through the production of new metrics. The first of these points will now be explained in relation to two aspects of our operation—poor quality of data and real estate information as a historically contested legal domain—and this will be followed by a short discussion of the new metrics emerging from digital real estate platforms.

To begin with it is useful to consider that, by extension of this research, I have argued elsewhere that digital real estate platforms should be regarded as "messy and overlapping" entities that are very difficult to disentangle from one another (Shaw 2018). Through their dependency upon the accumulation and flow of (often culturally complex) user data (whether human or non-human) through numerous other platform infrastructures, they are already co-dependent and attached to many other platforms. Nowhere was this more obvious than in our daily work, where a constant and sustained interaction with other digital platforms was unavoidable in the development of our technologies. This ranged from the open source technologies that we used to developed our own platforms (for example, database systems like PostgreSQL, map projection standards like WGS84, software development systems like Git) to the for-profit services we needed to run them on (which might have been things like Google's Cloud Compute or Cloud Source Repositories). However, whilst we depended upon these other platforms to develop our technologies, these examples in particular often constituted a surprisingly felicitous performance of software development, since by and large they worked quite well. By contrast, the more subtle and important observations, however, stem from those unhappy performances of data accumulation: the aforementioned friction of collecting, cleaning and processing data from other platforms, in a manner fraught with challenges.

The first example of this, which was observable throughout the research and was mentioned by almost every professional interviewed, was the poor quality of data that already exists within the real estate domain. Whilst this observation is itself an uncontroversial and widely documented reality of the real estate market, it is the significance and degree to which it was observed empirically that should be re-iterated. Accounts of "bad data" were everywhere in the marketplace: ranging from one fund surveyor who travelled to India and couldn't find an office building they owned (or that it might have had more storeys than they previously thought), to multiple interviewees (including a client) having serious pre-existing doubts about the 'data hygiene' of both *System X* and its many competitors. And, it was this direct experience of poor data quality in the workplace which justified and took

these concerns to another level. Often this issue would arise with data acquired from clients who appeared to have no reliable (digital) information surrounding where some of their buildings actually were (never mind how large the building was, or any other more granular information), but more typically problems arose from wider challenges that included uneven data coverage or categorical cultural and conventional differences in measurement standards or real estate regulations. And, it was these issues that then became compounded by a genuine lack of domain knowledge on the part of us as developers.

For example, in addition to our geographically remote position in *Town X* (i.e. we never visited a single building in the database except *Garage X*), this situation was effectively one in which a group of individuals almost entirely lacking in domain knowledge (for example, that gross and net floor areas can vary massively depending on whether a building's regional conventions define floor areas as 'usable area', entire building footprint, or even building plus sidewalk) were sat together collecting vast amounts of data that was entirely inconsistent in provenance or approach. In reflection, I realised that I was probably one of the only employees at *Company X* who had actually measured or surveyed a building in real life, by using an actual laser 'disto' and paper, and perhaps having to get yourself into spaces you didn't like (mouldy, cold, damp, dark)—the type of manual task more likely to be undertaken by people who went to the "old-people café" across the road. By contrast, this was a very remote and detached process (in much nicer surroundings), to the point where it occasionally roused reflexive laughter from myself and colleagues when it bordered on the ridiculous. For example, whilst it is not the objective of this research to utilise ethnography for the purpose of anecdotal shock stories, it is worth noting that one of the more bizarre and amusing examples of these issues is where I observed one colleague checking some floor area data by using his hands to eye-ball building sizes on Google Maps (see Figure 4.5). Given the nuances mentioned above that are involved in a seemingly simple measurement of floor area—not to mention that the construction of a building will also naturally have an effect since this was just an aerial view of the roof—it should first be clear

that this is an absurd practice, and second that (if replicated at scale) any small discrepancies would have very significant effects for any modeling of such data.[2]

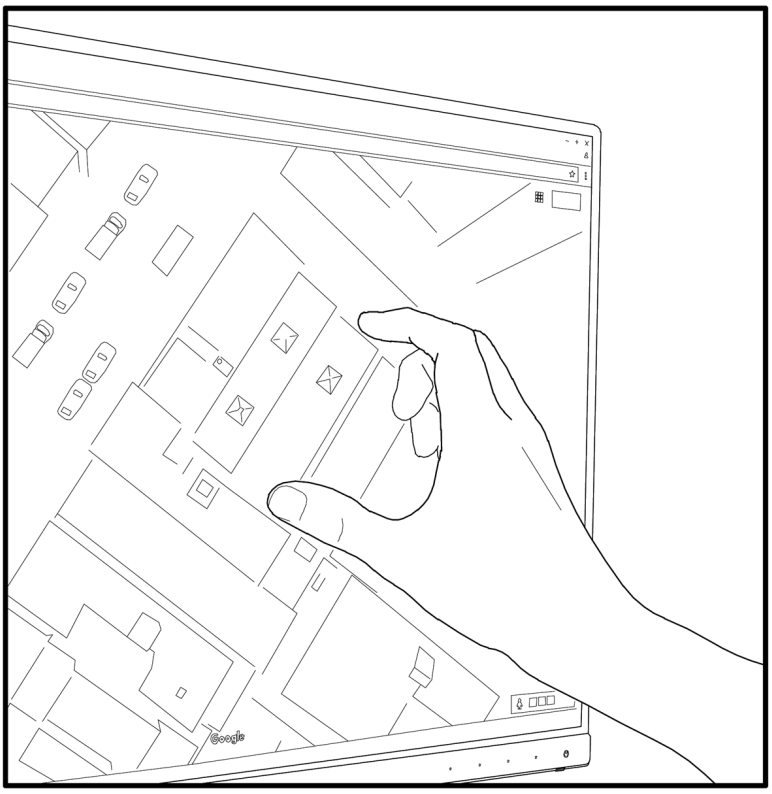


Figure 4.5: Eye-balling floor areas on Google Maps to check data we have 'scraped' on buildings in countries we've never been; addressed in ways we misunderstand; and with little understanding of the difference between gross and net floor areas.

However, contrary to this rather troubling aspect of building digital real estate platforms for asset managers (particularly given the financial crisis of 2007, and especially as presented in the film *The Big Short*[3]) it is important to note that these examples are largely entirely normal, both in real estate markets generally and in more contemporary platform technologies. Interviewees cited examples of many other platforms and even 'industry standard' tools that were also known to be operating with and trading upon data of dubious value or otherwise "lacking in

[2]When errors in our data were inevitably spotted, one of my favourite examples was the presence of a bar in East London called "Get Trolled!" in the data used for *Dashboard X*—a (fictional) bar with great reviews that turned out to have been "built" into Google Places API (likely by a student) in one of Beal High School's outbuildings.

[3]This film presents the financial crisis as stemming from a variety of causes, but one of the biggest problems is poor market information relating to mortgage-backed securities.

real worldliness" (a Director at the UK Land Registry). For example, IPD analysts (IPD is a widely used global property index) were said by professionals to "always [be] compiling errors" (REIT Senior Analyst), and it was accepted that although the new wave of analytics products had "some failures in the data", they would (and should) nevertheless be embraced by those who knew it was "only a matter of time" (Consultant 2) before these failures turned to success. Indeed, it was generally believed by some that the data would become more commodified and therefore more reliable as the market would choose the best data, allowing it to move more freely throughout real estate platforms (Consultant 1). That is, until we consider the second aspect of real estate market information as a historically contested and legally-charged domain that shows few signs of willingly opening up such flows.

As hinted in the previous section, much of our data was acquired by means where we did not ask anyone for permission first. Indeed sometimes permission wasn't necessary, but more often than not the dynamics and wider disposition of our labour were such that it seemed normal that we would just try to take what we could. Whilst this may have meant violating various Terms and Conditions (of websites, of APIs, of non-commercial student access agreements, etc.) it generally seemed to be the case that if data could be taken and used then it would be (see Figure 4.6). Combined with the ruthless attitudes towards data scraping explained in the last section, this broad approach ran deep and connected with us as employees; I too became completely consumed with what I knew in to be in a grey area from a legal perspective (though not in my opinion problematically unethical). Indeed, my diary and archive of Slack conversations is littered with passages that illustrate the degree to which "the harder [a particular London arts website] makes it [to scrape their website], the more I want to steal it all"; to the point where if a particular website (and often very small ones in the case of arts and gig listings) made it difficult for me to get their archives then "I now felt like I had some kind of vendetta against them." Inevitably, I would enjoy the triumph of uncovering their database structure and finding the quickest possible route to crawl the site, even by simulating a legitimate login of a (fake) user if necessary. Or through developing what myself and a friend

joyfully termed our 'proxy carousel': a Python script that by simultaneously building and rotating around a list of proxy servers could anonymously crawl the entirety of a major nationwide residential sales and lettings website in a few hours. This broad approach was no different for major real estate funds, and the addresses, floor areas and occupancy information of their assets would be duplicated daily, en masse.

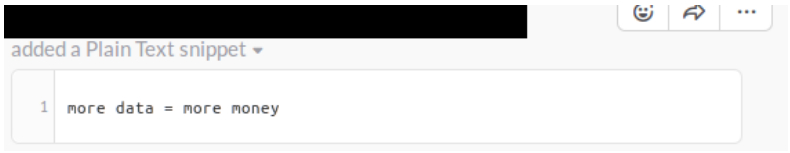


Figure 4.6: As a colleague joked to me on Slack by using the code snippet function (to pretend it was actual computer code), we both knew that "more data = more money".

Whilst I would not say that I, or *Company X* violated any laws during this work, it is nevertheless important to relate this situation to the wider reality of real estate market information as one which has long been extremely litigious, competitive and 'high stakes'. In addition, it has also had a history of state regulation and intervention. For example, I discovered through interview that at least one group of twelve large UK-based funds had been blocked in their attempt to form a private consortium of data sharing around the turn of the millennium due to legal challenges against them as a monopoly (Surveyor 1).[4] However, it's also important to note that the model of the digital platform itself can often be observed to exploit certain situations of *alegality* (Bratton 2015, p. 367) that did not apply in such historical examples—in other words, real estate platforms operate in a legal context that is now less visible to the state, and in a manner that might circumvent pre-existing forms of sovereignty (Shaw 2018). For example, the *CoStar* platform contains far more data than these twelve companies could have had at the turn of the millenium, but has cleared multiple antitrust assessments and avoided at least one legal challenge on these grounds (PRS 2018; Banister 2017). That is not to say state intervention is now absent in these matters, just that it is both adapting to the platform model and can also be negotiated in different ways. For example, at one point a founder of *Company X* explained that although it would be useful to open a German office,

[4] I cannot name this group as part of the conditions of my interviews

that this would nevertheless complicate matters on how we used open data on German public buildings for commercial purposes (in some cases it would be illegal or require a license). The short-term solution to this is simply to avoid becoming a German company and to continue to operate outside of their jurisdiction.[5]

Nevertheless, a modern and digitally networked world obviously does not dispense with issues of intellectual property. And, the competition between platforms for data continues to be fraught with legal tensions. In the case of CoStar, multiple legal cases have been documented in recent years, including one competitor 'hiding' data in the Philippines (Bonner et al. 2017). Data which they had accumulated by remarkably similar strategies of fake user accounts, automated methods to circumnavigate mundane labour, and a manner that was obviously somewhat lacking in domain knowledge—see Figure 4.7. Another competitor, CompStack, was also once banned in all offices of one major fund because their own data was 'leaking' into it as employees traded it for access to the platform (Surveyor 1)—which has proved to be an excellent strategy of generating network effects for CompStack, where users must submit 'comps' (comparative transaction and valuation data on buildings) to access the collective pool of comps. That said, CompStak has also been legally challenged by CoStar for having users who have themselves stolen CoStar data (Geiger 2014). Most interestingly, and crucially to this section, this has also led to a situation where a modern twist on the 'trap street' of cartography has developed: *trap data*, or outright mass algorithmic *alteration* of building data by CoStar in order to prove legal cases of mass data theft between platforms. For example, a building in their database might appear to be a 4,034 sq.ft office built in 1962, but it is actually 3,567 sq.ft and was built in 1952, or even 1914. Table 4.8 is an example of this taken directly from CoStar's successful legal action against Xceligent in 2017. Therefore, whilst such practices reveal that our operations relied on other platforms to come into being, the more important observation is that our success would effectively rely

[5]Accessing such data on public buildings was a legitimate concern despite their traditional exclusion from any real estate markets—since one potential client was involved in both politically advocating for and brokering the sale of public buildings on a rent-back basis, and wanted some data and analysis that could backup this case on grounds of good 'common sense' economics.

on whether we could eventually disentangle ourselves from these reliances. And therefore detach *System X* from its need for other sources of data that could open up legal problems, would require geopolitical strategies to circumvent, or contained unwanted and obdurate presences like trap data or basic gross inaccuracies.

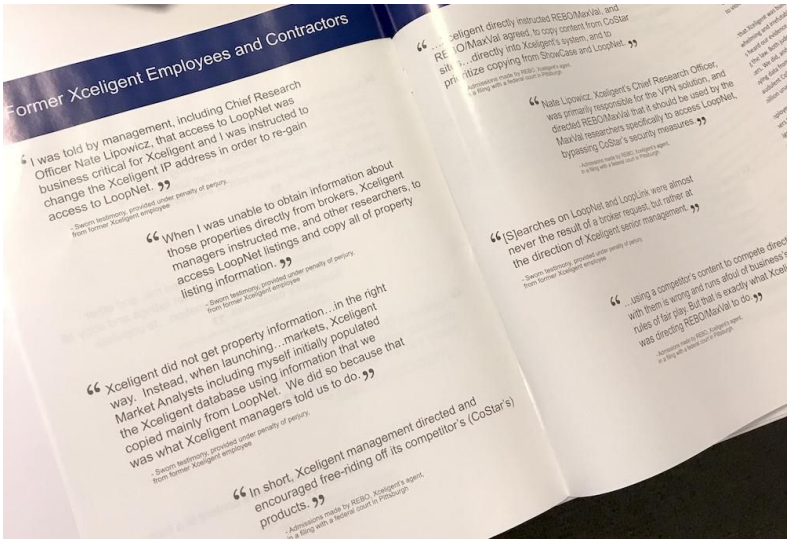


Figure 4.7: Former Xceligent employee testimonies used in CoStar's legal action against Xceligent, including evidence of copying data from CoStar's LoopNet subsidiary through practices like masking IP addresses and acquiring fake usernames to access data on up to 3.8 million buildings (Bonner et al. 2017).

It is often argued that the cultures and technical requirements of contemporary neoliberalism and financialisation require new metrics and measurements as a way to advance competition and create new economic instruments and assets (Lazzarato 2014; Beer 2016). In relation to this, it could therefore be said that there was a market 'out there' for our platforms. However, it is in relation to the dynamics of platform capitalism—the accumulation of data at all costs and in relation to myriad other competing platforms—that it can now be argued that there is also an internal logic to businesses like *Company X* whereby the creation of new standards and metrics for real estate is also desirable for strategic business and operational reasons (i.e. before we have sold a single client license).

In the first instance, this is because new metrics (like building quality scores, WalkScores or neighbourhood gentrification indicators) have the capacity to black box a range of the obdurate problems outlined above. In particular, they can

Address	Data Field	CoStar Value	Xceligent Value	True Value
1720 West End Ave	Parking Ratio	3.3	3.3	4.54
5501 Lakeland Ave	Parking Ratio	2.85	2.85	4.375
801 W State Rd 436	Parking Ratio	3.85	3.85	4.37
2102 Business Center Dr	Parking Ratio	7.02	7.02	4.12
5675 Jimmy Carter Blvd	Lot Size - Acres	12.4	12.4	9.68
411 E Town St	Lot Size - Acres	0.2	0.2	0.15
13330 - 13420 College Blvd	Lot Size - Acres	7.47	7.47	5.36
1700 Wyandotte St	Lot Size - Acres	0.4	0.4	0.2
744 Royal Ave	Year Built	1962	1962	1952
1409 - 1411 W 11th St	Year Built	1978	1978	1914
544 Flint River Rd	Year Built	1987	1987	1984
1103 NE McClain Rd	Year Built	1995	1995	2002
2105 Academy Cir	RBA	7,876	7,876	9,163
11410 W 105th St S	RBA	4,865	4,865	4,835
3590 Recker Hwy	RBA	7,600	7,600	8,032
843 S Cherry Ln	RBA	3,040	3,040	3,388

Figure 4.8: Table from a Missouri District Court complaint presenting evidence that the platform Xceligent stole deliberately 'seeded' data from CoStar (*Complaint from CoStar Group v. Xceligent* 2016).

reduce the need to display the data upon which they depend (and thus obscure its provenance, ownership or quality), and can be exchangeable substitutes for revealing any underlying reality. In the second instance this is also because they help to differentiate one platform from the next, and the capacity to produce new types of metrics is also the capacity to exist as an independent platform in the first place. Hence, to be able to present a new kind of metric (for a building, for a fund/owner, for a city, for a neighbourhood) is also the first step in viably demonstrating that, as a platform, we were capable of assembling large amounts of data from many different countries, legal jurisdictions, co-ordinate systems, and so on. And to make it all visible together, side-by-side. New metrics, and especially being the first to produce a certain kind of metric, create a viable situation whereby any poor data can be shrugged away since "eventually most of things will be mapped" (Developer 2), and where what really matters is that the system exists by which we can demonstrably assemble a technology to produce the metric in the first place. We were, therefore, absolutely committed to the creative endeavour of producing

new metrics as a foundation and core essence of what we were as an entity. If we had no metrics then we were a gatekeeper of nothing. In other words, metrics were in themselves of value, and the emergence of real estate data analytics platforms is itself negotiated in a market-like space.

In reflection on these observations, it's important to say that although these tendencies are no doubt common in other strands of platform capitalism, that it is their particular effects on the social construction of real estate markets that should be considered. Although this will be returned to later, it is important to emphasise what is new about these processes: that essentially, there are a huge number of smart and creative individuals who are entering a domain about which they know relatively little (and are very unlikely to encounter any actual buildings or assets directly), and with them is coming a new culture of measurement whereby the utility of a metric itself is overdetermined in the sense that it is already needed for reasons which pre-exist its involvement with any real estate market. This is a subtle point, but it is to say that if certain platforms are widely adopted in the marketplace, then that is also going to import these logics into that particular marketplace—that metrics are good for the platforms in the first instance. Hence, real estate markets will be subject to a new culture of measurement where emergent actors, including metrics themselves, value the process of commensuration as a means by which they themselves can come into being. The platforms themselves import with them a pre-existing and prior market of data barter, exchange and plunder. And any *thing* that exists afterwards in the marketplace must first have been traded or stolen as part of 'platform real estate' (Shaw 2018). Crucially, this will naturally include buildings. Therefore a platform real estate ontology is one where to exist as a disentangled commodity, a building *must* have data. But whether or not any resulting metrics about the building or its location are correct is a second-order issue.

To conclude the first half of this chapter, it should first be said that many of those developing digital real estate platforms for asset management and investment purposes rarely (or never) encounter buildings in situ as commodities. What is encountered, however, is a plethora of other platforms and the data they have

accumulated, and which is often of very poor quality, and sometimes stolen. As such, platforms emerge in relation to this wider context of platform capitalism in a manner whereby they need to position themselves as a certain type of coherent gatekeeper amidst the range of alternatives available. Whilst it is already widely documented that real estate market data is both often lacking in quality and yet also tightly contested, the important observation here is that one way in which a platform business can respond to this challenge is in the production of more new metrics. Not only do new metrics give the impression of a platform's independence from other data providers, but they also have the capacity to both hide any poor quality data and any data that might be legally problematic. Controlling a system of standards and metrics that can present a platform as such is therefore an impetus that emerges as much from the context of platform capitalism (and particularly in the case of building a platform from scratch) than the present real estate market as such. It emerges from a logic that cares *first* about the accumulation, processing, exchange and production of data, signs and metrics. But only second about their actual 'real-worldliness'. Hence this also means that beneath most digital real estate platform metrics lie a lot of complicated relationships, battles and performances that bear little relation to the buildings or spaces in question, and are much more a product of what data was available, how it was accumulated, by whom, and in what ways it could be convincingly re-packaged. All amidst a distinct social context within which success was contingent upon certain traits and performances. Therefore, whilst there might be an impetus and demand for new metrics from cultures and technologies of real estate financialisation, it's also important to understand that the production of new metrics is itself a strategy that benefits a platform before it has attained new users or can produce any of its own data. And, if any distributed cognition should emerge from the market devices of platform real estate, then this cognition is already one that contains and depends upon a market ontology of its own making: a distributed cognition that emerges from a circulation of metrics as part of platform capitalism. One important question that emerges from this situation is how will these two worlds, each with their own prior

logics, find a working means by which to interface. This subject will be returned to throughout the following chapters, but first the specific example of *Dashboard X* will be considered in light of the previous sections.

4.3 *Dashboard X*

As a speculative project, and an offering distinct from *Company X's* main platform (*System X*), *Dashboard X* was designed as a project that could initially be a stand-alone project (aimed at specific clients) and then later incorporated into *System X*. The rationale behind building *Dashboard X* was based on at least three factors. First, that there was already a prospective client to whom this could be an attractive tool, with a London office and a London use-case. This client was pursuing a large Build-to-Rent (BtR) scheme[6] where identifying and better understanding the attributes of different and often small urban sites would be important to their investment and development strategy. Second, as described in the introductory chapters above, urban 'renewal' processes (including gentrification explicitly) were of interest in general to real estate investors around the world. A tool which could locate, quantify or predict dynamics around gentrification and urban renewal was thus thought to be attractive to all sorts of potential clients. Third, a proof of concept for a general model could later be rolled out to more cities, and ultimately become part of *System X* as a global offering to all users. If this proof of concept proved successful then *Dashboard X* could feed its own metrics into building and portfolio scoring and benchmarking processes, and perhaps become integrated with the overall automated valuation system. And, as an investor, asset manager or other interested party, you would therefore be able to assess your portfolio, other portfolios, and potential investments against a 'gentrification score' at the click of a button.

In the simplest possible terms, the eventual functioning prototype of *Dashboard X* comprised a basic relational database that was populated with a range of locational data, including both static venue information (cafes, bars, galleries, nightclubs,

[6]This emergent asset class of real estate will be discussed much more in later chapters, but is best defined as an emergent class of new-build private housing designed for rent rather than sale. It is typically built, owned and operated by large institutional investors/funds.

artist studios, etc.) and mobile event information (gigs, pop-up markets, raves, exhibitions, etc.). These data also had chronological information attached to them in terms of either when the venue was estimated to have opened, or when the event took place. This information had been pulled from an array of online data sources including the APIs of Foursquare, Google Places and TripAdvisor, as well as manually scraped from a range of more 'underground' listing sources. In other words, the processes by which this was done were much as detailed above in sections 4.2.1 and 4.2.2. These data then provided a basic potential to identify, over specific periods of time (e.g. the past x years or months), which areas of London were experiencing increases and decreases in certain socio-economic activity relative to the overall dataset for the city. The basic claim here was that *Dashboard X* could accurately measure, to a very granular and time-specific margin, small increases in certain socio-economic activity that its marketing copy and documentation clearly stated was indicated of interest in the area from a 'creative class' of young, artistic and hip urban dwellers. These were not necessarily affluent young professionals, but more 'marginal' gentrifiers who would likely be renters, early in their careers (if they had any), and full of enthusiasm for big cities and trendy neighbourhoods. Hence, these events and venues were supposed represent not just people who went to trendy areas of the city, but also something which made areas trendy to begin with.

In addition, *Dashboard X* also used a range of other rental data (to identify cheap areas) and transport data (to look at connectivity) to produce several additional prototype models and heatmaps which were selectable via a main menu. Each one conveyed a sense of which areas were 'hot' or 'cold' in London and were scored accordingly by cell. For example, Figures 4.9 and 4.10 show a view across central and east London that demonstrates the heatmap along with various point data that would reveal information pertaining to the underlying database (for example, what cafés or artist studios a particular cluster of point data contained). It should also be noted that the heatmaps were not produced with a standard static cellular method, but were generated based on a nested geohash grid (Whelan 2011) that would grow and shrink in resolution depending on the zoom level (allowing the user to zoom in

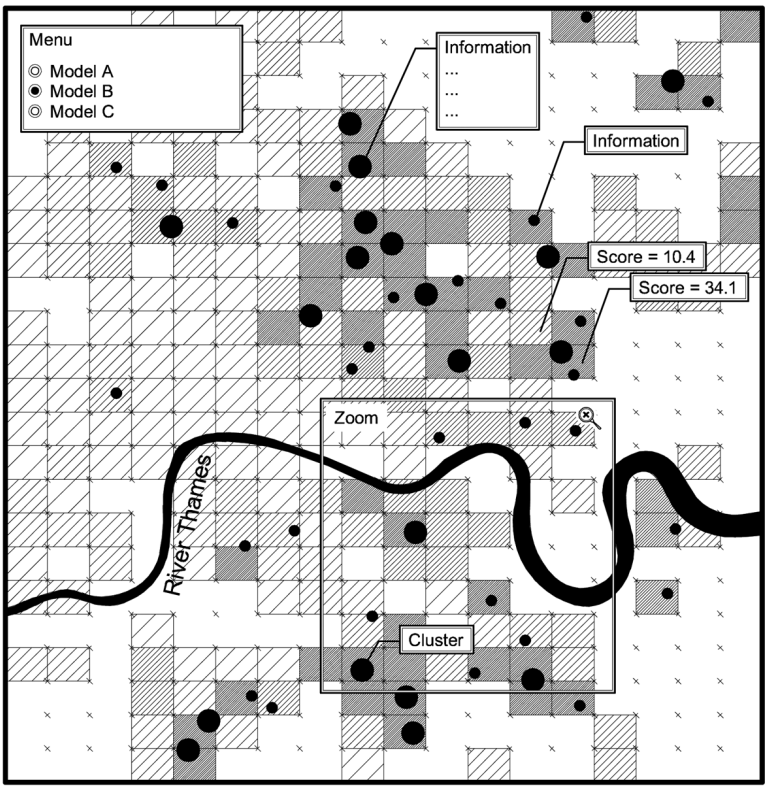


Figure 4.9: Indicative sketch of the form of *Dashboard X*, showing a heatmap of central and east London that reflects relative states of gentrification according to a Gentrification-index score (depending on the model selected). This sketch also demonstrates the manner in which point data would also reveal information about what venues and events had caused the cluster to appear or heatmap density (and therefore score) to increase. An expansion of the zoom area box is reflected in the next figure.

very close to different sites whilst still seeing a scored gradient). Furthermore, the scores were based not just on the amount of 'gentrifying activity' within a geohash cell, but based on a walking score system that used OpenStreetMap path data to calculate walking distances at various time-intervals (n-minutes, n+5 minutes, etc.) from the centre of each geohash to each record of geolocated activity in the database. Therefore, the score and 'heat' of each geohash in the related to its distance from certain new activities or venues, low price rental listings and transport hubs. However, for the basic main model (looking only at new activities or venues, not rental or transport data), the overall relative Gentrification-index score (Gi) for each geohash was derived from Equation 4.1.

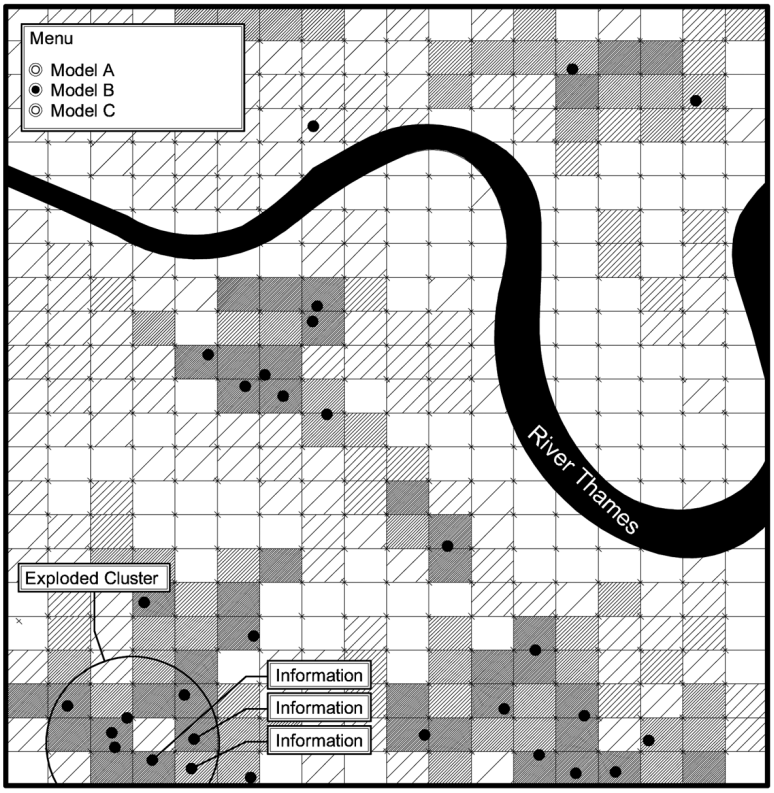


Figure 4.10: Example of zooming-in from the previous figure to reveal more information, and see the manner in which the geohash cell scaling changes accordingly to re-map gentrification at a lower, more microscopic and granular level (even to the street or block, depending on how close the relative geolocated data is in walking distance).

$$\mathrm{Gi}[n] = \frac{\dfrac{\mathrm{NS}[n]}{\sum_{i=1}^{T}\mathrm{NS}[i]} - \dfrac{\mathrm{OS}[n]}{\sum_{i=1}^{T}\mathrm{OS}[i]}}{\dfrac{\mathrm{OS}[n]}{\sum_{i=1}^{T}\mathrm{OS}[i]}} \tag{4.1}$$

Equation 4.1 relies upon first calculating two scores for each geohash cell that relate to the amount of either new or old geolcated acitivity nearby the cell (NS and OS). Both NS and OS are calculated separately around a new/old cut-off of x months (not shown in Equation 4.1), and where the scores are calculated based on several weighted intervals of x minutes' walk from the centre of each geohash cell to all nearby geolocated activities (also not shown). The *Gi* score for geohash cell n is then calculated as a proportion of how much new geolocated activity has occurred within a weighted reach of cell n relative to all historic activity across the dataset as a whole (where the dataset concerns the overall city being examined,

and all cells in the matrix are notated by T).[7] This means that the Gi for each cell indicates how much of a recent increase there has been in nearby activity, but normalised in significance by comparing to all activity in the dataset.

The following discussion of *Dashboard X* will now build upon the sections above (regarding the general dynamics of working on *System X* for *Company X*) to further examine the actors and values emerging around *Dashboard X* specifically. This will be done in a manner that considers the emergence of the Gi metric in Equation 4.1 as part of a 'calculative frame' (Beunza and Garud 2007) that combined both technical and social aspects: first, the data required to generate values for NS and OS in Equation 4.1, and second the narratives that were attached to this metric and the methods used in *Dashboard X* as representing value in relation to a process referred to as gentrification. The chapter will then conclude with a short analysis of *Dashboard X* as a calculative frame, and a summary of the values and actors upon which its success depended.

4.3.1 Addressing the city

In the simplest terms, values for NS and OS are generated from a mass of points in space and time, about which a modicum of additional label information is also known (like the name of the point, which could be a bar or an event that happened). In combination with walking paths from OpenStreetMap, this mass of points was used to generate a score to each geohash cell (at each scale) that reflected how many 'old' or 'new' points were within a certain distance's walk from each cell. This point data was gathered in much the same way as discussed above in sections 4.2.1 and 4.2.2, and the reliance of *Dashboard X* on aggressive data accumulation amidst a competitively creative social context was hence very similar to *System X*. Thus from the beginning it was a project that would benefit from the same shrewd tactics of data sourcing, and the pursuit of new metrics and data

[7] It should be noted that this equation was also weighted for representational purposes through numerical tweaking (beyond that represented here) that would result in the best possible gradient for the heatmap.

repackaging as a core method to obfuscate this process and instead ultimately present something more novel (the *Gi* metric).

However, there were also at least three factors that drove the project towards utilising data from other digital platforms, and particularly social media platforms or smaller local websites. The first was that there was simply a massive abundance of highly granular urban social data that was available from other platforms which appeared to be relatively accessible (somehow) and with few real immediate constraints. This basic uncontroversial fact (e.g. Kitchin 2014c; Rabari and Storper 2014) was also complemented with an attitude that, from the start and before any real idea of what the product would be, there was an assumption that the best thing to do was to simply "grab it all ... the more the better—throw it into a model to run later!" The second factor was that the best available traditional data sets that contained the type of information we wanted (for example, the Ordnance Survey's Points of Interest® data set) were often very unreliable by contrast to the granularity of information available through social media. In particular, the Ordnance Survey data was clearly biased in its underlying collection methods (revealing more about how and when it was collected than about London's socio-economic activity or businesses), and although data from Google or Facebook invariably revealed mistakes and duplications (afterall, as my colleagues knew all too well, it was "added by regular folk—*$%£%£$!!!*"), its variety, volume and coverage proved much more attractive than such traditional sources.

The third factor that drove the project towards social media data and local websites was the general belief that this represented a potential to measure something "more local" than anything else. The theoretical implications of this will be discussed much more in later chapters (especially as *mētis* during Chapter 7) but there was a strong belief, driven by the perceived user-production of social media data—combined with its potential variety, volume, velocity (i.e. real-time) and granularity—that this offered a chance to uncover truly 'local' knowledge of the city and its processes (specifically gentrification and a posited utility-value people were getting from sites of consumption). Even more so, that we could 'recursively address'

(Bratton 2015, p. 206) and cross-reference our data within and between platforms, to reveal "deeper" overlaps and meaning. As if the tension between the headache of illegible local systems of meaning (Scott 1998, p. 29) and the standard protocols of digital information had collapsed, leaving us to measure whatever we wanted. This meant that, despite typical problems like uneven coverage, that it felt like we could select anything from this abundant data and use it to tell us something somehow new, and thus render legible previously unaddressable market externalities.[8]

In reflection however, it's easier to think of measurements that bordered more on the absurd than somehow locally authentic. For example, at one point I pondered whether to try and incorporate PlaceReviewAspect measures of bar 'atmosphere' from the Google Places API, where it seemed that in practice 'atmosphere' was measured on a binary scale of either 'has atmosphere' or 'doesn't have atmosphere'. Indeed, earlier on this aspect seems to have been a tag, before later being scored on a basis that almost always, as with many online reviews, tended towards a bimodal 1 (lowest) or 5 (highest) (Shaw 2015). Later on, I even experimented with adding an option where *Dashboard X* could be tailored to show only independent bars and cafes, before discovering that certain chains were doing a good job of distinguishing their names in a manner that had fooled my filtering. These events again demonstrated that the process of building digital platforms generally in *Garage X* was more about encountering other platforms—including new standards, metrics and protocols—than it was about encountering buildings, cities or other people. This was still data that was filtered through a plethora of other platforms, and data that had been acquired through means which were much less-than-ideal. Indeed, rather than picking up a more accurate reflection of local measures, I was engaged more in the prior development of a dragnet technology where eventually, and ideally,

[8]The one ethical push-back I received in my work was when I speculatively suggested that we could try and develop a list of 'local influencer' types—"cool kids who go where the cool stuff is"—and surveil them individually on social media at a relatively anonymous aggregate level. In pushing back against this it seemed clear that whilst violating rival platforms might be fair game, that the rights of individuals was a step too far.

we would be in a position to very easily and simply choose whatever and however we wanted to address and measure as part of the new metric on offer in *Dashboard X*.[9]

Indeed, although we also pulled data from some city-specific websites, there was always a constant tension between what genuinely constituted 'local data' and what was, in fact, just another platform standard. However, given that a discourse of 'local' runs throughout most platforms dealing with urban spaces and communities, this is perhaps unsurprising. Overall, this led more to something more like a confused blending of things that sounded like local measurements with practices of aggressive standardisation that were technically necessary to produce the product. In other words, similarly to the project Livehoods.org, we were pursuing an idea whereby we could "offer a new way to conceptualize the dynamics, structure, and character of a city by analyzing the social media its residents generate" (from Livehoods.org website, see also Cranshaw et al. 2012). But in reality the data that made up NS and OS said much more about the platforms it came from and the process by which we accessed the data than any true 'bottom up' measurement. Or, there's an illusion of locality but the means of production dictate something closer to wholesale standardisation (again, this will be discussed more in Chapter 7). This was reflected in another facet of *System X*, which aimed at a localised energy consumption model for buildings yet often had to rely upon its 'fall-back global model', that was actually just based on buildings in a few Global North countries (because "pulling each country into equivalence was very difficult... especially Japan").

There's now three preliminary points that can be raised in relation to this brief explanation of where NS and OS in Equation 4.1 came from. First, that these scores were gathered in the same way as described above, and were subject to the same social and business dynamics around their production (creative data wrangling bordering upon data theft and the pursuit of new metrics). Second, that *Dashboard X* drew on a great many sources of highly granular social media data that we

[9]Similarly, this principle was also the premise of the other project I nearly worked on to produce an 'Open Valuation Framework'—or, a valuation method where the user is in maximum control of the metric, leaving as little onus as possible on us to dictate the narrative by which this metric attained meaningful value. In other words, let the user choose how they want to value as long as we control the machine that crunches the number.

reasonably believed was hyper-local but in fact was more the product of other platforms than it was any modern day 'use value' at play in the city. Third, and this will be discussed more later, it reveals that in the very first step towards building a valuation metric for gentrification that we were, rather than expanding our field of vision, in actual fact isolating the cause of gentrification to a subset of behaviours from a subset of London's urban population that could only ever (at most) account for a 'consumption-side' model of gentrification. For example, as discussed by Ley (1996) and others.[10] That is to say, the lack of socio-demographic data, government policy information, or even market participant variables (e.g. where other developers are building) almost entirely denies any 'production-side' account of the matter (e.g. as discussed by Neil Smith). This means that, from the start, *Dashboard X* is not only committed to a metric of gentrification that relies on variables which strongly pre-define the means of its production (from other social media platforms and websites). And where it can only ever provide an account of gentrification as a process driven by certain city-dwellers themselves as individuals engaging in certain activity and consumption. This does, of course, mean that *Dashboard X* has a specific view of the world (within its scope only lies one cause of gentrification), but that will be discussed more in later chapters (especially Chapters 7 and 8).

In reflection on this abundance of geolocated data from which *Dashboard X* began to be assembled, one final point to raise needs addressing immediately is: now we had all this data, how did we decide what gentrification was? And, by extension, who were this group of city dwellers that *Dahsboard X* claimed to address through NS and OS? The next section will now sketch out the process by which value was attributed to the points that produced NS and OS, and further discuss the method and equation that we used to pull them into an indexed relationship.

4.3.2 Valuable narratives

The first recognisable iteration of *Dashboard X*'s metric that emerged from the abundance of data discussed above was a small speculative study I conducted which

[10] Discussion of this topic will be expanded upon in the final two chapters.

sought to correlate and explore the relationship between a specific sub-culture of urban dwellers and rental prices in New York City. This study employed an archive of addressable "underground" events advertised by email, over fifteen years, on the New York-based listings project NonsenseNYC—an email list for "independent art, weird events, strange happenings, unique parties, and senseless culture" (Nonsense NYC 2015)—and explored it alongside rental data from the American Community Survey. This study was conducted before my employment at *Company X*, and although it was never used in the eventual production of *Dashboard X* because the list owner had given consent only for me to use it for my academic work, it provided a useful reference point for my initial meetings with the CEO of *Company X* as both a concept for discussion and a personal selling point for the work I might take on during my employment.

The study relied upon addressing particular events in space (by carefully extracting, cleaning and geocoding many thousands of often inconsistently addressed 'underground' parties and events) and time (by allocating approximate dates to the parties) which we presumed were frequented by a certain subset of young, hip and artistic New Yorkers—though whom were also likely not particularly affluent [11]—and exploring the relationship of these events over time with rental increases in each associated geographical area (by Public Use Micro Area, PUMA). This provided two useful points of departure for the work that would eventually become *Dashboard X*: proof first that you could track over time the movement of *either* a certain postulated group of urban dwellers *and/or* the movement of the places they might want to spend time in (see 4.11), and proof second that you could at least strongly correlate this to some form of market metric, including rent (see 4.12).

Introducing this study to my future boss, during our first meeting at *Coq d'Argent* restaurant in the City of London, was the crucial step in gaining employment and access to *Company X* and the world of real estate data analytics platforms. However, the most important observation at this early stage was that it was not my extremely

[11] NonsenseNYC was also born from a group of artists closely related to the nomadic Toyshop Collective "known for instigating outrageous happenings like marching through the Lower East Side with fifty people playing instruments made out of junk" (NYMag 2011)

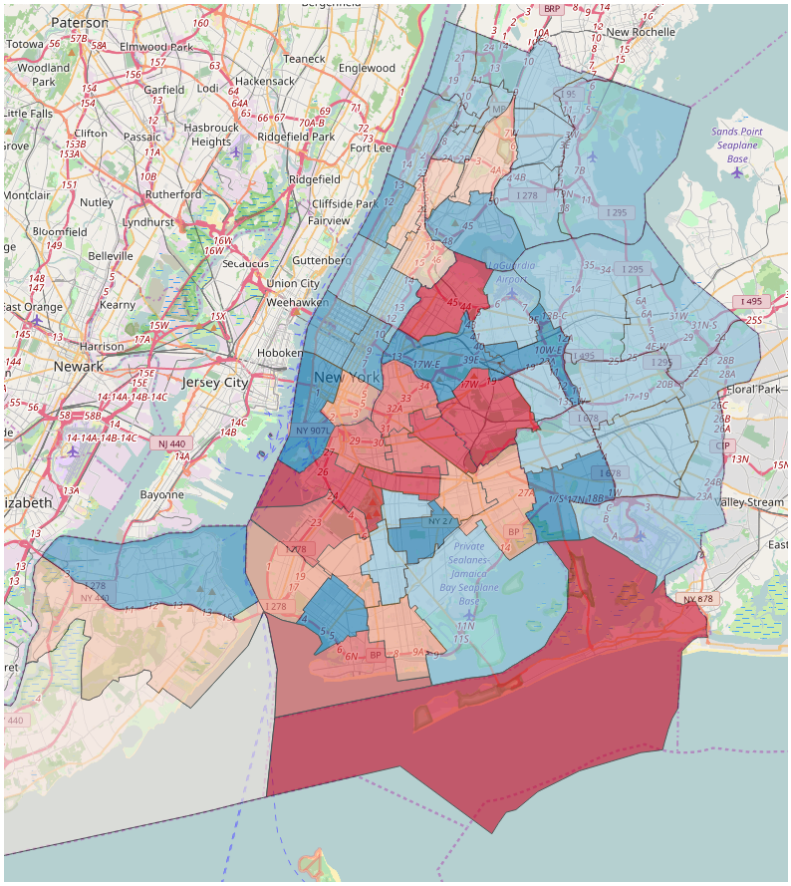


Figure 4.11: Choropleth map showing relative increase (red) and decrease (blue) in NonsenseNYC events over a ten year period (2006-2016). This visualisation and others demonstrate the manner in which a specific group of people interested in "independent art, weird events, strange happenings, unique parties, and senseless culture" have gradually moved from downtown and 'first wave' areas of gentrification to more peripheral areas in Brooklyn and Queens.

simple linear regression model that seemed to excite him (he had just been talking about *Company X*'s white paper on machine learning for valuation so this was pretty basic work by contrast, and he glossed over a bit). Rather it was my description of how I conceived of the city in theory, and most of all how I described and supported the presumption above about who this group of people were as 'marginal gentrifiers'[12] that caught his attention: a sort of authentic pioneer gentrifier, likely renters but also a group which both define and produce value in urban space through their everyday life, leisure and consumption. In other words, I narrated my study

[12]This term was originally coined by Rose (1984), but was used in a different, incorrect, manner during this fieldwork which will be discussed further in later chapters.

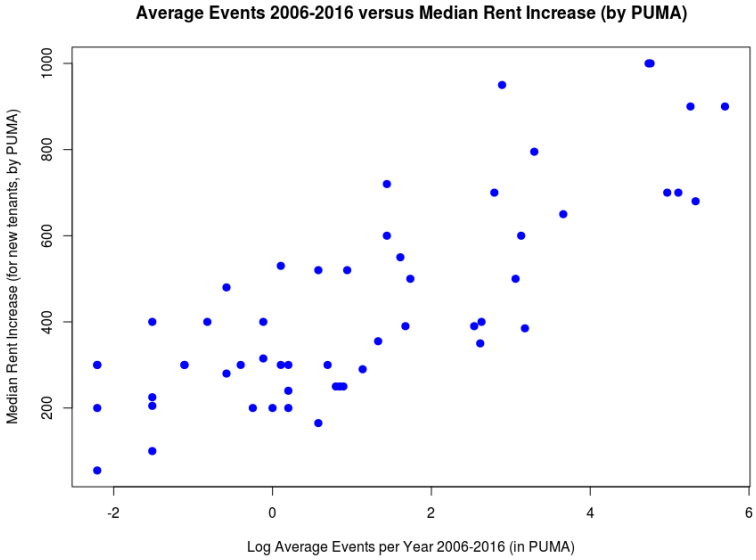


Figure 4.12: Basic linear regression of number of NonsenseNYC events (see last figure) to changes in median rent across PUMA census areas, over the same ten year period (2006-2016).

by describing a sort of "down-and-out, more bohemian 'creative class"', in the Richard Florida sense of the term (Florida 2002).

The importance of this narrative to my employment in *Company X* (alongside figures 4.11 and 4.12, it got me a job) now illustrates a defining aspect of producing new market metrics that is crucial to this research: the production of new metrics depends upon a careful and laborious process of stripping, building and asserting *narrative* (Espeland 2015). And for my new boss this was no different, as he explained that "there was a need for model designers..."—and where he himself used to do most of it in the inception of *Company X*—"...whose skills were not necessarily expert programming but as a mediator between the clients' understanding of the project, including how we measure values in space, and the technical construction of the models around the platform's database." And, "programmers weren't usually suited to this sort of thinking ... they are only needed to do the technical work." People like him and I could (and would) do the exciting and most important work of "mediating between the technical and the creative." In talking about our favourite examples of this, Kevin Lynch's *Image of the City* (1960) came up, and we agreed that what was great about the book was that Lynch had blended a

technical understanding of how to measure certain points in the city alongside a narrative that *explained* their value. Therefore, to explain this crucial aspect of the *Gi* metric further, two specific such narratives will now be discussed: my exposition of what I understood in a very personal way as a marginal gentrifier (including how this often departed from academic definitions), and the wider exposition of narratives in how the *Gi* metric was produced through what others have termed the 'social life of methods' (Savage 2013).

Marginal gentrifiers

The NonsenseNYC study that helped me gain access to *Company X* clearly carried some authority from the start of my employment (I strongly doubt that my personal credentials and CV would have been enough, and the repeated requests to use the maps and graphs from it to woo potential clients later down the line demonstrated that they obviously carried significant value), but it is very important to point out that it was absolutely *not* the only narrative of urban renewal, improvement and gentrification in *Garage X*. Indeed, as I begun my work (which consisted at first of simply brainstorming and researching what socio-economic data might be available for use), numerous other ideas of value came up in the city from colleagues. And often these ideas would result in the raucous debate discussed in sections 4.1 and 4.2. In particular, as a suburban crowd (as described above), many of my co-workers forwarded ideas of what made urban space valuable which departed significantly from my own, and always a long way from the weird events and 'senseless culture' of the NonsenseNYC listings archive. Sometimes they'd get quite insistent, and the most technically minded always seemed ready for a debate about it.

During 'stand-up' (our regular Agile-inspired team 'scrum' meetings), suggestions from others came thick and fast, especially from the newly hired data scientists who tripped off so many suggestions that it became annoying to engage with them. For example, electricity consumption per capita and Amazon postal statistics were two suggestions that kept coming back, and I had to actively argue against them, despite the fact that acquiring this data would be almost impossible anyway. A few

others seemed transfixed on the idea that *Fitbit* and *Strava* data obviously showed which areas were pretty to run through ("more green") and therefore valuable (according to them), or that a lack of traffic meant it was easier to sleep. Others re-iterated their fear of crime, and some highlighted that the most criminal areas of cities often housed the most immigrants. Indeed, in contrast to my own disposition, many of my colleagues' ideas of value and urban renewal seemed to focus on more individual acts of consumption and a nice, quiet middle-class lifestyle. Almost as if all cities should be as white, male and middle-class as *Town X*. As a result of these occasional debates I'd often have the feeling that I had to defend my own ideas of value by countering these ideas as arguments. Sometimes my closest colleagues would even come to my defence, reciting lines I'd already laid down previously about why I was trying to pursue the ideas I had ("Matthew immediately backed me up about electricity consumption, pointing out that the data also wasn't available on the scale we needed to do what Dean was suggesting"). In other words, once my colleagues learnt my lines, they too could explain the *Dashboard X* project and what the value was that we were measuring. But I had to do a lot of work to get to a point where the majority of *Garage X* was fully versed in the story.

To that end, I had to negotiate the first months of my work with a constant re-iteration and defence of what I was doing that itself took up a significant amount of time, energy and often emotion ("I pointed out that his ideas were good but that I had slightly different priorities about what I was trying to do ... he looked a little disappointed, or perhaps just confused"). Instead, I had to combat this with a constant narration of what a 'marginal gentrifier' was, and a citation of my NonsenseNYC study to go with it (along with the occasional mention of Richard Florida and the creative class). Eventually, some of these terms began to come back at me, or I heard someone else mention them. One of my happiest moments in terms of validation was when one of the part-timers mentioned to me "that he thought it was cool that artists could raise the profile and value of an area."

Although this process often allowed me to cite academic work on gentrification (some of which I now realise that at the time I didn't understand properly, including

the original term of marginal gentrifier), it more often became very personal. Whilst I had done all I could to keep my private life separate from *Garage X*, I realised that I had been increasingly using it to justify the project. I spent time re-telling stories about parties and events I'd been to years ago on a decommissioned ferry that had turned into an artist-squat in a backwater of Brooklyn (see Figure 4.13); about the best nightclub in Manchester being in a derelict industrial zone near Strangeways Prison (see Figure 4.14); and about how it was usually poor artists and young creatives that usually turned areas around into something valuable. In lieu of this I recounted another story that a well-known artist studios I'd once lived at in Queens, New York, had a board member who worked for a (very large) land-owner and developer in the area, and they wanted to keep the studio there to 'incubate' the area and raise the land value. I also took to citing any news about this type of phenomena in Slack [13], as part of my constant and sustained performance that this is a process out there in cities. And a process which, despite the fact it likely sounded a bit edgy and foreign to my colleagues, that we can otherwise believe in it as worthwhile enough to try and get it represented through a PostgreSQL database and a dashboard frontend.

However, although this work of justifying and narrating the triumphant processes of data wrangling described above became quite technical, I was constantly uncomfortable with the degree to which I was essentially defining the field as a participant. This was not drawn so much from a methodological concern (I was, afterall, also simultaneously observing the workings of a very successful digital real estate platform business) as a concern that my own understanding of these processes might be disappearing before my own eyes. I realised as I went that 'marginal gentrifiers' is really a much broader and more complicated term than the narrative I was spinning (Mendes and Caldwell 2013); a narrative about what was essentially just "young, middle-class wannabe-Bohemian hipsters" ("Me?! I

[13] A graph showing "More Coffeeshops Less Crime" in Chicago (see Figure 4.15) seemed to go down the best with everyone, possibly because the value of espresso was so much more relatable to *Garage X* than stories about me living in an illegally-zoned industrial warehouse in another country, or as a property guardian in London.

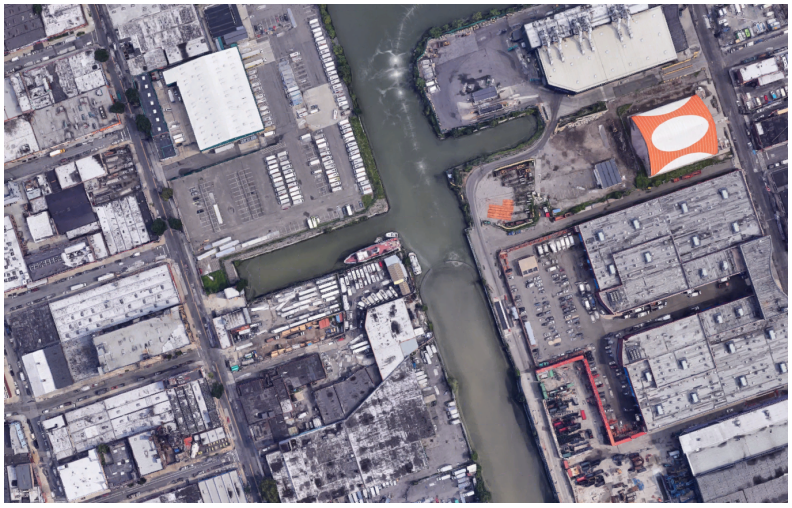


Figure 4.13: The decommissioned *Schamonchi* ferry, home to many an event from the NonsenseNYC email list, and accessible only via "a dank industrial warehouse parking lot" (taken from an earlier diary I kept in New York, which I re-read some of during my work at *Company X* in order to find mention of some other event listings websites and refresh my memory on some details about the developers and artist 'gentrifiers' I had encountered).

worried.") who could be likened to a 'creative class', though that category seemed ever more nebulous as the work progressed.

Indeed, in reflection on the notion of the value attached to this presumed group of addressed and geolocated urban dwellers in *Dashboard X*, I now realise that although my narrative about urban renewal, valorisation and gentrification departed from that of my colleagues in *Garage X*, that by the end of my employment it did so only slightly. But in constructing it I had also made assumptions and co-produced categories which I no longer believe to be as valid or as simple. Whilst those around me—young, male, white suburbanites—generally had a much more green, peaceful and safe sense of value that they were trying to reconcile with urban space and real estate, I had essentially imported a swathe of ideas that stemmed from my academic background in this area (selecting Richard Florida and the notion of marginal gentrifiers) and my history as someone who has lived in what might best be termed marginal 'consumption communities' (Jenkins 2006, p. 260; Andrejevic 2011, p. 616) that roughly reflect these academic ideas (creatives, artists, risky lifestyles, collective values, probably middle-class but mostly broke).



Figure 4.14: View exiting the White Hotel nightclub at dawn (Manchester/photographer unknown). I spent a lot of time describing the value often attributed to otherwise desolate industrial zones; remarking both on the aesthetic value some marginal gentrifiers might attribute to them, as well as their location often straddling peripheral 'rent valleys' (see below for discussion of rent valleys).

And, at the time, this process was very much lubricated from being placed in a situation where my success was contingent on the performance of such a narrative. To a degree I was now locked into seeing it through, despite some slight sense of uncertainty. My narrative was thus one which I increasingly began to doubt: "did marginal gentrifiers even exist anymore?!"; "did hipsters exist?"; and if so, "were we capturing a process at the beginning or the end?". With some of my closer colleagues, critical discussion reinforced my sense of doubt: "we chatted about our shared disdain for the contemporary middle-class 'artist' community

and their endeavours, and how nothing was actually that risky anymore" ... "art was a soft commodity for middle class families".

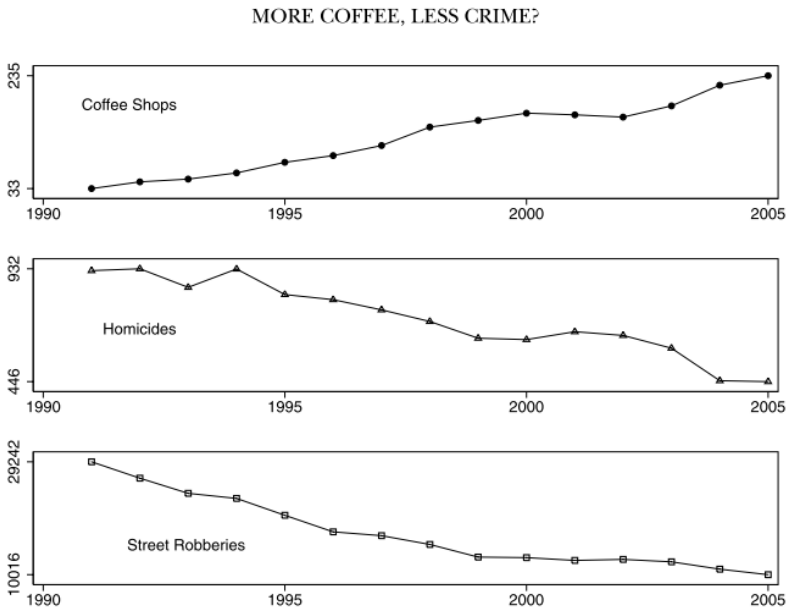


Figure 4.15: More coffee shops, less crime? A figure from from Papachristos et al. 2011 showing coffee shops, homocides and street robberies in Chicago from 1991-2005 (as shared by me with *Garage X* on *Slack*).

Thus, at some points during the work I began to lose sight of the answers to these questions. I became worried that my own narrative might be unravelling, and so my reflexivity turned in on itself as someone not just affecting the field to a significant degree that might become methodologically problematic, but that was perhaps occurring in a way that didn't even make sense to me anymore (this will be returned to in the final chapter). But on the other hand, this only reinforced the fact that by now my narratives had actually been remarkably successful: *Dashboard X* was built, *Garage X* understood what it was, and meetings with clients had begun. And whilst they might have been exaggerating, one colleague told me later that it was one of the 'cool things' we we working on that convinced them to join the company. Therefore, this narrative that I had personally carried—from New York in one time; to London, Manchester and *Coq d'Argent* in another; and onto *Garage X* more recently—had served a crucial purpose as part of realising *Dashboard X*. And just like my boss' grand team talks of *responsible investors* using *System X* to

quantify risk and environmental impacts, the purpose of my narrative was to justify the selection of available data to construct a new notion of value in a new platform. It didn't matter so much whether my marginal gentrifiers existed or whether I really thought they did, it just mattered that everyone else thought they did.[14]

The social life of methods

Whilst *Dashboard X* may have begun with a study that was looking for a statistically-relevant connection between the activity of a certain postulated group of urban dwellers and rent increases, the ultimate end product did not in any way offer anything like a statistically-backed metric. By contrast, the metrics of *System X* were produced using statistical or machine learning methods (and could therefore be more meaningfully incorporated into risk analyses), whereas *Dashboard X* simply offered a new measurement of something that had not previously been measured. In this respect, *Dashboard X* was a tool more aimed towards fixing something like Knightian uncertainity (Knight 1921)—that is, a lack of quantified knowledge about the world—rather than putting a probabilistic figure on how well something could be measured (like a statistically quantified risk). Because of this, it's important to consider where the metric itself came from in order to illustrate a second type of narrative. A narrative that relates not just to the value of what is being measured, but also the value of the process by which it is being measured.

During the process of building *Dashboard X*, the wrangling of data and the social work of trying to explain the value of what we were trying to measure was also accompanied by more technical hypotheses of the dynamics at play. And this did introduce many other statistical studies and arguments—one in particular, released to much media attention, was a study that used *Foursquare* data to measure a form of gentrification in London (Rodionova 2016; Hristova et al. 2016)—and the one causal hook to the narrative which returned repeatedly and was broadly understood by my colleagues was Neil Smith's (1996) notion of a 'rent gap'. This, along with

[14] This is a very important point that will be discussed as part of the final conclusions in Chapter 8, especially Section 8.4, but at the time of building *Dashboard X* I mostly did believe in 'my' idea of marginal gentrifiers, but now I would say that I mostly don't.

the notion of a land-value valleys or 'rent valleys' (Porter 2013) as a semi-peripheral spatial zone of under-realised or mispriced rental value in the city (i.e. a temporary increase in the rent-gap as you move outwards from the urban core and through a rent-valley zone) were the basis of the hypothesis that we could locate marginal gentrifier activity as they sought out these under-valued spaces of the city and then valorized them through gentrifier activity. A number of sketches and graphs came out of discussions with colleagues about this process, some of which have been reproduced as an example in Figure 4.16.

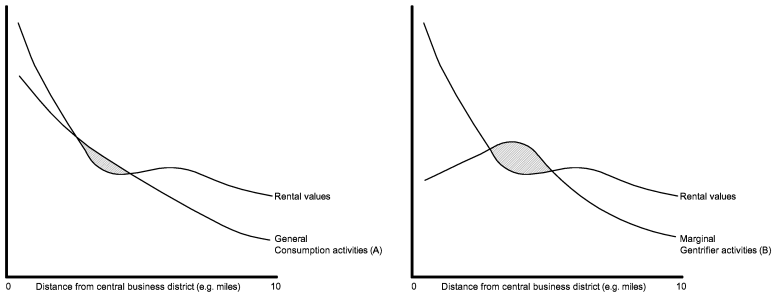


Figure 4.16: A reproduction of sketches from discussions with colleagues about possible relationships and overlaps between rent valleys and either general urban consumption (which in your average global northern city might produce a central 'blob' if visualised) or marginal gentrifier activity (which was theorised as more likely to peak in these peripheral areas, and would produce more of a 'doughnut' around the central business district).

The ideas represented in Figure X introduced a notion that whatever data was available to select and use for the project, that in some way we were seeking a representation of a process that would naturally represent something relatively peripheral. And whatever *Dashboard X* ended up like, it had to show something on a map which in itself showed a marginal process. In effect, it needed to be the opposite of the average heatmap of social media in a city ("a big blob of activity in the middle") and therefore something that would probably "look more like a doughnut". The action and 'heat' needed to be in the periphery, or the margins. It was because of this basic representational requirement that we used Equation 4.1, and for reasons that will now be explained.

Equation 4.1 was extremely simple but was not plucked out of the air. It was neither born or discovered in *Garage X*, but in fact was carried by myself from my previous experience working in a market research agency. Originally concocted by myself and an old colleague (and in liaison with another Oxford Internet Institute student), we had used what we called the 'relative-percent equation' to make small increases in outlier points of social media sentiment and chatter appear more significant in our reporting dashboards for clients. Dashboards which were (at least in that particular line of work) often absurdly 'cooked' in the way they presented data. Since when working in a much less technical and numerate domain (i.e. often for clients who just needed graphs and charts as presentation eye-candy), it was not uncommon that we'd field nonsensical requests from clients and senior staff who wanted us to do impossible but amusingly-phrased things like "broaden the field of zero"—and the relative-percent equation therefore also became a running joke. It was a tool that often saved us in times of stress, when a client needed to have some sort of value (and perhaps Knightian uncertainty) translated into their "actionable market insight" as a representation that over-emphasised small changes and movements in the periphery of a dataset. In other words, it was an equation that I knew would often nicely capture uptake and activity in the margins of a dataset.

However, the lack of statistical significance and this import of my own experiences and tools from market research does not render *Dashboard X* meaningless. The equation still shows a relative increase in something in a manner that made sense to all those around *Dashboard X* as it grew and developed into a working prototype. The equation was there for everyone in *Company X* to see and discuss, some of which had PhDs in statistics or data science. And as I put the final pieces of the prototype together, and toyed with the heatmap settings and equation weightings, I experienced the most ultimate triumph of the project where the world came into view, and I saw it "come alive ... in New York the trail of newly opened bars, cafes and artist studios around Long Island City looped down through Brooklyn and around the frontline of all the well-known outlying gentrifying areas. I imagined it like a solar flare, or the way fire burns through coals, like a spit of energy. London

was similar but less linear and more potted. The main band came around the East from Tottenham down to Stratford ['the sweet spot']. The rest were bits and pieces, all of which a quick word with friends or a search online confirmed their status as 'the next big thing'. The patterns weren't stark (even better?), but they were there."[15]

Hence, whilst Equation 4.1 is not 'wrong' in any way, its use in *Dashboard X* does support a reading of innovation as something that requires "the circulation of people" (MacKenzie 2009, p. 68; Fleck 1994, p. 641). In other words, it was as much my embodied knowledge from another domain (in this case three overlapping domains—my personal life, academia and market research—along with a strong narrative from each) as any abstract discovery of a reality out there that contributed to the building of *Dashboard X*. And, it supported the argument that equations themselves can be a vocabulary and communicative tool that can cross from one domain to another (in this case market research to the far fringes of real estate) (Espeland and Stevens 2008). And, supporting the argument that these narratives of value and method were so important, the growing impetus for myself and my colleagues to document all of our work on the internal wiki—lest we leave and take the knowledge with us—was accompanied by a request from the head data scientist that we "include the story of how we got there." To this end, I included academic references and anecdotes alongside equations and tables, and as a convincing piece of evidence that I had finally won around the most technically minded amongst my employees, it was also stated that others should should "do [the documentation] like Joe." Indeed, whereas it seemed some of my colleagues were less dedicated to this task of careful documentation (perhaps they didn't want their knowledge documenting), I saw this careful process of documentation as one good means towards a graceful and ethical exit from the field.

That an artifact from a less-than-statistical domain of market research moved so successfully into an environment where most of my colleagues were crunching

[15]This will be returned to in later chapters, but I would argue that the biggest triumphant moments in building *Dashboard X*, like this, were not just the point at which *Dashboard X* and all that it represents "began to dance" (to borrow Marx's discussion on commodities), but also a key point at which a new regime of expression began to emerge through *Dashboard X* in relation to the real estate value (Lazzarato 2014, p64)

data using tools like Data Science Studio (a piece of software containing all sorts of 'out-of-the-box' machine learning tools) is telling. In doing so it had transformed from market research artefact to an animated and living actor of *Dashboard X*, brought into being by a sustained performance of narrative. And, narratives that had been convincing enough to forge a valid reason for the endless hours sat in front of a terminal trying to fool Bing's geocoding API into letting me use multiple free authorisation keys. Or finding the dates of the first review for every restaurant in London from TripAdvisor. And, as part of an overall method, these practices, narratives, assumptions and equations behind *Dashboard X* were also strong enough to outstay my own presence at *Company X*. Many months after I had left *Company X*, an ex-colleague publicly shared some information that gave insight into their new machine-learning valuation model in *System X*. This showed a table of which input variables were found to be the most significant by the model. High-up the list, and in a way that surprised me to some extent, they had determined that n minutes walk to nearby bars and gigs were two relatively significant input variables. But before I arrived, it seemed that few had seriously considered or discussed cultural events like live music in relation to property values. And bars had arisen only in relation to a small project for a student housing investor (and bars of a very different kind). Yet here they both were as key input variables for their main automated valuation model (AVM). This account is therefore distinctly representative of both the social life of methods (Savage 2013) and social life of data (Beer and Burrows 2013), and a direct example of value(-able) narrative work having a lasting impact within an organisation that has now long outlived my employment—the performative crux of why "some measures disappear, [but] others become the lynchpin of judgement" (Beer 2016, p. 119). And, cumulatively, "why some devices survive and dominate ... while others are eclipsed" (Ruppert et al. 2013, p. 40).[16]

Given that this AVM—that now uses methods and values that were instituted and narrated for *Dashboard X*—is now in the hands of several global real estate funds,

[16]It should be noted that there are other aspects of the 'social life of methods' that will be discussed in later chapters, for example how these metrics and values begin to circulate more widely (Chapter 5), or how products like *Dashboard X* are imagined by market actors (Chapter 7).

this also validates the notion of a data assemblage as containing people and social elements as well as technical ones. In another world it could have easily been Strava, Fitbit and Amazon deliveries. But instead it was now a (slightly strange) mix of both a young, male, white, suburban middle-classness alongside my own somewhat over-complicated, convoluted and confused account of my own vision of urban gentrification, that threw into the mix my own middle-class 'bohemian aspirations' and beliefs (not to mention a somewhat over-romanticisation of the places I've lived), much of which this entire process had now led me to call into question (never mind the category of marginal gentrifiers, which I had reduced and simplified far beyond a second reading of the academic work that influenced these ideas in the first place).

Whilst a technical critique of this reading might say "Well, perhaps these variables really *do* predict real estate value?" or "Maybe they would get a better model if they put more variables in and not just yours?", this also misses the point of what I am arguing. What has changed is not the method (machine learning generally) that they might use to produce the AVM for *System X*, or the skill of their execution. Rather, it is the way that my own narrative work around the values and methods used for *Dashboard X* has been relatively successful in leaving a lasting perspective or *knowledge* of urban real estate value within the humans and social processes that combined within *Garage X* to co-produce *Company X* and its platform products. Categories like independent bars, music events and artists now constituted real estate value in the minds and cultures of this organisation. And a valorisation-through-consumption aspect had entered a concrete market device of real estate value (*System X*), not to mention the more embryonic *Dashboard X*. In this respect, despite being separate platforms, *System X* and *Dashboard X* embody values and methods which have bled into each other to some small degree, and the way this occurs is through the social work of producing narratives and the social life of the methods that produce the metrics that demarcate these devices as platforms to begin with. Their entire ontology, and the process by which they were built, is thus definitively social. Our identities, aspirations and histories as their developers were now embodied in the metrics of these two platforms.

4.4 Calculative frames and their data artists

In their research on securities analysts working in the presence of Knightian uncertainty, Beunza and Garud (2007) have emphasised the importance of calculative frames in understanding the work that analysts do. A calculative frame in this instance is not merely an abstract entity, but something that takes up a tangible presence in the devices that construct markets. They comprise the beginning of an economic agencement inasmuch as they can provide the foundation by which to render something calculable (Callon, Millo, et al. 2007), and they put in place the metrics, categories and analogies that make sense of the world as economic. In the case of *Dashboard X*, I argue that I had made the first steps in constructing a calculative frame that had the potential to eventually become, or to co-constitute, a new market device. Through these first steps, and an ethnography of this process, certain values and actors have been observed as crucial to the process of building *Dashboard X* as a calculative frame.

Whilst certain technical traits stemming from platform capitalism have been examined in the preceding discussion of *System X*, the first observation in relation to the discussion here of *Dashboard X* is that the construction of a new calculative frame can be a highly-social endeavour that requires at least one individual (in this case myself, though it was clear that my boss was on a similar journey with *System X*) to navigate and engage with a number of social conventions surrounding the site of its production. Both digital real estate platforms examined here emerged under social conditions that are congruous with the notion of a hacker-ethic amidst a hyper-masculine and competitive setting where success is based on a constant social performance of competence through triumph. In this instance, I had in some ways achieved the highest form of competence in successfully constructing the basis of a new calculative frame. Since, just as is the case for securities analysts, "one way in which unknown analysts can break into high-ranking positions is by offering investors a dramatic profit opportunity ...[one of] the quickest ways to do this is by providing an original interpretation" (Beunza and Garud 2007, p. 33). This was also similar for a colleague who began as an intern before developing one of our

first environmental models, and we were both offered more permanent positions as a result of building these calculative frames.

The second observation about this social setting is that constructing new forms of value requires a constant and sustained performance of narrative. Whilst the range of technical skills in *Garage X*, and the abundance of urban data available from other platforms, provides ample capacity to move towards producing *some* form of new platform, it is the constant iterative movement between technical address and narrative that contributes to new understandings of value. In this case, the emergence of a new metric in *Dashboard X* required me to navigate between the production of trust in my personal knowledge of the world and the 'mechanical objectivity' (Porter 1995, p. 3) I had established in the data I had collected, the database in which it was processed, and the equations and operations by which this could occur (Espeland 1997). This is what I needed to do to establish connections between the metric, categories and analogies in my calculative frame, and this was the crucial social work (Espeland and Stevens 1998) that was going on in *Garage X*. Hence, it was thanks to both technical competences in selecting what to address in the city and a conviction in a sustained narrative that led to a successful delivery of the project—a reality laid bare (somewhat embarrassingly) when a senior sales colleague boasted to have referred to me in a meeting with a large central London landowner as "a data artist" (apparently this was something that impressed them). Echoing the notion that all market devices at some point require an artful element of cookery (Callon, Millo, et al. 2007, p. 189). That said, my own conviction in the narrative that supported this project was also performed under a constant and growing sense of doubt about the validity of my calculative frame's categories—just as my carbon modelling colleague would share giggles about people checking building sizes on Google Maps with their fingers (see Figure 4.5)—but amidst this competitive environment, where success meant developing a calculative frame, these small humorous (but technically infelicitous) performances to one another were not open to *Garage X* as a whole. In this respect, any doubt in the validity of our work was never shared in a large group, and the amusement it occasionally delivered was

more of a private bonding between closer colleagues. Since, any wider admission of holes in the frame would have been politically tantamount to debasing our entire endeavour, on which both our jobs and identities as start-up hackers depended.

However, it has also been demonstrated that this continuum between metric and narrative is also more complex, because the methods by which the metrics come about also possess their own narrative. And in this case *Dashboard X* had been born as much from the world of market research as it was from anything like 'real' data science or actually-existing real estate. Its grammar was thus one definitively constructed from both my own history as well as an methodological origin and purpose in a realm of hyper-marketisation and consumption. But its success was also evident in the lasting impact it has had on the valuation model now used for *System X*, with this narrative of urban value as depending on the activity of 'marginal gentrifiers' seemingly remaining within the organisation and this particular market device. The success by which this moved into a domain on the edge of the real estate market (though not yet a part of) is thus indicative of a potential need for new metrics (of new forms and methods) by the real estate market proper, though this needs to be discussed more later after the next chapter.

Therefore, building *Dashboard X* was not simply about trying to find a novel metric about the world out there, but it was about building an entire calculative frame within the distinct social dynamics of *Garage X* and the backdrop of platform capitalism. And just like other calculative frames—which might be said to contain elements of metric, category and analogy (Beunza and Garud 2007)—many months of work had resulted in the successful and stable mobilisation of a frame that connected a metric (*Gi*), category (marginal gentrifiers) and analogy (ranging from historical examples like the Lower East Side in New York or Shoreditch in London, to my own relatively more contemporary stories about Bushwick and Dalston). By comparison to the work of Beunza and Garud (2007), this might look like Figure 4.17. Connecting these elements together therefore required a crucial actor: the 'data artist'. An actor who must somehow gather (or borrow) the technical capacity to creatively and coherently combine a great wealth of data

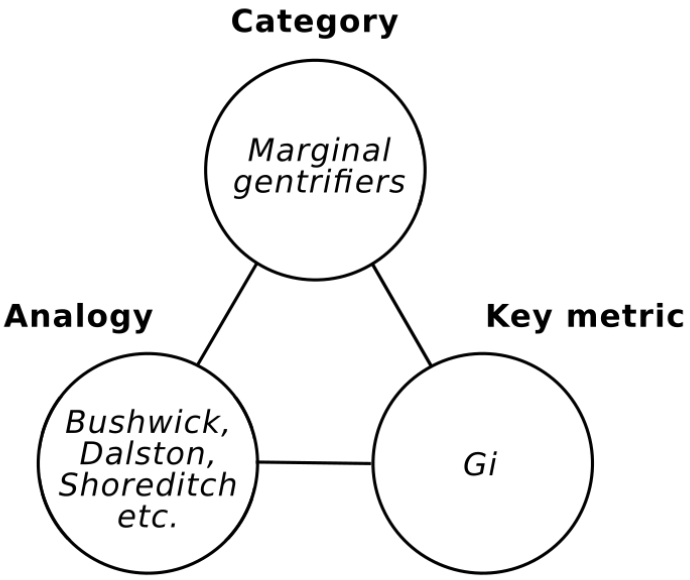


Figure 4.17: Drawing from Beunza and Garud's (2007) research on calculative frames to value the company Amazon (and their diagram of the frames presented by analysts Blodget and Abelson), a similar conceptual analysis of the calculative frame build for *Dashboard X* might look like this.

sources, but most importantly must be capable of the sustained effort required to explain the narrative behind the endeavour to others. And often in a manner that presents inconsistent or conflicting values. On the one hand, this role brought significant and anxious doubt for myself as a manager of the project, but on the other it had successfully brought forward an interpretive device that could now bracket, give meaning to and offer a quantitative point estimate of gentrification: *Gi*. The successes and struggles (both collective and personal) in performing the construction this frame are therefore evidence of both the importance of such 'data artist' actors and their performative narratives to quantification. Not to mention also understanding the wider 'felicitous conditions' of platform capitalism and start-up culture within which this frame was built.

4.5 Conclusion

It is often said that the marketplace is the site of struggles over value (Mirowski 2013), but this chapter has demonstrated the manner in which these struggles also take place in the construction of new market devices long before they enter the domain that most would strictly term the real estate market proper. In a long discussion around the general dynamics within *Garage X*, it has been demonstrated that the production of digital real estate platforms like *System X* and *Dashboard X* are subject to a great many prior tensions and social dynamics which help shape their characteristics vis-a-vis the actors and values that emerge around them.

First, the wider context of platform capitalism has been considered in relationship to *System X* as a real estate platform trying to be something like the "Uber of real estate market analysis". Here the general reality for new real estate data analytics platforms trying to vie for success is one of poor data quality and often outright data theft. As a result, the complex dependencies that platforms have upon one another means that a situation emerges whereby new metrics are pursued as a value in-and-of themselves: they have a capacity to demarcate and give value to a platform, and obfuscate poor quality or stolen data along the way. These general platform dynamics have been explored amidst the working context and culture of a very masculine and competitively creative social situation. A situation which valorizes competency displayed through small triumphs, many of which revolve around who finds way to access and enrol different sets of data within the products we developed and their metrics. And in particular, there is a clear parallel between the creativity, dynamism, hubris and successes of this world and similar accounts of analysis work in the finance sector, explored later in the chapter through the lens of building a calculative frame as an ultimate triumph for a junior worker at *Company X*. This parallel was also echoed in interviews with an analyst of mortgage backed securities "we were being incredibly creative in terms of what we were putting in securitisations" ... and how the "history of all the big numbers, your LTV (loan to value ratio), your DSCR (debt service coverage ratio) and so on" were constituted in the investors' interface (Software Developer 3—securities analyst).

Second, this chapter has explored the more particular case study of *Dashboard X* alongside these general dynamics. As a calculative frame, with myself as frame-maker, *Dashboard X* claimed to present a new metric for socio-economic changes in the city that meant an area was more likely both to be increasing in rental value and of growing popular appeal to a certain category of value-producing urban dwellers. Examining other elements of this calculative frame—in particular the category of person it presupposed and analogies of other similar historic processes in different cities—reveals the extent to which a calculative frame and the new metric(s) it offers depend highly on a great deal of social work to be done in order to construct an appropriate narrative to accompany the frame's more technical elements. In other words, there is a requirement for the actor of 'data artist.' Or, those who possess a modicum of technical skills, the right social background (young, male, white), and a (most crucial) capacity to narrate the newly emergent metrics that constitute these new frames of valuation. Amidst this role, we find an often awkward tension between the technical operations of mechanical objectivity and the 'selection of new truths' in narrative (Beer 2016, p. 117). A tension which simultaneously both threatened and drove this research forward in terms of its reflexivity in engaging directly with the production of narrative necessary to begin to measure new forms of value.

The birth of *Dashboard X*'s new *Gi* metric (and the socio-cultural conditions of the labour that built it), therefore demonstrates that the material and social reality of calculation requires a much more anthropological focus than the rhetoric around new digital real estate platforms might suggest. And although visiting clients and would-be investors who came to *Garage X* might have had the impression that we were all sole, heroic, technically-gifted individuals working in isolation with data that revealed inherent truths about the world; on the contrary, everyone from my boss down to the intern trying to build our first random forest model in Data Science Studio were in actual fact operating under much more complicated socio-technical circumstances. The production of the *Gi* metric therefore reflects these circumstances and is a product of them: a metric which valorises a rather unique (and often geographically far removed) view of the urban as having valuable

energy and 'heat' as a result of the leisure and consumption activities of a liminal category of young, creative and broke middle class urban dwellers pursuing parties, art and perhaps even 'senseless culture' in the city's normally less-visible peripheries. Therefore, at this stage of *Dashboard X*'s journey towards the real estate market as an economic agencement, there are plenty of reasons to think of it as 'more heat than light' (Mirowski 1989).

5
Selling *Dashboard X*

This chapter will focus on *Dashboard X's* journey from *Garage X* into the boardrooms and meeting rooms of the real estate market. It will consider the key emerging actors around *Dashboard X's* potential adoption, and what aspects of the product and its operation came in to contact with different forms of value. In doing so, the chapter will aim to demonstrate what potential clients and users of *Dashboard X* expected or desired from the dashboard. Including where it attained, added or lost value in this respect, and where it succeeded or failed to meet certain criteria of adoption in terms of social conditions. This will include consideration of how we collectively (both as *Company X* and the clients) framed the device, how the device did or did not disentangle market processes of gentrification in the manner desired by potential clients, whether the process of 'translation' (Callon 1984) was successful or not, and why. The chapter will conclude with some overall reflection on what sort of data-driven investor emerges around *Dashboard X*, and how they give rise to the circulation and production of new forms of real estate value.

5.1 Sales Strategies

Before proceeding to discuss the presentations of *Dashboard X* to potential clients, it's worth considering some overall sales strategies adopted in relation to *Company*

X's wider offering and other potential clients encountered in the field (some aspects of which were hinted at in the last chapter). This is both because *Dashboard X* was designed and built as a project that could link up with the main platform, and also because *Dashboard X* was, after all, produced in an environment that generally conformed to a series of set business and operational logics. In other words, our products were platforms and we were a start-up, so that meant 'network effects' and the accumulation of data were, in effect, universally important to our operation as a business. This meant that, for example, pro-actively adding fund portfolios to the platforms without asking the fund (discussed in the previous chapter) was regarded as one way in which to capture the world's biggest funds with a 'data imperative' (Fourcade and Healy 2016). As described in the previous chapter, such portfolio data would invariably be out of date (whether scraped online or obtained from a direct source), too complicated or multi-layered in ownership structure to properly represent, or simply incomplete. But the act of adding this data to the platform as a representation seemed to be regarded as a usefully coercive (albeit somewhat confrontational) strategy that would encourage clients to either get on board (and believe they can somehow retain agency over the information, see Beer 2016, pp. 98-108) or lose out. This occasionally ruffled feathers with both current and potential clients, but is similar to how many other platforms in real estate and beyond function, who might declare: "adding 5 locations every month—are you *Beeing* part of it?" (*ParkBee* 2017).

Importantly, whilst such strategies could be viewed as trivial mechanisms that either succeed or fail depending ultimately on the quality of the particular product, they also had a number of performative aspects that should be considered. First, these performances often seemed like a relatively simple type of generic discursive performativity, and might include declarations like "a transparent market is a high-value market" or the declared belief that "data is [now] for sharing" (Surveyor 1). But in reality they could also become significantly more complicated by some of the wilder (sometimes unfounded) claims made by the more senior members of *Company X*. For example, where someone presenting at a major private industry event might

take to the stage and claim we were adding x-volume of buildings to our database every day (where x-volume was a very large number, and soon to be several times larger). Sharing pictures of these distant conference events in motion on Slack—against a slideshow backdrop featuring these wilder claims—would then send our remote headquarters into giggles as we turned to our single staff member responsible for obtaining such data, and sarcastically ask him "Are you busy?!". Second, and equally importantly, there was an intense focus on generating interest in these wilder claims about the data (which was effectively invisible and completely unverifiable to the average real estate professional) by reference to data visualisations that would rarely be produced by working fully functioning products available to buy.

In this respect, there was a primary strategic focus on the output of maps, visualisations and mini-dashboards (that could be showcased or embedded on different websites) as a means by which to convey our accumulation of data (even if the data had not been accumulated in the best possible manner, as discussed in the previous chapter). For example, from the minute I began work on *Dashboard X*, there was a minimum expectation in place that I would "make maps", and then "we could show them to clients and use them to discuss the matter and get a sale." Indeed, much of the apprehension and anxiety I had about taking on the work at the start (due to a lack of a paying client and the project's speculative manner—because I didn't feel comfortable unless I felt like I was contributing) was soothed by the repeated belief that "maps were good to show people and [were] a powerful sales device in their own right [that] would be really useful for the company." And, as detailed in the last chapter, I too began to enculturate myself to this orientation and subsequently share the feeling that "the idea of putting maps in front of clients [was the] most appealing [aspect of the work]" (Colleague).

Ultimately, of course, these data imperatives and representational artefacts were intended to come together in the sale—at which point, presumably, we had to deliver a working product somehow—but in the meantime there was a distinctively affective purpose in our endeavours that, as in many young start-ups, was not realised in an immediate economic value (Cockayne 2016). Indeed, many other real

estate platforms in this area might only declare "*now* let's go and build something really awesome" *after* receiving significant funding (BisnowTV 2016). And so, generally speaking, this aspect to our operation contributed to an overall strategy where we would aim to show prospective clients representations of themselves (or the processes they cared about most) in the products we wanted to sell them in order to animate the relevance of this data imperative to them as a lively and attractive proposition. And, to demonstrate that we somehow possessed knowledge they could (and should) buy. Examples of this could be anything from the value of their portfolio 'after Brexit', to their highest scoring building, the value of their own house, or best of all, that we value their portfolio in a live demo of *System X* in a 'big' number or through a new kind of metric. In sum, this undeniably rhetorical and affective strategy resulted in a pattern where one of the bosses or sales team would make a contact and would then call back to headquarters to ask "send some images of the map" ... "it doesn't matter if they are no good, the guy is not computer literate and we just need to whet his appetite."

However, these performances were also never straightforward and often appealed to multiple discursive levels simultaneously. For example, as part of our overall marketing strategy we employed public relations experts in order to get media exposure that purposefully had multiple conflicting 'hooks'. In this respect, one afternoon trip to meet a major media outlet yielded a high-profile promotional feature aimed at underlying language that would signal to investors, but presented as a news story with a different rationale of public interest. Whilst 'advertorial' content (whether explicit or not) is commonplace in today's media, it took on a more significant and over-determined guise in relation to *Dashboard X*. In this case, we would drop the term gentrification entirely ("bad press!") and aim at a consumer angle that was all about market transparency where people moving to London could use the tool to find areas with low rent and lots going on. In this way, we would also "get the correct audience we wanted—investors, fund managers, and other big money players." Therefore, these events might be described as 'dual performativities'

(Goffman 1975) (which have both front- and backstage aspects), or even lively 'layered' performativities (Morris 2016), and will be challenging to pick apart.

However, in moving towards considering two specific client meetings in particular (below), it should be noted that research has demonstrated the importance of looking at these complicated and over-determined instances of performativity in the economic domain as crucial in the formation and coordination of marketplace *expectations* (Braun 2015). And, this is of special relevance to selling *Dashboard X*, since the manner in which these dual performances can frame and disentangle expectation formation is particularly significant to entering into a contractual relationship around *Dashboard X's* adoption as a market device. And, if the giggles of my colleagues are anything to go by, then although the "10-15% fudge range" (i.e. how much it was OK to over-promise or improvise) sales philosophy of our boss may have reassured me (as much lower than in similar previous jobs I've had), the proof would still be in the performance. Therefore, two client meetings for the sale of *Dashboard X* will now be considered in order to pick apart these aspects in relation to its potential sale. This will be done in relation to Michel Callon's (1984) framework of translation as a means by which to think about the adoption of the device in the market, and where the first meeting consisted of 'problematising' work, and the last meeting was where 'enrolment' seemed likely but ultimately failed.

5.2 Meeting the clients

The clients for whom *Dashboard X* was primarily intended had a close connection to *Company X* by virtue of various personal and business ties. Obviously the extent to which this can be revealed is limited by the terms of the research, but it's important to explain that this relationship was enabled through *Company X*'s existing client base, its formal investment partnerships with other funds, and the contacts of *Company X*'s shareholders. Due to the nature of global real estate markets as increasingly constituted by elite financial and real estate professionals operating across nation-state boundaries (Forrest et al. 2017; Hay 2013; Paris 2013), this might come as little surprise, and conversations around news items like the

Panama Papers (Brown and Houlder 2016) revealed the extent to which the business was already connected to, and highly reliant upon, connections with small circles of elite decision-makers in real estate. When I asked one shareholder about the matter and whether they knew anyone involved, they replied matter of factly and with some amusement that "we know some people in there yes, some friends, some clients".[1] And, conversations about these subjects revealed that our clients were not necessarily always just business connections, but could naturally also often be friends; revealing the manner in which global real estate is constituted as much through everyday life as it is the more obvious spaces of global capital (boardrooms, trade shows, Mayfair, etc.). Another aspect of this relationship with some of the world's largest real estate funds was that we also had a small number of individuals in the team who had worked in real estate investment and finance, and maintained active relationships with colleagues at large funds (or even continued working there). Therefore, the extent to which *Company X* was successful was undoubtedly aided by connections directly to the top of elite global real estate networks. We were not, in this respect, really 'disrupting' the world of real estate exclusively from the outside—for example, like AirBnB might be said to have done (Gallagher 2017)—but rather, we were already partially overlapping with the network that constitutes the assemblage of global real estate markets.

In this respect, getting the first of these meetings was not necessarily that difficult, and we also knew a great deal about the potential client beforehand. Right down to who we would be meeting and what they were like as people. Again, whilst many details have to be left out for ethical reasons, a description of the client might include that they are a large real estate fund who is currently embarking on a large Build-to-Rent (BtR) scheme that is aimed at the growing private rental market in the United Kingdom, and the much-discussed 'Generation Rent' who need somewhere to live (Evans 2015). Amongst other factors, this meant that we were well primed to go into the meeting and pitch our services on two levels. First,

[1] Though it should be noted that individuals from *Company X* were certainly not implicated in the scandal and any similar internal discussions were usually framed in a manner that did not suggest such behaviour was in any way virtuous.

that my boss wanted to demonstrate *System X* to them as a major prospective client to whom its portfolio benchmarking capabilities could be relevant, and second to turn to me for a pitch that played directly to the BtR project in particular via the proposal that we could build them *Dashboard X*. A short description of this first meeting will follow next, followed by an assessment of the final meeting with the client and an overall analysis.

5.2.1 Problematising gentrification

Although getting the first client meeting might not have been a major coup, that's not to say that a significant amount of nerves weren't involved on my part and seemingly perhaps on the part of my boss (though well hidden). Although I had my fair share of experience in the world of business, and in London, little of it had been in areas of finance (with the exception of previously having worked with a large insurer as a client). To this end, I had already acutely felt the gravity of having changed worlds, both from my own comfort zone as well as that of *Garage X*: the City of London was very different, the client's office felt "serious" and my boss later admitted they were "sharp". Unwittingly feeding the 'estate agent in a Sunday suit' approach, I'd felt the need to splash out on a new suit for the occasion (that fitted), and it hadn't come cheap. But, it had gotten me comments in the right circles for the brand: "I like them, they've got a really innovative product" one colleague remarked on seeing the badge on my suit bag. And now, sat on the top floor of a building in the City of London, going into a meeting with board members, it seemed to pay off. My nerves didn't disappear entirely though: my shoes were weird (too alternative and didn't match the suit), my decrepit smartphone was now visibly six years old (so I kept it away from the table), and in future meetings my boss and sales colleague agreed whole-heartedly that it would be best not to use my own crumbling ThinkPad laptop in any live demos of our products (though nor was I offered a new one!).

After an awkward chat at the top floor reception of the client's office—where I think both my boss and I were small-talking our nerves away, in the presence of

at least one other small party of visiting delegates who looked far more nervous than us—we met the client. There were four of them entering from different angles. One friendly figure that was the contact, one older senior director with oversight on research who was relatively more prickly, one younger development manager who was working on the BtR project, and a very silent fund manager. Introductions were made and cards came out to be placed on the table in ceremonial fashion, handshakes following. Notably, I didn't yet have a contract—which my boss later made a point of joking about in front of the client as a factor of how well the meeting went—so I had decided to follow the mimickry and drop my own personal cards on the table: "I thought fuck it, he can give me some company cards with a contract if he wants me, otherwise maybe these people want to email me and we can talk directly". I can't be sure if this was a *faux pas* or not, but it seemed to pay off with the more prickly board member who subsequently copied me in to my private address in future correspondence.

The important thing to note from this initial entrance of *Dashboard X* is that amidst the multi-layered meanings and protocols behind this meeting, there was a great deal of symbolic value, social capital, power and risk at play. For example, I had effectively taken the role of a start-up within a start-up at this point. My boss had his own risks and power to contend with, including perhaps in bringing me[2], but in my own actions of spending hundreds of pounds on a new suit, making my way into the city, and bringing my own visual materials (albeit on my bosses much sleeker laptop), I had also taken on a very significant risk to be here for our unbalanced collective gain. Importantly though, as "we followed them down a carpeted corridor, some antiques in a glass cabinet, some oil paintings" I was also demonstrating that I was highly capable of functioning within this environment ("still or sparkling?" / "sparkling please") and as he began introducing me as "Joe is at *Oxford*" to a group of people at the top of a large real estate fund (some of

[2]Though, as noted in the last chapter, I'd already managed to deliver a competent pitch in person several weeks prior. In effect this was an interview of sorts, but also demonstrated that I was more than capable of functioning in this particular environment.

whom wore signet rings[3]), it became clear that I also brought with me my own symbolic value in various guises, including as the lauded "PhD-level knowledge" that some real estate start-ups like to advertise they 'possess' to "discern CRE data patterns humans can't" (*Reonomy* 2018). In this possession, and my boss's quip that "we haven't signed a contract yet, it depends how this meeting goes!", there was undoubtedly an undertone that he was displaying something he owned (or would own subject to everyone's enrolment in *Dashboard X*). An undertone that married well with the previous chapter's discussion of events in *Garage X*, where who greeted certain visitors and what visitors saw in the garage was often highly choreographed. Hence I already began to wonder "was I mainly a sales pitch in my own right?", and knew I had to charismatically assert myself in the overall performance in order defuse such insecurity.

However, at this point it should be noted that the capacity of my boss to operate in this environment was certainly no less important, and that we were collaborating in this performance as a team. Furthermore, whether through something like false consciousness or more complicated aspirations, his was a skill almost universally respected by those back *Garage X* due to the fact that it was crucial to our operation: "a lot of [the success of *System X*] comes down to business expertise, which err, I think our boss is really good at... and it really strikes me as being fun, I'd love to be good at that..." (Software Developer 4). And I myself have to admit that my boss's undeniable ability to sell at points of high stress was a skill that (even though I didn't recognise in principle as a 'virtue') I couldn't help but admire in practice.[4] In this respect, as we met the clients, it became clear that *Dashboard X* was highly dependent upon us both as individuals who could successful carry certain symbolic value and power across the multiple sites of its translation in a

[3]According to Tatler's magazine, signet rings are an emotional 'statement piece' of jewellery that conveys social meaning about lineage, bloodlines and heritage that are "worn by the sons who no longer have estates. The ones who feel they should have one, but make do with selling other people's estates for Foxtons." (Bell 2017)

[4]A bit like watching Mohammed Salah play football for Liverpool when you support Manchester United.

meaningful way. And if it hadn't been for the connections and performances that preceded this point, we could never have passed into the door of the meeting room.

Therefore, although the power was clearly unequal, I was quite happy to consent to the performance and enjoyed it—we were crossing a boundary together.[5] However, in glancing across the table at the development manager in the 'world' opposite me (who I later learned was pretty much the same age with the same educational and early-career background, but with a nicer shirt and sharper shoes), my mind couldn't help but wander to the steady nature of his ample pay cheque and at what point in life our culturally informed stance on risk had diverged (Neff 2012, p. 164). In later conversations I learned that he probably wandered the same about me, his inflexibility as 'organization man' (Himanen 2001; Whyte 1956), whether I already had equity in *Company X* and whether I, like him, had a "me on the weekend versus me on a Tuesday night" (a verbatim quote, as he outlined the sort of person and place we needed to capture in *Dashboard X*). The truth was that I didn't, and would be in the pub just an hour later with an ex-colleague from a previous job who was taking great delight in ridiculing my shoes, not believing I had worn them "in there" (gesticulating to the glass and steel structure where *Dashboard X* was still making its first abstract intervention in the real estate market). In other words, the type of person working within the client organisation was distinctly different to the majority of individuals working within *Company X*'s garage; with the crucial necessary exception of my boss and a few other intermediary figures overlapping these worlds, and which now included me.

In pitching my card into the situation it seemed that I had also steered attention around to myself, and therefore discussion began with *Dashboard X*. In briefly explaining their situation, the head of research explained that their BtR scheme would consider multiple sites in London and perhaps other UK cities. Ultimately, they wanted to build homes for young professionals who couldn't afford to buy, and

[5]That said, and following the previous chapter's discussion of the workplace, it's doubtless that many others in *Company X* or similar work environments and relationships that require such risk might not have had so much to gain, or so much strength and power to trade, in navigating these dynamics than I did as a researcher who could exit at any moment (which probably aided my confidence to a degree).

within the meeting it was stipulated that they needed "micro-level, site specific insights, local dynamics" and that this needed to be able to look at the whole of the country in a generic manner, but also focus down on specific cities. In a manner that almost sounded like market research language, this meant needing to know about local dynamics that revealed how this young demographic of renters would perceive value in their residential properties as a 'brand'. The development manager explained that he needed to know if there was a good coffee shop nearby, and if there wasn't then maybe they'd have to bring one in? Was there an independent arts venue nearby, and if not could they partner with someone to fix that? Or, what were the cool areas that were already up-and-coming? In terms of languages like 'place-making' (Musterd 2013) and 'tactical urbanism' (Mould 2014), this was a tacit promise of 'tactical real estate.' And at one point the tenants were even briefly referred to as an 'audience', implying that they might somehow need to meet with or otherwise be constituted alongside a spectacle. In this respect, this verbal briefing aligned well with all the latest marketing languages, for example: homes conceived as "platforms for life in the city" (*The Collective* 2018), that might come with Uber vouchers (Baynes 2017) or new platforms self-styled as "renter's clubs", "ecosystems" and "great rental experiences", but all with a firm recital of the mantra of 'location, location, location'. Therefore, the overall conclusion was that this meant they wanted to move from an old and established investing model where "the site picked us" to one where "we pick the site" (some of this language and the ideas that arose in this conversation will be returned to in later chapters).

Whilst I would have liked to discuss the topic of the "structural shift towards renting among young people in Britain" (Evans 2015) at this meeting, that was not my job here (and will be discussed in later chapters), so at this point "I talked of gentrification, cultural events, and so on, and rent—whatever was necessary". I explained, with the same clear and connected personal narrative I had used in *Garage X*, that through study and personal experience that there was a great deal of insight to be gathered from new sources of data, and backed up by my boss we presented some exploratory work I had done on the "underground mailing list" in

New York. This demonstrated, as displayed in the previous chapter (see Figures 4.11 and 4.12), that plotting the passage of certain cultural events through urban space (and across time) can begin to disentangle a process we might call "gentrification," and with the beginning of a direct relationship to rent. Where these events were held—events that I myself had been to, and described in some detail to the five sets of wide eyes who had not passed into the world of underground free parties in the deeper neighbourhoods of Brooklyn and Queens—were the neighbourhoods that tomorrow would display rising rents. They were the places that young people without the means to buy, yet with the paycheques to rent, would want to live. These were cool places, with cool people and cool things. We just had to measure that in a sensible and intelligent manner.

To the table, who were now rapidly warming up, the main question now was whether this could be done for any city? I explained that the best way was probably to produce a standard 'relative increase' model that pulled on certain standard sources of data, and then which could be customised further for individual cases. We could combine both globally applicable trends with local knowledge, all neatly packaged in the *Gi* metric and the *Dashboard X* interface. To this end, it'd be good to work with them and their research team to make sure we were 'tuning' *Dashboard X* to the correct signals. After a round of nods and one or two smiles this brought about my boss' turn to speak, and he duly (and smoothly) demonstrated the main platform (*System X*). Beginning by showing to the room the very same building that we were sitting in and a range of data about it, and a range of scores the building had achieved. Our audience had mixed reactions here, likely because the purpose of the meeting was to focus on *Dashboard X* and not *System X*, and the most sceptical member (the director) fired a series of tougher data-sourcing questions at my boss who answered each without hesitation, but mostly as 'yes'. Interjecting here or there, we talked of 'data barter' (we knew so much about data that people gave us their data for free in return for 'cleaning it'), scenario analysis (we could deal with complicated political events like Brexit), and the possibility of throwing 'sentiment' and VISA transactions into the *Dashboard X* model—the dreaded 'fudge-level' I

was afraid of, as I had no desire to become embroiled in complicated geo-located sentiment analysis, and this was unnecessary over-promising in my opinion. This seemed to cause a few glances at watches from the clients, but we wrapped up on the positive note that we would go away and develop the *Dashboard X* idea more for a formal proposal (a joke was made by the senior board member about my contract), and the job could then move towards a sign-off if everything was in-line. Finally, in the lift on the way out, the more senior director who had begun in a more frosty state, turned to me and asked "I remember some research from about ten or fifteen years ago now about gays moving in and rents going up... I think it was in a report by *DKNY*?" ... "Ah", I said "That's probably *Richard Florida*... look up 'the rise of the creative class'!" ... he looked pleased and said he would. By the time we'd arrived in the lobby we were talking about my time in New York again, my boss somewhat sidelined.

Overall, this initial meeting could be characterised as the successful problematising and disentangling of gentrification, through framing and introducing *Dashboard X* as a tool that could assist the client in moving from a position where 'sites select them' to 'them selecting sites'. To do so, we (as *Company X*) had successfully passed a series of tests, demonstrating discipline and symbolic value consistent with the client's world, in order to outline a manner in which a significant real estate project could better conduct its site selection by knowing in advance which areas were the best: which were gentrifying, which had the "right kind" of people wanting to live within them. In effect, this was a proposal whereby we could simplify and render legible a very complicated (and contested) social process in a manner that could consistently commensurate different areas of urban space according to the values and actions of a particular demographic of potential renting tenants. We had framed the device in a language close enough to their own, and proposed a way to proceed towards a new agencement whereby they would become actors who 'picked a site', instead of the previously situation where (they alleged) the site picked them. In effect, this became a defined obligatory passing point (Callon 1984) towards how this *could* occur and, through the layered performativities at stake,

also how it *should* occur. Or: "At this point in our story, the entities identified and the relationships envisaged have not yet been tested. The scene is set for a series of trials of strength whose outcome will determine the solidity of ... [our] problematization" (Callon 1984, p. 8).

5.2.2 Failure to enrol

> "Interessement achieves enrolment if it is successful. To describe enrolment is thus to describe the group of multilateral negotiations, trials of strength and tricks that accompany the interessements and enable them to succeed."
> —Michael Callon (1984, p. 10), in *Some elements of a sociology of translation.*

As detailed in the previous chapter, the process of building *Dashboard X* involved a significant amount of labour to pull together the required data. This work followed the opening client meeting described in the previous section, and was therefore conducted in a manner that was partly informed by both the discussion above and a small amount of ongoing communication with the clients. And where those assumptions about what should or should not be included in the model as an aspect of value *vis-a-vis* gentrification were subsequently often framed and discussed in light of the clients' BtR project and this initial meeting to discuss their needs. Following this work, and arriving at a second meeting, *Dashboard X* had now become a fully visual and material device that could be presented to the client. And any debate (that was non-productive of the sales process) around what exactly gentrification was or entailed (as a process or as a value) had now been replaced with a simplified interface that offered a spatial and legible representation of gentrification (or 'urban renewal', to use the term that was increasingly being used for our more public-facing marketing purposes).

Approaching this second meeting required significantly more preparation than the previous pitch. In particular, a lot of work had gone into preparing the different *views* of *Dashboard X* that could be put in front of the client at this meeting[6],

[6] An extra dummy menu provided shortcuts to these views, that would position the map in the way I wanted, usually over a certain area of interest or 'frontline' of gentrification that I wanted to talk about.

and rehearsing the hypotheses that went into each view as a *story* that would be the controlling factor in the presentation. This involved what could an could not be interrogated from the data, and how the representation could or could not be filtered. There would be no follow up 'demo access' to *Dashboard X* and this was, in effect, the ultimate pitch where costing would be discussed in detail and the contract details floated. As before, there was an distinctly performative element to this: test run-throughs in our offices beforehand, interrogation by our marketing personnel as to how various aspects were justified, and the general notion that the work would be won more on my story and presentation than the content of the data. In effect, all the earlier narrative work inside *Garage X* had been a warm-up to this point where we would now test whether we could carry these narratives into the real estate market as interventions in their own right.

Arriving at the client's offices was much the same as last time, with the exception that this time it would just be the senior director, the development manager and a young research analyst. Also, this time my partner would be our newly hired sales executive Jay, who was about the same age as me and with some pedigree in other start-ups, albeit none of which had anything to do with real estate. I got on well with him and was more than happy to team up for this pitch. He was one of the few exceptions in *Company X* of people who lived in (and claimed to enjoy living in) cities, and possessing the self-awareness to make humorous but cynical remarks about the start-up environment—as he decried a crowd of young men in a WeWork office we visited (as they noisily crashed into a ping pong table with their free lager) as being like "something from *Nathan Barley*" (a TV comedy critiquing hip media workers in Shoreditch).

We had an agreed strategy and plan for our pitch, and after a fumble with the power, Jay set about a standard presentation of *Company X*'s offering in the form of *System X*. The relatively junior members of the client team seemed interested, but the board member seemed to glaze over and quickly steered the matter around to *Dashboard X*. With the aid of my New York City gentrification visualisations, a few slides showing Richard Florida and some graphs of coffee shops and crime



Figure 5.1: Sign from outside a coffee shop in Forest Hill, claiming nearby home-owners can afford another fancy 'Flat White' (FW) coffee because their house has risen in value—and in part because of the existence of the coffee shop. Photograph taken by Matt Hutchinson, Director of SpareRoom.

in Chicago (Papachristos et al. 2011), the introduction to the project went well. The director smiled and nodded in acknowledgement of Florida, the rest listened attentively, and we all chuckled at Figure 5.1. We were in effect, repeating and strengthening the last script: I talked through my personal stories and experiences of cities and development, from Manchester to being a "wannabe plaid-clad hipster" in New York City, and then launched *Dashboard X* on Jay's laptop. I explained that the models and methods behind *Dashboard X* were intended to replicate the method demonstrated by the New York case, but on a larger scale and using London. I had three views pre-programmed in to do this that best illustrated the 'difference' that the heatmap implied, and would show the way in which we had constructed a metric that highlighted certain spaces and not others. I started with one pre-curated view of East London.

There was an immediate reaction from the development manager who pointed at

the patterns and densities of colour around Stratford and said "that's what we want!" From here, excitement built as we switched to views of what I termed 'frontlines' in the North-East[7], and demonstrated the functions that could 'drill-down' into the information to reveal what was causing certain areas to appear hot. Or, that the product could both prospect and then reveal this 'hidden value.' The development manager was very excited by this and then went into explanation of how this could aide them through 'providing certainty' as to "what's there now" and to augment how they understood their offering: "do we need to put a café or a gallery in to keep them?". This returned us to a language of place-making and he launched into great detail around describing how they would plan a site and how they needed to fill a gap in their knowledge in terms of the insight into a neighbourhood before they committed to a site. This allowed the board member to re-iterate that this project meant they needed to pick their own sites and that convincing others in the fund to invest would take persuasion. To this end, having some sort of relative quantification of what was there in this manner, and a gentrification metric (Gi), would be extremely valuable not only in site selection and development strategy but also in the investment process as due diligence and evidence for others. The whole conversation was very interesting in this respect, and I left the model on the screen that excited them most (events and rental price data combined) as we turned to more specific matters.

What struck me at this point is returning to a consideration of boundaries. Not only had Jay and I managed to navigate our way from the ping pong tables to the top of this large fund, but *Dashboard X* now fell between a series of worlds. First, it sat between us as its producers (who had built something that we did not yet fully understand all of the use cases for) and the client as users (who had things in mind for it that hadn't been factored into its production). But second, if *Dashboard X* was ever to be adopted then the image in Figure 5.2 was particularly striking in illustrating another type of boundary. This was because the client's offices sat slap bang in the middle of the lowest scoring cell that had available data in central

[7]The use of this term will be discussed in chapter seven.

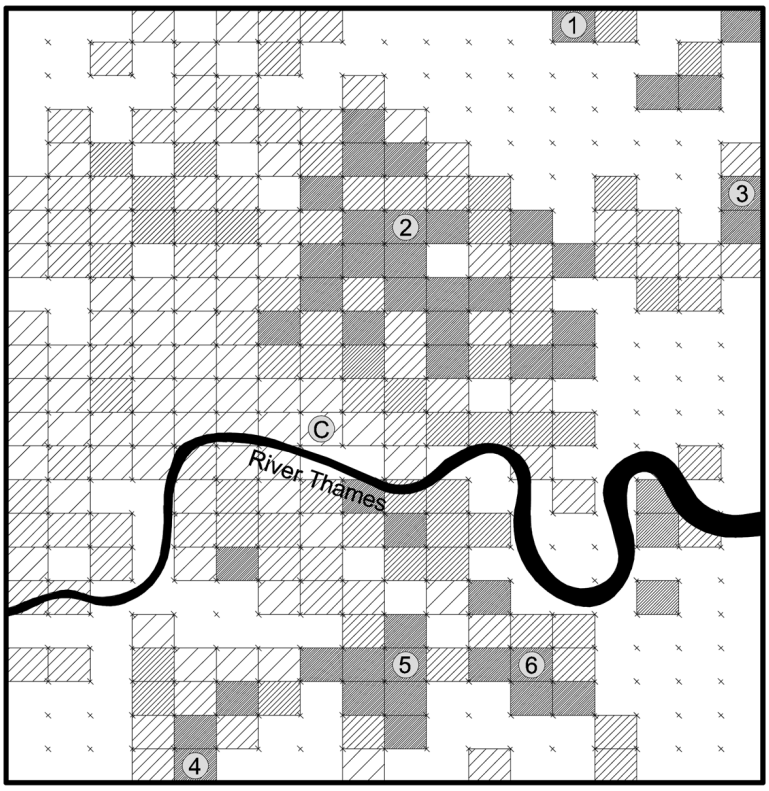


Figure 5.2: Indicative sketch of prototype gentrification model for Dashboard X. 'C' denotes client's offices, 1-6 respectively indicate: Walthamstowe, Dalston, Forest Gate, Brixton, Peckham and Deptford.

London, but the areas they were so excited about were in a hot band of value that spread down from the east to the south, around the periphery of the city in places that the younger two had only been on the odd occasion it was "me at the weekend." And areas which the older board members presumably had no interest in beyond remote investment. But we had now, in effect, presented them with a device that claimed to have privileged (and *pioneering*) knowledge of these areas; mysterious other areas of London that they believed had untapped profit sources, but perhaps either didn't feel they knew enough about or otherwise felt they lacked the means with which the persuade others that these areas had value. Meanwhile, the city core was conspicuously absent, "fading away just like the most boring suburbs."

The conversation then turned to more detailed matters. They seemed very happy with the tool, and ready in principle to somehow sign-up to a program of utilizing it. However not all was in line at this point, and sadly Jay seemed to

struggle in a manner my boss did not in previous conversations. He seemed to lack the stone-cold confidence, since although he could 'fudge' he also seemed slightly amiss, unclear and indecisive. Then, after I reiterated an affirmative answer to "Can you do this for any city?" ("Yes, it's just a blend of standards and city-specific tweaks"), we came to the question of sales and the first sticking point. If they handed over cash, the board member wanted to know what exclusivity they had in owning *Dashboard X*: "If another client, a competitor of ours, comes to you with the same brief, what do you do? Do you just re-use this?" Jay did his best to deal with these questions but also turned the discussion back to *System X*: if they subscribed to our main offering, and *Dashboard X* was built on top, then it was all theirs, but otherwise it sounded vague as to whether we'd lease it out elsewhere. The second sticking point was less obvious but will be discussed below, and that was that I had emphasised from the beginning that the precise manner in which we designed the model should be dependent upon the brief—the standards and tweaks mattered, and we wanted to work with them to get this right. Although the pretense seemed to be that our answers were satisfactory, I suspected otherwise. Nevertheless, we agreed that the client would come back to us with a brief in the coming week, after they had met internally to discuss their requirements, and we'd agree terms from there. They didn't though, and the closing period of my employment was characterised by confusion on both my own part and that of my boss as to why exactly we had failed to make the sale. It really seemed that *Dashboard X* was, in the client's own words, *exactly* what they wanted (and I have been in enough similar meetings to know when this isn't the case). The next section will consider some reasons for this failure as a way to understand more about the emergent actors, their values, and the adoption of *Dashboard X*.

5.3 Renting story machines

The following section will discuss some hypotheses and evidence for reasons why *Dashboard X*'s first intervention with the social world of real estate markets appears ultimately unsuccessful in terms of translation. Three possible scenarios will be

discussed, the first of which is an important supplemental factor, but the latter two of which seem to have the most explanatory support in this case. In discussing them, it will be demonstrated that *Dashboard X* illustrates the manner in which digital real estate platforms are understood very differently by their producers, advocates and owners (*Company X*), as opposed to their potential users (the clients). And that these misunderstandings can also shed light on their potential adoption and use in real estate markets.

5.3.1 Poor performance?

Given the contrast in social worlds between the inner workings of *Company X* and the client, it is hard not to be suspicious that perhaps our collective performance in the final sales pitch was somehow unsatisfactory. I reflected on this a lot in the weeks following the meeting, and in contrast to the previous team of myself and my boss, I spent particular time considering my own position and power in contrast to that of Jay. If the first meeting was characterised as my boss demonstrating the 'ownership' of something they wanted in a way that met with their expectations, then how was this meeting configured? What were our collective interpretations of this as actors yet-to-enrol? What were we associated with as actors? This gave cause to consider whether or not Jay had been able to demonstrate the same level of functioning and performance in the boardroom that we had previously. First, I thought about the difference in symbolic and social value we may have brought to the table. Jay seemed initially much more confident and cocky in his self-presentation—no concern about suits, for example—and seemed to embrace the fact we were a dangerous and 'disruptive' start-up, but I also had my doubts as to the origins of these characteristics. For example, one of the younger employees in *Garage X* (with English as a second language) had jokingly referred to Jay (in his absence) during a lunch break as a 'negro' (to the immediate disdain of the other developers present, all of whom immediately challenged him in using the term). Aside from the fact that this was technically incorrect as well as politically incorrect—Jay was not white, but neither was he 'Negroid' by any definition—this had alerted me to the fact that even

within what was otherwise a relatively progressive *Company X*, that such difference was still felt and existed. Contrasting this with the world of the clients and their almost entirely white male boardroom, and an industry whose main conference MIPIM is the haunt of prostitutes (Hatcher 2016) and represents as much as half the members of the President's Club (Allen and Williams 2018), and I had plenty of cause to wonder generally about whether such social dynamics had been present in our pitch as a damaging factor. Jay was a confident (and competent) man, but was he *too* different (or too cockily different) in other ways to be felicitously accepted by this world in the same way that I could be as a confident young *white* 'disruptor'?

This raises general consideration of Jay's confidence and capacity to perform in the way I or my boss did, and could. A more developed argument here might be found in the consideration that whereas I had the backing to take on the risk of speculatively working for *Company X* before my contract had been signed (I also had a research grant), that Jay's position as a salesman was much less secure. His passing comment that our boss had yet to finalise his contract (sometime after the start of his informal employment) also gave me concern that the risk he took on was very present, real and perhaps affective upon his capacity to display confidence. Or, that he might over-compensate somehow. Therefore, his fumbling with laptop power cables alongside an unwelcome eagerness to talk of our main product, *System X*, could therefore be an over-determined factor of several insecure dynamics Jay was dealing with that I wasn't. This discussion could be laboured on further (and is discussed in the previous chapter), but since it isn't verifiable as a sole cause of our failure to sell *Dashboard X*, other considerations need to be made (but with these social factors constantly in mind). Particularly, it should be considered that Jay was very eager to push the company's main product—which was likely related to commission, and perhaps a formal employment contract that would not be available on 'my' product, *Dashboard X*—and that this seemed to be received negatively by the client. Therefore, whilst structurally embodied risk and inequality in *Company X* (and the real estate market at large) might have directly contributed to our failure to sell *Dashboard X*, there are some other more interesting explanations that

should now be considered. Both of these tell us more about what sort of actor the client is, and what sort of values are at stake.

5.3.2 Renting a machine?

> "There are pension funds out there that need to put out billions... billions a year... OK, so there's two things here... raising money is difficult, and once you've raised money that's fine... but it's also very very *very* difficult to deploy money, just finding good deals to actually do, and so, err, once you get your teeth stuck into a deal... you really want to make it work [laughing]... because there's only so many hours in the day, you've got targets you've probably got to hit yourself..."
> —Investment Manager 1

If "interessement is founded on a certain interpretation of what the yet-to-be-enrolled actors are and want, as well as what entities these actors are associated with" (Callon 1984), then we should consider some aspects of what exactly the client thought they would do with *Dashboard X* and what other actors would be involved in this that were not present at these meetings. Specifically, this turns us to consider the process of real estate investment and where *Dashboard X* might have fitted in as part of the 'asset assembly line' of real estate (Weber 2015). Once these considerations are factored in as further social conditions in the translation process, some additional and more concrete factors can be illuminated as reasons for the failure to enrol *Dashboard X* in the market.

In following the quote above, it is worth considering the dynamic of how *Dashboard X* was intended to be used by the client. Whilst the younger development manager spoke of using it to mitigate poor sites ("do we need to put a café in to keep them?"), the focus of the keener and more experienced Director was perhaps more in line with a wider, more important use: this was a project where they want to "pick the site" and they have to "convince others to invest, which would take persuasion". The precise dynamics in real estate investment here are important, because the tension between raising capital (hard, but not that hard[8]) and deploying capital are

[8]For example, real estate funds under management by Morgan Stanley and Goldman Sachs made record losses during the last financial crisis, but seemed to have had few problems in raising billions of dollars again just a few years later (e.g. Karmin 2013).

significant, and the manner in which this occurs is reliant upon a vast and complex arrangement of power, gut instinct, data, and connections. Or, as stated in the quote at the start of this section, that it's often very hard and time-consuming to just get deals done and deploy your capital. To this end, the research analyst explained that his director was especially skilled at navigating these dynamics, because "the more expert you become... [at] writing titles for slides [the more efficient you become at completing investments]... and I would say he is probably 80% accurate in his guessing [at what slide material to use]... educated guessing... [and he says] to me 'Put together this chart', let's say this series chart... 'this should show this, this is probably going to show that' ...the story that you want [to complete the investment]." (Research Analyst 1) And his experience in this area (in getting deals done) was a time-honed skill: "Yeah I would say, if you've been around for, say, 15 years in the same industry as [he] has been, he is very likely to get data, story-telling, right..." (Research Analyst 1).

This could be discussed at greater length, but the repeated understanding both from the boardroom and from the garage (from those developers who had some contact with clients) was that all of these data tools and products were very much enrolled in a process of subjective story-telling. What the client got from us was "usually a dashboard... with a particular view built for them... which they can use the data and, erm, kinda see the story that the data is telling them in which they can then decide if it's actually interesting" (Software Developer 1). This meant that the manner in which the dashboard would likely be used was in a valuable but "supplemental" way (Investment Manager 1), where it could fill a gap to justify pushing deals through. In this respect, the sense of urgency for such data was palpable: "the thing is [the data] just doesn't exist... it doesn't exist... we bought something in Norway, in Oslo, that I bought in my last place, and the guys in the States were asking me for all sorts of comparables, because they're a big American fund, they've got comparables coming out of their ears, they've got trends coming out of their ears... specific type of asset class in that part of Oslo... but it just didn't exist... they kept pushing, and they kept pushing, kept pushing, I found

some data and it was completely wrong, to the point where it nearly torpedoed my deal, because the information was so wrong that it made the deal look pretty bad, pretty crappy, and so I then had to go away and speak to the local guys on the ground about what actually happened... [*Dashboard X*] is absolutely something that would be part of the supply and demand story, which is part of a much larger investment thesis" (Investment Manager 1).

And generally, this thirst for data to rhetorically back-up the investment process was also driven by the global nature of real estate, since not only was its use said to be driven by a cultural influence from the United States post-crisis, but the increasingly remote position of funds means that investing in far-flung regions was increasingly demanded: "we only had European capital that we were managing [in the past], err, and from the demand side, err, we were seeing that our clients were very often not able to make the decision themselves whether to... how much to allocate in Europe, how much in the US, how much in Asia... they didn't have in-house the knowledge to do that, so they were asking more and more for a global product, instead of a European folder..." (Investment Manager 2). In this situation, the investment was not driven by internal data being available to make new products, but by clients themselves: "more from the client's side, a global perspective was better... fulfilled their needs better" (Investment Manager 2). Therefore although investors might be excited by the fact that "the universe is larger, there's a larger set of opportunity, a larger set of mispricings", they still need rhetorical power and data to justify their moves: "err, we try to rationalise, or to be able to justify all our err, decisions... that we can go to the client and we can say 'It didn't work, but we did this for these reasons'" (Investment Manager 2).

All together, this has given rise to a situation whereby the use of tools like *Dashboard X* is believed to be a phenomena that could, eventually, lead into "a push from investors who want to invest in a specific fund, to also assess how, let's say, the research of potential opportunities has been done or will be done... so there may be a score, let's say on err, tech... how an investment decision has been driven by technology... a data-driven investment score, like ESG... environmental social

governance scores for investment ethics" (Research Analyst 1). Others in positions of brokerage might say "I used to spend a lot of time on the phone or with people explaining, err [cough], 'This is what Soho is like... This is what Shoreditch is like... This is what Southbank is like... This is what Farringdon is like.... err, This is what Aldgate'... everywhere' ...and all the different areas are very different from each other and merit different explanation, err, but people would see that it would de-personalise the process a little bit, they're sure to see the value in [*Dashboard X*], without a doubt..." (Surveyor 4). This was also framed by others in exactly the same way: "I've spoken to people who think that's what they would use that for... to basically do a sort of, err, macroscopic reccy [i.e. reconnaissance] of the entire city to see what the most appropriate site was for the people... because they want to market to people who actually want to, you know, be there in that area... it makes your investment criteria." (Surveyor 4)[9]

In sum, these dynamics contribute to a situation where an investment imperative fed by a wall of global capital seeking access to real estate as 'just another asset class' (Aalbers 2016; Loon and Aalbers 2017) has met with, and mutually exacerbated, a data imperative (Fourcade and Healy 2016). Real estate needs to look like just another asset class and this means using data, *somehow*. Hence, this has produced a situation where investors and investment managers, via organisations like funds and the clients of *Company X*, have sought products like *Dashboard X* in order to complete deals at the required rate (the clients' watch checking is real) and in the required mode or performance of utilising data.

> "Yeah, it's the global nature of real estate now... global clients... we work on accounts with properties in Brazil... North America, Europe, Australia, Japan, err... you know... a fund manager in New York, or a fund manager in London [needs to be able to] pick up his iPad, login to our platform and go 'Right... what's going on with my properties today?"'
> —Surveyor 2

[9]This interview transcription says "makes your investment criteria", but could have been "meets your investment criteria". However, it's more illuminating in the former sense, since by virtue of having these metrics available, the client can indeed *make* an investment criteria, and that's the point of the argument.

However, an important thing to understand is that the manner these devices are used is rarely in the manner advertised and performed, but rather more often one in which other connected dynamics influence the use of these products to align with strong pre-defined, or even cultural views of value, of which clients also admit there are many: "there are cultural differences with respect to view on value, and notably... even within Europe I would say it differs between the UK and Germany" (Investment Manager 3). Subsequently, the actual manner in which real estate data analytics are employed are already informed by a great deal of subjective constraints even *before* the interface has been designed and built: "[at the beginning of a project] they literally say 'This is our view, how we want to approach this, so use [this data]' ...and we are already approaching it with this same approach. For example, in a recent project, they basically said, 'Yeah, we want to find a good location for a new warehouse', and for an entire country... so that's what we started doing... and then on a later, err, beyond this brief... they basically diminished that by saying 'Oh yeah, by the way, we're only interested, after doing some personal research, in *these* ten cities'... so then, they've already basically ditched everything else, which might have been against their view, and they just won't look at that... they're basically, what's it called again?... they... just... they have a certain understanding of the world, and they're accepting that, and re-affirming that every time." (Software Developer 1)

Whilst it is possible to find endless quotes that suggest all current digital real estate valuation platforms are embedded in complicated social conditions (and used very subjectively), it is important to remain fixed on the fact that some *are* used and that *Dashboard X* could be one of them. With that in mind, it has to be accepted that real estate clients use these devices as a very real means by which to "convince investors", and the people and organisations that use them are, therefore, very serious about them. For example, the recent re-design of the real estate price index tracker *IPD* caused "all the fund managers, who might be 50 or 60 years old, a lot of stress" and consequently led to "a lot of delays... I sit close to the performance manager... investment and fund managers who were pulling together presentations are calling her, emailing her, and saying 'I'm not able to' ... 'They've

changed the format!'". And today, various large global funds were making every effort to embrace the new format of *Dashboard X*, and "especially when there's... when it's err, exploratory data or where you have tools which you just can lose yourself in, in dragging and dropping, and more people should do that actually!" (Research Analyst 2). And so there are people who declare that parts of their job "is also to grow our data driven decision *culture*" (Investment Manager 3).

Returning to *Dashboard X*, this raises some more important aspects to its enrolment that are directly related to its power, politics and culture as an interface. Chiefly, it should be noted that until this point, all of *Company X*'s dashboard projects (of which it did several, that provided an additional stream of income to its main product *System X*) were paid for in one-off lump sums (generally speaking). This meant that a client bought the product, owned and used the product exclusively (in this rhetorical, narrative-driven manner), and that was the end of the arrangement. However, in raising a range of supplemental and complicated scenarios whereby the client would *subscribe* to *System X* in order to get *Dashboard X*, a series of politics had been introduced around the deal that were uncomfortable to the client. Indeed, since usually "all the data that is going in [to the product], they never really ask for it, or see it, or do anything with it... they're only interested in the results... they're buying the interface and renting the machine behind it" (Software Developer 1), it seemed that they were exclusively interested in the interface: it could be screenshotted for presentations, 'live demo-ed,' and talked about to investors in the nature described above. It had the required symbolic and affective value as a device to *get deals done*, which was the mode we sold it in and the mode in which it was desired. But now this had been presented as something that they would possibly only be 'renting', that a competitor might also gain access to, and therefore would lose a good deal of symbolic value as a rhetorical and *exclusive* device. In other words, these new dynamics of network effects were less than desirable. Therefore, in attempting to convert the client to the logic of a platform, by presenting the means of their access to *Dashboard X* as likely shared with others, and trying to 'up-sell' them into the main *System X* as part of this, we

had lost the client. We had failed to achieve interessement or enrolment because of a failed interpretation in what the client, and their clients, needed from *Dashboard X*. The fact this might partially stem from dynamics described in the last section—the risks, symbolic values and social performances of start-up cultures—demonstrates just how far apart our social worlds were, and the manner in which organisations involved had distinctly separate operating logics.

5.3.3 Loss of boundaries?

Despite the fact claims of rationality, transparency and market value circulated around products like *Dashboard X*, it has been demonstrated that the way in which they are actually used is likely significantly removed from these Platonic ideals. Indeed, in selling via the mode of affect and imagery, perhaps we didn't realise how much this would be picked up on, or already fitted their needs perfectly—a co-performance. But furthermore, the fact I had sold (and been instructed to sell) the interface through the medium of a story is perhaps also a factor that met well with their own expectations and desires for its deployment as a rhetorical investment tool. In essence, the client "is buying a machine that can convince someone of a story" (Software Developer 1). Therefore, they did not really want the data so much as an interface that usefully coalesced with a certain story or knowledge that they felt should or could be prioritised in the process of real estate investment. In this respect, whilst I had done my best to produce and sell *Dashboard X* as a tool for the client, I had not until this point realised just how much I was also a part of *Dashboard X*. The final email from the client that I am aware of—finally communicating the trail had gone cold—made a point of signing off with "Also, we understand that Joe is no longer involved with the project."

Therefore, although we had most certainly successfully disentangled a certain process of gentrification, and in a manner commensurate with the client's expectations, the degree to which *Dashboard X* perhaps also required an authentic story-teller was a significant aspect of its translation. I had provided this authenticity up until now, through the production of a device that was, in the client's mind, coherently

entangled with myself as an actor that possessed symbolic and performative value of the type required in their particular actor world (or 'use case'). In some ways it seemed they expected to own me as well. And if, for example, we consider *Dashboard X* as a boundary object (Star and Griesemer 1989; Leigh Star 2010), then we know that the role of boundary spanners (in this case as an individual, myself) can be crucial in ensuring that the manner in which two or more knowledges from different actor worlds can meet around *Dashboard X* in a suitably plastic manner. This disentangling of gentrification is a process that required commensurate knowledge on both sides of the boundary object, and with a means by which this could flow across the boundary. But in this case, not only was the politics of the boundary object's ownership called into question, but the potential for its very operation as such was threatened with the loss of my own involvement as the 'boundary spanner', chief narrator and data artist.

This meant that my exit from the field would decrease the manipulability of the knowledge, and introduced a number of political factors into the equation. Not least, the notion that the client might have to work with *Company X* in order to verify and set "standards and tweaks" necessary to fulfil their brief was also unattractive, since it not only suggested additional labour on behalf of the client to stablilise the device, but also that this interface was not in fact a fixed interface. Hence, if the interface was a machine for rent, operating on the shared logics of a platform, utilising knowledge that suddenly entailed *too much* plasticity, and without the presence of the valuable boundary spanner that had first successfully problematised its appearance, then enrolment was now a significantly unattractive proposition. *Dashboard X* had become an very unstable boundary object of dubious value. What the client actually needed was a stable interface to buy and own, that was clearly entangled with a coherent story that could be rhetorically used to justify investment decisions in the board room, but with all the symbolic value that such a mode of seeing and knowing entailed as 'data driven investment'. To a significant degree this had now been pulled from under them.

In sum, given what I regarded as my contracted duty in assisting in the development and sale of *Dashboard X*, this was a disappointment for all. However, the main way in which this disappointment was dealt with also adds weight to the boundary object argument as follows. Suddenly, and out of the blue, Jay asked if we could meet for beers. I naturally agreed and discovered that his intention was to not-so-subtly drill me in order to write a job specification for my replacement. What was interesting about this is the underlying fact that what was hard to replace was absolutely not my coding skills—this was the labour that would always have to be brought in once the project moved from prototype to deployment—but that the conversation focused almost exclusively on what type of person would replace me in terms of affective story-telling capacity. In other words, to find out what qualities I possessed as a 'data artist.' And so we spent time arguing the toss between service design and human geography, market research and sociology. In effect, we primarily needed someone who could do the narrative work to construct and cross the correct boundaries between the garage and the boardroom. In addition to my boss' suggestion that I might abandon my research for a full-time position at *Company X*, it seems clear the the actors and values emerging around the adoption of *Dashoard X*, as well as *System X*, were distinctly affective, symbolic and rhetorical in operation, and that the conditions for its adoption were distinctly social. In this respect, the truly data-driven real estate client or investor was nowhere to be seen. Finally, as problematic as it might be for research methods, in terms of an assemblage or device I was no longer sure where *Dashboard X* ended and I began.

5.4 Emerging actors and the alethurgy of value

> "We could call alethurgy the manifestation of truth as the set of possible verbal or non-verbal procedures by which one brings to light what is laid down as opposed to false, hidden, inexpressible, unforeseeable, or forgotten, and say that there is no exercise of power without something like an alethurgy"
> —Michel Foucault (2014, p. 7), in *On the government of the living: lectures at the Collège de France, 1979-1980.*

> "Err, yeah it's always setting, setting something against something else... so it can either be against competitors, or *City X* versus *City Y* or, you know, you always try to make it a relative err, yeah..."
> —Research Analyst 2

The failed sale of *Dashboard X* has illuminated several important factors of its adoption, but it also shines light on a more successful processes as well. Such as the initial problematising and disentangling of gentrification as a process of real estate value that could be converted into a metric, *Gi*.[10] Indeed, provided the infelicitous issues above could be addressed, it's clear that generally there was great hope for the device: "you must have been delighted when the results of that came out like that for South London [laughs], it just looks absolutely amazing" (Surveyor 4); "Yeah, it's really good! It's really cool!" (Investment Manager 1); "We have a lot of macro data but going deeper than that in terms of let's say... err, areas within the city, it's quite tough... but you can do that with *Dashboard X*" (Research Analyst 1); "*Dashboard X* is my favourite thing that *Company X* have done ... how all those little factors can make a place, and influence how much someone wants to pay for it" (Sales Executive 1); "can I just say that's very impressive... you've got something there which would actually, you know, be evidence, rather than someone just saying 'I think...' you know?" (Surveyor 2)

In this respect, just as David Beer (2016) has drawn attention to the processes and infrastructures of metrics in the circulation of value, this process of trying to sell *Dashboard X* had, in its own way, contributed to the very real circulation of real estate value in relation to gentrification. Whether ultimately successful or not, this was visible in the garage, during which *Dashboard X* was built, and it was visible in the meeting rooms of London where its calculative frame was presented. And so, in its own small way, *Dashboard X* was doing work in the production of a metric that could be the means by which future real estate markets would be realised. This is how a metric begins to become embedded, institutionalised and materially realised as *true* (Beer 2016, p. 115). And as an infrastructure of this

[10]It should be noted that a number of enquiries came from North American investors interested in *Dashboard X*

circulation *Dashboard X* was not just counting coffee shops and all-night raves, it was *disseminating* them: in the circulation of *Dashboard X*'s metrics we can find one particular manifestation of truth, how it is selected and (in future) how it will come to be exercised. Processes that Foucault discusses in his later work as a set of truth-selecting relations as 'alethurgy' (Foucault 2014, p. 7; Beer 2016), and where the discussion above represents on slice of the alethurgic work done by *Dashboard X* as a series of investor-focused 'truth acts' (Foucault 2014). Acts based largely on re-appropriated data and my narratives about running around illegal raves in Brooklyn.

Understanding these truth acts in the processual context of translation means that the endeavour is, of course, ongoing. The technical artefacts, metrics and values implied by *Dashboard X* would, as an end product, have to emerge over time as different actors offer new interpretations of others' interests, including their own (Gasson 2006, p. 5). The process is mediated by actors, both human and non-human, and gradually *Dashboard X* might (or might not) become a stabilised phenomenon, carrying with it a particular set of meanings and values. At this (later) point it would become more sensible to discuss it as market device, but for now we can observe its behaviour as a boundary object, engaged in the project of stabilising a series of contested meanings and knowledges (Callon 1984; Latour 1987). This case study now affords the following observations above the type of client actor emerging around *Dashboard X*, and the form of values they are beginning to produce.

5.4.1 What type of client actor does *Dashboard X* imply?

It is clear in the first instance that the client, as a newly "data-driven real estate investor", will need to be disciplined according to a range of new logics that have been discussed above. Here, despite all the benefits that *Dashboard X* brings in terms of feeding the 'data imperatives' that can produce boundless new metrics and 'comparables' for market assets and the increased financialisation of real estate, there are also clearly some undesirable constraints for current investors. Chiefly, the translation of *Dashboard X* requires that the investor client be newly relegated to the role of collaborative information prosumer as part of the network effects

we sought as a subscription-based platform: they needed to become disciplined platform users, ceding significant power to *Company X*. However, whilst this is in tension with the expectations of some real estate investors, it's also not the most interesting or unique observation about the client actor emerging around a product like *Dashboard X*. For the simple reason that these tensions will likely subside in time, as they have done with products like the aforementioned *IPD*.

The much more important observation about the client actor implied by this research so far is that there is no clear reason as to why the data-driven investor is any more of a rational agent compared to their predecessor. Indeed, amidst the lively dual-performativities characterising the sale of *Dashboard X*, it's clear that any notion of a more individually-empowered, rational and isolated investment decision is highly problematic. In this case, the manner in which real estate investors both expect to use *Dashboard X* is bound up with the notion of data as stories (Neff et al. 2017) and metrics as rhetorical devices (Porter 1995). Indeed, from design to sales pitch, the entire process implies a carefully choreographed series of interventions that purposefully produced affective dashboard experiences (Tkacz 2016). From the design of the heatmap itself to the circulation of visualisations as symbols of data accumulation, the notion of the client actor as a rational investor agent is *a priori* removed through the crafting of the interface as a cultural and highly subjective boundary object. Especially since "to use an interface is to participate in a culture—it both performs and presupposes acculturation" (Hookway 2014). This means that the emerging client actor for *Dashboard X* is, in fact, carefully constituted in an affective experience and rhetorical performance, at home much more in behavioural economics and design theory than *homo economicus* (Lovink et al. 2015). This is why important and primary questions for the client of *Dashboard X* are never about how they access any of the 'underlying' data, but about how they might come to "enjoy the dragging and dropping" (Research Analyst 2). Hence, although coming to terms with the distinct organisational logics of platforms was crucial to the emergent investor actor, it is the type of subjective agency implied in the data-driven investor that is most interesting. Especially given the wider

claims around real estate data analytics of greater transparency, objectivity and so on. Since although *Dashboard X* might help deals to happen more quickly or more smoothly, this research now shows that the deals made will be largely the result of social, cultural and other symbolic values surrounding the rhetorical and affective power of data, rather than any innate capacity of *Dashboard X* or *System X* to directly grasp the 'truth' of any market signals.

5.4.2 What type of values does *Dashboard X* circulate?

> "The newly landed gentry of England knew that even an imperfect survey was better than none."
> —Andro Linklater (2002, p. 13), in *Measuring America.*

This chapter has illustrated how the actors emerging around *Dashboard X*, including myself as 'data artist' and the client as 'data-driven investor', began to acknowledge forms of value like the *Gi* metric and this new calculative frame. Therefore, as actors we were also beginning to "generate pathways to their realisation and visibility" (Beer 2016). As a result, at this point, several important characteristics of these form of real estate value that we were producing can be discussed. The first is that *Dashboard X* appears to give rise to circulations of value that prioritise the affective qualities of data visualisation and the instrumental value in pretty maps and interfaces that give rise to positive experiences of these measurement processes. And the second is that the *Gi* metric itself serves a particular form of rhetorical value, perhaps best encapsulated in the idea that the first person to put a figure on the value of something attains power in relation to the alethurgy of that particular truth: "It doesn't really matter exactly what the figure is, no one else has come up with a figure so yours is the best available!" (Colleague)

Both these forms of value (affective, rhetorical) are indicative of the notion that the data-driven investor does not seem to be any more rational than their assumed predecessor. But this is also a misunderstanding of the purpose of devices like *Dashboard X* and the forms of value they circulate. This is because the power in wielding such a 'story machine' is also the very real power to *get deals done*, and therefore these forms of value are indeed rational in the sense that they also provide

pathways to realising new investment opportunities. Amidst the cultivation of a 'data-driven culture,' it therefore makes a form of rational sense to 'tool up' with data-driven devices—better to have some data-driven devices than none at all.

Indeed, by extension of this argument its clear to see that the abundance of new metrics in this domain also meets with other aspects of the responsible, data-driven investor culture. In particular, amidst a global trend of financialisation where the research analyst using *Dashboard X* says "it's always setting something against something" (Research Analyst 2), the real estate stock broker trading in his company will also declare that *Dashboard X* "should have a place in every investment process... and then you get to a point estimation, because there's always a point you know" (Investment Manager 3). Their contemporary in mortgage backed securities will say "a lot of that was dealing with what the traders were demanding of us in terms of numbers... I mean, just how to display things, how do, you know, keep it manageable, err, the... the thing about *ABS* is that there's a hell of a lot of data to drill into and... you might want to have some of that available, but you want to abstract it away as best as possible into a single number [like the *Gi* metric that the investors understand" (Software Developer 3). *Dashboard X* (and *System X*) therefore contribute to the emergence of new forms of value that have very rational purposes in the increased financialisation of real estate as an asset class (which will be discussed more in the following chapters). In this respect, *Dashboard X* and its associated actors are contributing to a situation where new forms of real estate value might not just be understood as prices: they could be an array of other emerging metrics that do not correspond directly to currency or market value as price. The logic here is that any metric is a good metric, and to own the machine that produces the metrics is the best of all, since: "what matters is to capitalism is controlling the asignifying semiotic apparatuses ... modern-day financialization is simply an intensification of indexing and symbolizing systems that enable the evaluation and control of differentials in value in and between different domains" (Lazzarato 2014).

Therefore, the problematising and disentangling of gentrification in the *Gi* is a powerful new form of value that both the data artist and data-driven investor can

benefit from in their respective worlds (*Garage X* or the boardroom). But it should be reiterated that so far the inherent doubt surrounding the rationale behind the metric has not gone away: it remains a metric forged more in heat than light, amidst a sea of crafted narrative, rhetoric and affect. Where any practical commensuration between different *BtR* assets would necessarily remain characterised as much by what the metric leaves out than by what it objectively accounts for (Espeland and Stevens 1998). The theoretical and political implications of this partial perspective of gentrification and real estate market value will be returned to in Chapters 7 and 8.

5.5 Conclusion

This chapter has examined *Dashboard X*'s constitution in the site of a meeting room in the City of London, in order to understand what actors and values it encounters and how this can help explain the factors of its adoption in terms of translation. Some of the findings here could be generalised to other digital real estate platforms, others to broader trends in finance and data science, but mostly this explains a series of site-specific factors around the adoption and framing of a technology that ostensibly provided a way to measure 'gentrification' for market purposes of real estate investment. Through considering the dynamics of two sales meetings, as well as broader interviews drawn from the 'live demos' of *Dashboard X*, a series of explanations can be found as to what conditions are necessary for the adoption or translation of *Dashboard X*. And what type of actors and new forms of value could emerge in a real estate market that actively mobilises *Dashboard X*. Following this, some initial reflection can be made upon the notion of *hyperreal estate* presented in the literature review.

First, a series of social conditions were identified that suggested *Dashboard X* could only be successfully problematised if the individuals concerned had the right connections, symbolic value and social capital to successful enter the social world of real estate in order to begin this endeavour. Global real estate is elite, powerful, gendered and secretive. The most successful real estate platforms are highly unlikely to be built by companies that do not conform to these norms and

structural logics, and there's a lot of room for telling successes and failures of performativity. Second, the process of translating digital real estate platforms for valuation is highly affective and rhetorical, and the ongoing narrative role of the data artist or 'boundary spanner' is crucial to ensure the adoption of devices like *Dashboard X* (and similarly *System X*). Indeed, the failure to sell *Dashboard X* to the client actor revealed the extent to which the adoption of new market devices is a very laborious process that has to meet a lot of conditions to be successful. The most interesting aspect of which is that none of these conditions really seem to be about the technical prowess of the machine, but more about the quality of its presentation and narration, and how it will be used to get deals done. This leads to the first observation about the type of investor actor implied by real estate data analytics more generally, in the sense that the primary use of the tools appears to imply that data-driven investors are not any more rational than any other form of investor. Indeed, they are denied any rationality from the start by the nature of the design and marketing of *Dashboard X*. Instead, this emergent actor is simply pursuing the control of novel metrics in any guise, and "story machines" that will help them get deals done in the context of an increasingly financialised global real estate market. *Dashboard X* therefore implies a distinct form of data-driven investment culture (as driven by a manufactured data imperative), but not a newly objective data-driven actor. This chapter has, therefore, begun to shed light on real estate data analytics in terms of how methods of measurement are adopted and how the metrics they produce circulate in the social world (Beer 2016, p. 116).

To close this chapter, a few reflections can be made upon *Dashboard X* and any notion of hyperreal estate. The first of which is that the *Gi* metric indeed gives priority to consumption and commodification in the gentrification of space, and the speed at which it brings together a representation of these processes across urban space is clearly emblematic of hyperreality: offsetting Shoreditch against Stratford, and artist studios against art galleries. Additionally, it gives the impression of disappearing materiality, whereby "the smell of baking bread in your house" (Surveyor) or "smelling the paint in a new office" (Investment

Manager 1) is given over to data points that might say "Artisan Bakery" and "Construction Date: 01/01/1970"[11]. Additionally, the distinctly self-referential aspect of these commensuration processes based on the models built by small circles of individuals leaves a cynicism impossible to ignore even for the most quantitatively minded and techno-optimistic:

> "Yeah, whether or not [building decent automated valuation models for real estate] is actually doable, it will continue and people will continue to believe in it... but it makes me kinda think, how much of this business is actually real in the sense that everyone in the industry is like... one of my housemates works for a company that does kind of analytics, or err, big cargo airplane planning and where they should send everything over the world and where is the best, and so like that kind of business... can contract out other businesses, who are helping them and selling them data, and like, we have businesses that are helping us and selling us data, ... and everyone is just in a big web of never actually actually doing anything... that could just collapse..."
> —Excerpt from interview with Software Developer 4.

To this end, I eventually left *Company X* remaining simultaneously optimistic and highly sceptical as to whether any form of gentrification actually existed as the *Gi* metric suggested. If marginal gentrifiers didn't exist, then was this a model that concealed the fact there was no original? In this case, the co-performativity of alethurgy between data artist and data-driven investor was also the production of a truth without a truth. These reflections will not be answered yet. But they do seem, so far, to represent a form of hyperreality as an ongoing process of simulation towards an end-state (or real estate simulacrum) that will ultimately be distinctly real, yet without original. This notion is also complementary to the fact that although data-driven real estate actors don't appear to be getting any more rationally objective than their predecessors, that it is nevertheless clearly rational for them to use these tools in the contemporary context. Or in other words, whilst the disentangling of gentrification had (so far) produced a metric around which it was natural for me to feel suspicion due to its extremely abstract relationship

[11] Where this particular date is a nod to the poor quality of information available—since so many entities in our data seemed to stem from the beginning of 32-bit unix 'epoch time' on this day, rather than any building spree that occurred over Christmas 1969.

with reality, there is nevertheless a distinctly possible world in which it could be used to *make real* future data-driven hyperreal estate markets. And, if investors want to deploy capital and make a profit in hyperreal estate markets then they will need hyperreal devices. This cursory discussion will be returned to later, but first it's important to explore in more detail exactly how *Dashboard X* and other real estate data analytics devices are imagined and understood by their the would-be data-driven end-users of the wider real estate marketplace.

6
Interlude: dissonance

The degree to which I had been involved in the development of a small yet-to-be adopted real estate market device was undoubtedly towards the extent of a full-participant (as discussed in Section 3.1.1). Since whilst I had remained an observer in many instances, I had also been the chief instigator and integral component in others. Writing about it now, even many months after exiting the field, is quite difficult in this respect. Since although the world of real estate markets is at times unpleasant in its social exclusion and inequality, and in the various ways it seems to reproduce these dynamics, I had also enjoyed a lot of my work a lot and grown close to my colleagues (many of whom were similarly cynical about some aspects of the technology, both functionally and ethically). However, throughout the previous chapters the focus has mostly been on emerging actors in the field (data artist and data-driven investor) and a limited analysis of the values that they have begun to contribute to circulating or producing. There has therefore been little consideration of any theoretical or political implications of these emergent actors and forms of value. Therefore, the purpose of this small interlude is to introduce one theoretical implication of valuation through real estate data analytics as a point of departure for the rest of the thesis—*dissonance*—and to frame the manner in which valuation through devices like *Dashboard X* can produce dissonance, and therefore also concern a politics of valuation.

To introduce this interlude, it should be noted that one key reason for the lack of discussion around the theory or politics of our work so far within *Garage X* or client boardrooms is that these issues were so rarely encountered in any explicit manner. For example, political issues that arose were always at arm's length: occasional musings that "rough areas of cities make bad people"; the cursory replacement of the word 'gentrification' with 'urban regeneration'; and repeated small-talk about Brexit. By and large, our work was conducted in a bubble. Because of this, there was a tendency for me to disengage with this angle of my research. Between the temptations of success and my enjoyment of the work, I had come to focus my attention much more on the perversities and peculiarities of the production of real estate data analytics platforms and value rather than any politics 'out there' in the cities where these platforms would be used to measure value. Indeed, perhaps due to the early stages of some of the technology, coupled with the often apparent (and often fascinating) irrationality with which it was going to be deployed, I had begun to wonder if there were more reasons to think its adoption would be unpredictably trivial. And any emergent politics only subject to accidents of design, as opposed to intent.

Although I didn't completely cease paying attention to these matters, it wasn't until a personal 'matter of concern' (Latour 2004) brought these questions home to my attention that I managed to re-focus my attention on the theory and politics of real estate data analytics. The purpose of this short and personal interlude is therefore to illustrate that the politics of valuation was still very much at the heart of *Garage X*, and to refocus the direction of this discussion on the potential relationships between our work in *Garage X* and other people, relationships and urban space. To do so, the next section will briefly explain an important personal connection I have to a particular urban community and place, and the following section will then explain how I directly encountered a troubling political matter in relation to this place. This will illustrate certain theoretical and political aspects of the preceding chapters, and relate them to the next chapter's discussion of how market participants are coming to know and imagine real estate data analytics platforms.

6.1 *Pub Y*

Pub Y is a public house that sits on a side-street in the centre of *City Y*, a large, rapidly changing post-industrial city in the United Kingdom. As someone who has been visiting this pub for over fifteen years, I'd say that it is only by slim chance that it still stands as it was when I first walked through the doors, with the same owner and many of the same clientele (plus many new ones), despite all the changes around it and despite the troubles within. Both the Irish landlady, now well into her retirement years, and her family would probably agree if the issue wasn't so clouded with history, myth and doubtless more than a fair share of emotion. After decades of living upstairs, numerous other changes, troubles, births, deaths and vices almost certainly don't make their story simple. Nor does the transition from being the tenant of a long-gone local brewery to being beholden to one of the UK's largest PubCo's[1], notorious for rapidly rising rents of both the dry (building) and wet (alcohol) variety (Cope 2018). Displacement is on their mind.

Downstairs, my own relationship with *Pub Y* is similarly marked by history, as are the other regular visitors, staff and those in-between. The important things to note here is that the place is quite far from a typical British pub—either in George Orwell's fabled terms (Orwell 1946; Moody and Turner 2011), or in more recent and realistic academic discussion over the 'disappearance' of the British pub (Pratten 2003)—in the sense that it defies both idealised categorisations and trends of decline in a manner that reflects that we, as a community, have a very strong and somewhat unique relationship with the place. The purpose of briefly illustrating this is not so much to say that *Pub Y* should be cared about above other urban communities, but only to emphasise that it is nevertheless the site of a well-defined and strong urban community that defies a few trends, and is therefore valuable to us. For example,

[1]Typically a PubCo is large company that owns a chain or portfolio of licensed bars and public houses. Sometimes they unify all the venues under one brand, but sometimes they simply act as a landlord and allow the tenants or managers of the venues to run them as they wish. Historically this type of role was normally only taken by a brewery who had tenant landlords that would run the pub and buy beer through the brewery, but now PubCos have emerged who don't produce any beer or drinks and simply act as landlords, whilst also forcing tenants to buy drinks through them as part of the tenancy agreement—and often at prices which they set themselves.

despite the building looking old, and being regarded by many as one of the last "proper boozers" in *City Y*, it is far from 'an old man's pub' (Gates 2004, p. 125). Demographically, socially and politically it is relatively more diverse and welcoming in terms of age, gender, occupation, sexuality and political views than the norms suggested by recent work on British pubs (Watson and Watson 2012; Noor et al. 2017). For example, rather than being subjected to 'male drinking culture' (Watson and Watson 2012, p. 684), the women I know who go there have told me that it is safe and welcoming to go there alone. Poor students, rich lawyers, hairdressers from the Middle East, Eastern European chefs, and delivery drivers largely all intermingle without prejudice, and many have also developed their friendships far beyond the walls of *Pub Y*. And far from being the site of any inebriated right-wing authoritarianism (Noor et al. 2017, p. 673), it's a place where I have witnessed some regulars come down hard on the occasional racist newcomer. Hence, as a relatively metropolitan environment that nevertheless retains a strong bond between hundreds of well-known faces of all ages, I'd argue that it's a curious urban community that bucks many reported trends of division in 'Brexit Britain'.

The close trust and connections that exist between people that visit *Pub Y* also make it stand out as a particularly strong urban community. For example, whilst research seems to indicate that "the pub is no longer the hub" (Andrews and Turner 2012), there are regulars of *Pub Y* who have keys in case they need to store their bicycles or bags out-of-hours. The landlady's son occasionally gives a lift to the airport, or visits to hospitals and trips to football matches. And during one low point in the write-up of this research, one of the staff sent me a text message to remind me that people cared about how I was doing and noted that I hadn't been in for a while. On Christmas eve last year, when the only member of staff present was taken ill (and with the landlady and family unreachable), I got behind the bar for the first time in a decade and made sure *Pub Y* stayed open for the rest of the evening so that the last of the Christmas 'stragglers' and a random group from Austria didn't have to go home disappointed. Obviously, I could go on at length about this small urban community, but the point is that far from being a simulation of a long-lost

pub life (Watson and Watson 2012), this is a very real and functioning community. One where, as the former pool team captain notes, "you never have to text anyone if you're going, you just know someone will always be in". It's real to the point where writing about it or trying to represent it here is both woefully inadequate and, in some ways feels wrong and embarrassing—I hope I don't ever write about it again.

In sum, the only important things to understand here are that *Pub Y* is integral not only to my sense of identity and community-belonging both within and without *City Y*, but to many others too. And, in the context of *City Y*'s recently resurgent post-crisis real estate boom, and the predatory behaviour of the maligned PubCo owner, for several years we have felt collectively threatened with the loss of our place and therefore our community. Just like the nearest pub a few years prior, and the one before that, we are acutely aware that a manager will be installed and their poorly-treated staff will come and go. Upstairs will be a burger restaurant where some of us might be unwelcome, and all the walls will be painted "gentrification grey." And, there will be a social media marketing strategy. A few regulars have looked into some form of community ownership, but the outlook is bleak. One non-British regular (already distressed at the possibility of having to leave the country due to Brexit) tells me that she thinks the PubCo will screw us whatever happens. Another regular says "I don't know where we'll go when [the PubCo] take it, there isn't anywhere else." A teaching assistant in her early-twenties ponders: "I don't know what I'll do, I think it'll be time to move away from *City Y*". Such is the genuine sense of loss and displacement that we are collectively dreading.

6.2 Dissonance

> "I spent ten minutes out back of *Garage X* on the phone to [a *Pub Y* regular] trying to explain what I'd been asked to do by *Company X* for my last few weeks in *Town X*. As a delivery driver who didn't have an email account until a few years ago, they were the first to admit that they didn't fully understand the technical side, but told me "do your best." I went back to my desk and even toyed with different ideas of how I could try to subvert or sabotage the project. Doing things that might result in the client over-valuing or under-valuing *Pub Y* seemed daft, especially since because of the non-disclosure agreement I didn't actually

> know the purpose of the exercise—who was buying and who was selling, if anyone? Who were we valuing *for*, and what was the intention? Did price even come into this? Perhaps the whole exercise was just aimless market research, or a test run? I contemplated deleting the record for *Pub Y* from the data; that was obviously the most appealing action, but equally impossible, risky and rash. Eventually I realised the best outcome was probably if *Pub Y* appeared mediocre. Maybe I could somehow just make it look average?"
> —Fieldnotes

At no point would I claim that losing a local pub is as serious as displacement from gentrification or otherwise losing your home, but they're not unrelated.[2] And given the sense of home and security I and others can attribute *Pub Y*, it was perhaps the ultimate coincidental twist in my fieldwork that the last few weeks of my job were spent on a short project to assist in the valuation of several PubCo portfolios. And specifically, being handed data on several thousand pubs that to my dismay contained *Pub Y*: "there it was, record *********, with the address I knew by heart from years of taxi directions and the odd postcard". It is also supremely ironic, since long before I had read much at all about geography, sociology, Henri Lefebvre or Doreen Massey, it was *Pub Y* that had first made me think of places as being dependent upon and comprised of lived, social spaces and the people that inhabit them together. Not just that they looked a certain way or contained certain representations within. I used a photograph of myself outside of *Pub Y* to explain my interest in the subject of this research to my fellow PhD cohort long before the fieldwork began.

The project itself was conducted on behalf of a large European bank (coincidentally who I had worked with before in a past job, on a qualitative project to follow the lives of the super-rich on social media). They were, in turn, acting on behalf of a client, and my colleague at *Company X* explained that a lot of the terms were bound by a non-disclosure agreement. With only weeks left, and a feeling of sickness and wonder at having been given the work (were we finally going to lose our pub?), I decided not to pry into who the client was because I felt relatively less

[2]Especially via notions of 'phenomenological displacement' (Davidson and Lees 2010), but this will be discussed more in Chapter 8.

uncomfortable and less-compromised in simply not knowing (like a strict vegetarian half-way through eating a bowl of soup at a new friend's house that tastes mildly like chicken). The work was split into various tasks, but the essential gist was to gather a large array of variables on each pub in the portfolio, with my work being confined to social media presences across four different platforms (reviews of the pubs, how many followers they had, some basic sentiment information) and the average house prices in each venue's surrounding postcodes. Others in the team compiled more mundane demographic information: certain specific landmark and points of interest data; land usage type; and there was even talk of data surrounding local car registration and what age of car or models were most common.

The project itself was hashed out in a rush, seemingly as a filler for all involved and an easy money-spinner for the company as a whole. But the concluding point of this short interlude is to emphasise and explain an intense sense of dissonance (Stark 2009) that arose in me during the project. First, because the results of the project and the entire narrative around it made absolutely no sense to me in relation to either the value of *Pub Y* or many of the other pubs in the portfolio (in terms of what variables were being assumed to constitute 'value'). Second, because it felt awful to be involved, and made me acutely aware of the vast distance and fundamentally abstract position from which we were toying around with numbers about what things were worth. And that the people we were doing this for not only had an equally poor understanding of what I thought value was in the context of *Pub Y*, but they certainly didn't care. And, of course, it'd probably be naïve of me to think they should have. I will now expand briefly on these two senses of dissonance below.

To begin with, I stumbled across pub after pub with appalling address information. But what was more bizarre was that I found pubs in the set which seemed not to exist. I'd spend half an hour "walking" around the outskirts of cities on Google StreetView looking for non-existent pubs which didn't even leave a trace of demolition. In *Garage X* we had a good laugh about the PubCo's share price on this basis, but as the project progressed, the manner in which my colleague lead the project (in conjunction with conversations with the client) became more and

more oriented towards a narrative of value that departed further and further from my own understanding both of *Pub Y* and pubs in general. For example, pubs in working class areas and industrial areas were posited as worse, despite the fact I saw pubs I knew sliding towards the bottom of the list which I knew were busy and well-run. There was talk of looking at grade-listing of buildings, but did the beauty of these buildings really matter to all their regulars? In the case of *Pub Y* I knew that despite the relatively wide age range of our crowd of regulars, that the social media data meant absolutely nothing: it was completely eschewed by the place, and *Pub Y* would simply never need to get too worried about this due to a steady and unwavering footfall that defied periods where the place had been in a very poor state of repair. Bad reviews on TripAdvisor were largely irrelevant to *Pub Y* (they were much more likely to be a source of humourous discussion), and the woodwork was nice but it wasn't what made the place matter to us. In this instance it didn't matter that the ultimate aim of the project was to give the client the means to rank the portfolio in their own manner (based on our data), but that the developing narrative was one where the units of comparison and the story behind their value just didn't really make sense to me based on how *I* knew *Pub Y*. There was an enormous dissonance between the value I understood in pubs and the narratives of data we were compiling for the client. And so this seemed like one of the most extreme examples of a fetish for metrics that was little to do with price and everything to do with rhetorically wielding a database. This made me feel alienated from the project because it seemed poorly executed, and I began to yearn for the end of my contract, despite simultaneously being asked to extend it.[3]

But the second aspect of how this dissonance made me feel was the worst. It was the basic realisation of the ethical and political boundaries we were pushing (albeit more so on *Dashboard X*), and it was stark because I couldn't fail to see how close to the bone it was for the lives concerned. I thought about the oldest regulars of *Pub Y* and how they'd feel if this work resulted in a decision that meant they would not only lose the place if it was sold-off, but maybe never have anywhere like it again.

[3]Interestingly, such a reaction of desiring to withdraw from situations of dissonance seems typical according to some foundational psychology literature (Festinger 1957).

Would they find somewhere else, other people? Maybe I would, maybe the students and bar staff would. Maybe if we moved to a new city or a new country and started the hard work of building a community all over again. But even then, this was more like the "Old People's Café" in the first chapter: places and ideas of value that are part of the "old way", and don't really suit the "new way" of seeing things and sorting them out. In other words, the project was a good example of a process of "re-cognizing an aspect of the world" (Antal et al. 2015, p. 7) that resulted in a moment of valuation with which I felt a strong sense of dissonance. Indeed, we were once again (as with *Dashboard X*) engaged in the process of developing a new calculative frame for dealing with Knightian uncertainty—and where the exploitation of such uncertainty has also been deemed the quintessential domain of the entrepreneur and innovator (Knight 1921; Stark 2009, p. 17). And in this instance, our innovation (for which the bank handsomely remunerated us) was this act of re-cognising the PubCo's portfolio, and *Pub Y*, and deciding upon what bases they were (or could be) assets. Then re-distributing this cognition in the form of a new database. Would it be used to rhetorically push through a deal on *Pub Y*, just like *Dashboard X*? I didn't want to know.

Dissonance in theories, measurements and ideas of value has been posited as part of what makes innovative organizations resilient and successful in their work, whether factories or stock trading firms (Stark 2009; Beunza and Stark 2004). This was also no different in *Company X*, where encountering dissonance was part of the 'valuation work' generally (Helgesson and Muniesa 2014). But typically this dissonance was encountered in relation to our internal diversity as an organisation—confined to the technicalities of our data and how we arranged it, something only like a 'transcendence internal to the system' (Baudrillard 2005, p. 167)—and provoked disagreement only on the register of our own competitive macho-labour towards the production of new frames and models. This experience, on the other hand, was an external matter, relating to a politics of dissonance in the valuation moment. A moment where the units of comparison raised in the 'a-ha!' moments of triumph were not only distasteful to me as a member of the *Pub Y* community, but also

full of anguish at the notion we were moving towards a model that didn't really 'know us' and yet could presumably be employed to act against us. In other words, this wasn't just about seeking and seeing truth in the world through technologies of representation, it was a matter of the politics of valuation (Helgesson, Krause, et al. 2017) through the selection of whatever truth fit the bill for someone else. And a disagreement as to whether a place could or should be known in this way as an asset. I knew that almost no one at *Pub Y* really wanted us to be valued in the first place. And rather than an active strategy to disrupt or sabotage this process (I didn't want to sacrifice my job or reputation for what might have been a purely experimental project), my desire that *Pub Y* appear mediocre or 'in the middle' is emblematic of this politics. Really, I'd have rather that in the eyes of the client *Pub Y* simply had no features to be noted at all. I wanted us to disappear.

In some ways the purpose of this interlude is both quite basic and may even sound naïve, but to reintroduce questions behind the theoretical and political implications of new measurement techniques it provides a vignette to explain how easy it can be to forget about the theory and politics of value even in the midst of valuation. Yet also how close these issues are and how quickly they return. As a community, many in *Pub Y* would disagree with these new methods of valuation if they could, but the distance (geographically, socially, technically and conceptually) from which they are conducted means that normally we wouldn't even know how we fall into such ideas about real estate value. And, if it wasn't for a personal twist of having to work on a project about *Pub Y* I don't think I'd have felt this politics of dissonance in the same way—I was also left wondering, how many people, neighbourhoods and cafés might be subjected to *Dashboard X*, the *Gi* metric, or the walking distances in the automated vaulation offered by *System X*? To return to this, the next chapter will try to understand how and why anyone in the real estate market thinks that data analytics products like *System X* and *Dashboard X* are a useful and desirable way of coming to know such assets in the first place, and therefore begin to consider what assumptions are embedded in this knowledge. Or, how circulating ideas and knowledge of these emergent technologies inform

such politics of real estate valuation, and how and why exactly these devices are supposed to 're-cognize' the world.

7

Knowing *Dashboard X*

This chapter will now look beyond the confines of *Garage X* and client boardrooms in the City of London towards a more general collection of locales where *Dashboard X* and other related products (including *System X*) were discussed by market participants. Or, where data analytics platforms for real estate have started to be *known* in the sense that certain theories, discursive formations and imaginations of these technologies were formed, exchanged and circulated. Including those concerning how the platforms worked, and what they could or *should* change about the real estate market as it currently exists. Following on from previous chapters, examining how *Dashboard X* was built and sold to clients, the purpose of this chapter is to begin to engage with the third research question: what sorts of theoretical and political implications are embedded in these emergent technologies?

To begin to address this question, this chapter builds upon conceptually-overlapping literature around the framing and construction of markets in general (e.g. Preda 2009a; Fourcade and Healy 2016), and recent discussion of data analytics that consider the important manner in which 'data imaginaries' (Beer 2016) inform the progress and advancement of data analytics technologies towards a 'data frontier' and a particular way of seeing (Beer 2018, p. 19). From this perspective, work done (including discursively) to develop new understandings of emergent market technologies, or 'strategic practical action' (Gieryn 1999, p. 23), contributes to the

construction and legitimacy of new market boundaries in a manner that enables new market agencements to take shape. In particular, this therefore pushes forwards the practical frontiers and acceptable limits of what market actors can or can't see, know, or make possible (Preda 2009a, p. 10). Hence, such imaginaries are also emergent actors in their own right.

This overlap this opens up room for questions of politics. Or, what norms and possibilities certain discursive formations and imaginaries around digital real estate platforms present as the desirable avenue of technological progress. However, whereas Beer (2018) has already identified certain more general themes of a data imaginary (speedy, accessible, revealing, panoramic, prophetic, smart—all of which have been hinted at in the last two chapters[1], and examples of such claims can be seen in Table 7.1), this chapter will seek to identify some more real-estate-specific themes that have emerged from this research. In other words, rather than focusing on such general trends of data analytics (which are nonetheless important, and will still be referred to), this chapter will aim primarily at discussing knowledge claims that explicitly and specifically relate to real estate market processes.

To explore these real estate data imaginaries, and their politics, this chapter utilises the entire corpus of data collected for this thesis, but does so with particular attention to how data analytics platforms like *Dashboard X* were discussed in more public or quasi-public spaces like industry events, hackathons and meetings. Each of these are locations that Preda (2009) cites as important in boundary construction via 'indirect observation', and which others have emphasised as being key locales for real estate markets in terms of forming 'communities of practices' (Heeg and Bitterer 2015, p. 343), the exchange and circulation of best practices, models and strategies (McCann 2011; Devisme et al. 2007), the formation of political strategies (Guironnet 2018), and the coming-together of real estate with digital technology

[1]There is also a striking similarity between the marketing materials used in Beer's (2018) research and the marketing materials encountered here in real estate data analytics, and sometimes passages of marketing copy can be found that seem to encompass almost all of Beer's (2018) six imaginaries at once. For example: "Data from multiple providers can be overlaid seamlessly [to provide] the solution for faster and more accurate decisions by turning data from the best public and private sources into knowledge enabling you to focus on decision making." (*Datscha* 2017)

Data imaginary	Product	Example claim
Speedy	Kwelia	*"extract and analyze millions of data points in real-time"*
Accessible	Lucro	*"create a financial model in minutes–no coding required"*
Revealing	Lavanda	*"data to unlock the hidden value in every London property"*
Panoramic	Argus	*"designed to give you the complete view of your real estate portfolio"*
Prophetic	Triple Mint	*"we use predictive analytics to anticipate the market"*
Smart	Kensee	*"cutting through the noise by bringing you only the relevant information"*

Table 7.1: Examples of marketing copy from real estate data analytics platforms that fit into Beer's (2018) description of six thematic 'imaginaries' of data analytics.

in general (Shaw 2018). By utilising the entire fieldwork diary, interviews and other marketing materials (e.g. see Section 3.1.3), we can therefore qualitatively isolate certain themes. From this, three emergent themes or 'imaginaries' will be considered, each which interrelates but also individually identifies certain ways of thinking about or knowing data analytics platforms that are presently circulating in the real estate marketplace (albeit largely based on experiences confined to London and *Town X*). They also begin to reveal some norms, values and political implications as to how a frontier of data-driven real estate is being constructed that will inform the next and final chapter, asking: what sort of 'gaze' does a product like *Dashboard X* ultimately entail? To consider these three themes, various platforms will be considered, but each will be related back to *Dashboard X*.

7.1 A global land registry

> "[our CEO] also put a major emphasis on the notion that he wanted us to be something that 'mattered', and not just concerned with a few small products solving small technical problems. This had a pretty big claim behind it: our CEO wanted to 'end poverty' by building a global

land registry."
—Fieldnotes

> "Like computer networks... property systems become tremendously powerful when they are interconnected in a larger network. Only then is the potential of a particular property right not limited to the imagination of its owner, his neighbours or his acquaintances, but subject to a larger network of other imaginations."
> —Hernando de Soto Polar (2001, p. 73), in *The Mystery of Capital.*

> "If I was to invest in a planet... a planetary way of managing assets and the built environment, and leases, and the way that people use that built environment for, you know, shelter or business or recreation or whatever it is, then I wouldn't design it in a fragmented way. I would say that when we go to Mars or whatever, I wouldn't design that the way we currently have it on Earth, I'd say let's have one system for the whole planet that's all standardised."
> —Sales Executive 2

My final *Company X* team meeting in *Garage X* was characterised by the fighting charisma of our boss, fresh from a post-investment discussion in London at which a new roadmap for the business had been unfurled. As we sat there, largely silent (and with me feeling a wave of both sadness and slight relief that these were my last days in *Town X*), our boss launched into a long motivational presentation about how we needed to be doing something that wasn't just clever but that also *mattered*. With an initial whiff of excitement in the air (after all, and as discussed in earlier chapters, the hacker work ethic ostensibly values socially useful pursuits), our CEO then continued to explain that if information about a property wasn't clear and accessible then that property was somehow 'dead' as an asset. It was 'dead capital'. This, he said, created a problem for people all over the world, and especially the poor, because as a result they couldn't get mortgages and couldn't access loans based on their existing assets (i.e. homes). The way to fix this problem and end poverty (one slide in the presentation contained just the words 'Solve Poverty') was to open up information about property globally and 'unlock' these assets—and if all the information was somehow out there then the market would also attain a 'higher value' overall. As a result, the two areas we would focus all of our efforts on would be a new automated valuation model and

the pursuit of a 'global land registry' where all of earth's land and assets would be mapped alongside a database of title ownership and other relevant property information. Between these two goals, this provided an all-seeing eye of a global property market. Which, he claimed, would also *solve poverty*.

To explain and describe all of my personal feelings about the ideas presented in this meeting would take a lot of space (by this point I'd invested six months of work in *Company X*). But it's worth noting that on top of the melancholy resignation of having to say goodbye to colleagues that had become friends, I also struggled to swallow this particular speech both in ethical and conceptual terms. I even felt a little disappointed in the simplicity of the ideas presented by my boss (who I otherwise liked and respected a great deal) and the degree to which they sounded like a sketch from a Silicon Valley satire about technological 'solutionism' (Morozov 2013) and the new prophets of capital (Aschoff 2015). And, looking around the table I am not sure I was the only one with raised eyebrows that seemed to be struggling to absorb this particular leap in logic (from building a platform for real estate investors to solving global poverty), and which had arisen seemingly out of the blue. However, although the terms my boss had used sounded familiar[2], at the time I couldn't quite place where I'd heard these ideas before. So I sought to speak to my colleagues and ask them what they thought of the meeting and if they knew where our boss had been inspired by such ideas. Safe to say, there was some scepticism on the first front (ironically it triggered a very socialist-sounding lunchtime discussion amongst my colleagues in *Garage X* about why universal basic income was important to ameliorate inequality), but more importantly one of them informed me that "I think [our boss] got the ideas from some book he has read by someone De Soto?" And indeed, I quickly realised that the ideas in the presentation were a direct reading of Hernando de Soto Polar's (2000) *The Mystery of Capital*. For explanation's sake here, I will now briefly expand on exactly how the development of a global land registry links to De Soto's (2000) work.

[2]It wasn't the only time that references to the 'power' of capital came up, and often in fairly academic terms—for example, the term 'creative destruction' was applied to our work by one colleague.

The idea that *Company X* should aim towards developing a platform akin to a global land registry was supported by De Soto's argument that the world's vast wealth of extralegal economic assets lie unrealised in the form of 'dead capital' (much of which exists in the poorest parts of the Global South, like De Soto's cited examples of South American *favelas*). And, De Soto estimates that in 1997 there was over $9.3 trillion in such extralegal global property assets (Soto 2000, p. 32)[3]. This includes discussion of Latin America as a whole, where 80% of real estate assets were found to be "held *outside* the law" (Soto 2000, p. 87). Key to unlocking these assets, and capitalising upon their valuable potential through allowing their (mostly poor) owners to lend or borrow against them, was the development of an integrated formal property system. Without this a modern market economy is regarded as inconceivable (Soto 2000, p. 172). De Soto continues to argue that the result of such an integrated formal property system—where the problems of bringing in the extralegal sector have been *solved* (Soto 2000, p. 217)—is that both rich and poor would have equal capacity to access credit on the basis of what they already owned, that the two legal and extralegal parallel economies could be unified as one. As a result capital is placed "in the hands of [all] the nation", and the global poor finally has the capacity to realise the equal stature of its vast informal assets (and it seems even other economic activity like labour). Including through being able to start businesses, access loans and otherwise become capitalist speculators on an even keel with their richer Western counterparts. Counterparts that De Soto explains have benefited immensely from having such property systems for generations, in "lands blessed in having to surmount only one tyranny: that of the status quo" (Friedman and Friedman 1984). Where De Soto claims the 'status quo' includes established and integrated property systems that act to the benefit of all as "capital's hydroelectric plant" (Soto 2000, p. 45). In essence, it's a basic normative argument that capitalism works well, but that the global poor simply need better access to the institutional, organisational and legal systems and technologies of capital, especially when it comes to property, land and real estate ownership.

[3]This is perhaps another example of the rhetorical power in being the first person to estimate a value for something previously unquantifiable, regardless of whether it's accurate or not.

Before dwelling further on these ideas, it's important to note that these ideas did not only surface in relationship to digital platforms and data analytics from within the confines of *Garage X*. Rather, they were encountered repeatedly throughout this research as a refrain whereby the development of platforms to simplify and improve the legibility of real estate ownership was regarded by many as essential to the real estate market at large.[4] And not only that, but it would improve the economy for everyone (including through more stability and growth). For example, whilst musing un-prompted on his previous career in AdTech (where standardisation is the absolute status quo), one sales executive for a global real estate valuation software company told me that "the real estate market is too *fragmented*, and we need to move to *standardisation* as soon as possible", and that the *problem* was dealing with "the earth's crust and all of human history piled up on top of that today" (Sales Executive 2). In De Soto's terms, much of this messy history was also part of the problem. Since so much of it lies outside of what he deems the 'bell jar' of established capitalism, outside of which individuals cannot benefit from the benefits that established property provides. Naturally, the one technology that has come up repeatedly in relation to these issues is blockchain for purposes of land registry—De Soto himself having given ascent to its benefits at a blockchain event held by billionaire Richard Branson (*Necker Island Block Chain Summit* 2015), and more recently as part of a pilot project with company *BitFury* to design a new land titling system in Georgia (Prisco 2016). In London, other less well-known actors continue to espouse blockchain's value as a technology which can "remove the disagreement and politics between multiple actors" and "increase liquidity" in the real estate market (*ChromaWay* at FUTURE:PropTech 2017). Or "ensure the validity, integrity, history and ownership of documents, data, files and database information" in the mortgage industry (*Factom* 2019).

As further testament to how far these ideas are traveling, it should also be noted that large public institutions and governments are also engaging with and

[4] A cursory online search also shows that the idea of a 'global land registry' was far from original to *Company X*, and at least three competitors also had blog posts and marketing copy that used this phrase.

circulating these ideas. For example, the company cited above, *ChromaWay*, have been working with the Swedish land registry (Lantmäteriet) and the UK Land Registry is also experimenting with its own 'digital streets' projects (Abbott 2018) to clean up the 'unworldly' nature of their data in favour of a more standardised approach to land titling. Further still, the ideas of De Soto, despite being regarded by some as a failed defence of the 1980s-90s Washington-consensus towards global development (Goldfinch 2015), remain in strong circulation in mainstream politics alongside serious technology policy. For example, the recent UK Conservative Party election manifesto (2017, p. 82) claimed they would "use digital technology to release massive value from our land that currently is simply not realised, introducing greater specialisation in the property development industry and far greater transparency for buyers." As part of a manifesto that would move people "forward, together", proposals included combining the Land Registry, Ordnance Survey, Valuation Office Agency, Hydrographic Office and Geological Survey into a new body that would set new transparent digital standards in land ownership which could benefit both the general public and real estate developers through a complete "virtual mapping" of Britain. Or, "*keeping virtuality and physicality in sync* [so as to] capture the reality outside the bell jar" [emphasis added] (Soto 2000, p. 216).

The discourses circulating around the spectre of a global land registry also tie back to Beer's (2018, p.26) discussion of the data imaginary's premise of a growing ability to see the unseen and reveal hidden value: a global land registry would be panoramic, and its users would therefore hope to become globally oriented in their search for real estate value. Through our work in *Garage X* to create order from mess—"the never-ending data cleaning and sorting" of "enormous messes [that] could be turned into easily understandable portfolio data"—products like *System X* and *Dashboard X* represent an imperative to leave any potential real estate asset 'nowhere to hide' (Beer 2018, p. 26). In this respect, De Soto's 'bell jar' [5] is not entirely distinct to Beer's (2018) notion of the 'data gaze' in the sense that building and selling *Dashboard X* and other real estate data analytics products is

[5] De Soto was inspired by Fernand Braudel's (1992) usage of the term.

about bringing all things and relationships into the panoramic calculative scope of these new market devices, and constructing an imaginary or knowledge whereby the pursuit of these panoramic ends (and the development of the data gaze) is held to be a legitimate collective market process and norm. Or rather, that the data gaze of new real estate data analytics products can bring an increasing number of assets into the bell jar of a global real estate market. And therefore it is highly desirable for any serious real estate investor to develop such a gaze.[6] And besides, how many are likely to disagree with ends like unlocking hidden value, economic growth and *solving poverty*? Certainly, sitting around the meeting room table where we ate our tasty team lunches together, none of us were going to challenge these ideas.

7.1.1 Towards planetary real estate

But there are, of course, many disagreements with De Soto's work, and this is where the first political matters arise. Some of these should be considered briefly before turning attention to their implications in the case of *Dashboard X*. In the first instance, it's important to note that De Soto's work has been rejected by many for its lack of empirical evidence behind certain claims it makes about life both inside and outside the 'bell jar'. In particular, the distinction between property rights inside/outside of any formal system is seen as problematically simplistic (Goldfinch 2015), and this argument is extended in light of evidence that informal/formal relations have always co-existed and the notion of any formal market tabula rasa[7] is an impossible fantasy—and De Soto's American 'frontier' case study is one example of such a misconception (Harris 2010; Pisani 2007). Along these lines, other criticism of De Soto points to the fact that there is very limited evidence to suggest more formal property titling systems actually lead to the benefit of the poor or the attainment of credit (Gilbert 2002). Not to mention that economic resilience and

[6] More of what the gaze of real estate data analytics can *do* in this way will be discussed in the following chapter.

[7] For example, like that of Sales Executive 2 in the quote at the start of this chapter—because if indeed we did colonise Mars, then whatever land registry system we instated would be similarly marked by history as any other: imperfect, subject to politics and power both formal and informal, and forever uniquely flawed.

development often comes from places that would be regarded as outside the bell jar (that is, if we accept that the bell jar exists, for the purpose of argument). Indeed, the extra-legal imagination, innovation and knowledges already present in De Soto's *favelas* is often argued to be a much more powerful driver of more equitable democratic futures (McGuirk 2014), and pulling these systems into a globally aligned land registry or real estate panorama would arguably be a backwards step for their inhabitants in any truly equitable terms. For example, in the area of digital mapping more generally it has been argued that more embedded and locally-governed systems (e.g. Friendly Mailman in Rio, see Mier 2014) have far more potential for any 'right to the city' than their globalised platform counterparts (Shaw and Graham 2017). Since the former are not just likely to be owned with those who more closely share local interests and use-values, but they are also likely to prioritise and preserve local forms of knowledge that can be displaced by global platforms (Graham, Hale, et al. 2011; Graham, Hogan, et al. 2014; Ford and Graham 2016).

However, the most important critical assessment of these ideas in relationship to this research is the broader interjection that this particular vision of a global land registry platform appears to be one that conceptually detaches, and subsequently neglects, the use-value of property. It is by extension of the fact that so few home-owners actually wish to use (or jeopardise) their home to attain credit that the main political disagreement enters (Gilbert 1999; Lemanski 2011)—why should anyone forget all the important activities they carry out inside or nearby their home, and instead become concerned only with the property itself as an abstract exchangeable entity?[8] The manner in which the global land registry discourse neglects the many use-values of property is stark. Some have referred to this conceptual move as a form of 'voodoo economics' (Christophers 2010), in the sense that De Soto's original theory appears to advocate representation as a means to

[8]It's probably worth noting that sat around our meeting table in *Garage X* it was a lot easier to believe these sorts of entrepreneurial ideas from within *Company X* because we'd just been given serious external investment. So stories about the founders of companies like *Cisco* taking great personal risks by mortgaging their homes and setting up in their garage seemed much more realistic when it was happening around us. From *Town X* to Bogotá, wasn't this the path everyone should try and take?

"go beyond viewing the house as a mere shelter" (Soto 2000, p. 48) and detach a property's useful life from its financialised capacity to create new assets and new value. And, by extension of the assumption that value can be 'created' via the marketisation of all property, it is also important to point out the way in which this discourse treats all stakeholders as investors, including other powerfully hegemonic economic assumptions of our time surrounding the meanings and interrelations of innovation, finance and democracy (Muniesa 2017, p. 452). This imaginary is therefore one which not only problematically suggests that all of the use-values and cultural 'mess' of property as it exists outside of the bell jar can be once-and-for-all concealed and contained to the idealistically simplified purpose of market exchange—which, as many have explained, chiefly serves rentier capitalism and the trend of treating property as a pure financial asset (Christophers 2010; Harvey 1982)—but that this is also a desirable situation and perhaps even 'moral horizon' (Muniesa 2017, p. 446): a universal status quo of transparent global provenance, exchange and value creation. In this situation, which is also implicitly a *society of investors* (Preda 2009a), future performance and value creation through the rationalisation of previously intangible assets and the relationship between enterprise and capital (i.e. through innovative representation) appears as a key goal and therefore driver of societal decisions. The global land registry discourse therefore also embodies a particular vision of democracy itself as constitutive of a society of real estate investors. And as others have argued, decision technologies like data analytics therefore also become representative of political ambition (Muniesa 2017).

Between De Soto and our CEO, there appears two immediate possible futures where developing a global land registry, including through tools like *System X*, would be desirable for investors. The first is in Aalber's 'wall of money' (Aalbers 2016) heading towards the hitherto relatively less-assetised Global South (Gruffydd Jones 2012; Fernandez and Aalbers 2016), and the second is in a renewed post-crisis financialisation in the global north via the construction of new asset classes, such

as Single Family Rental (SFR) housing in the United States (Fields 2018)[9][10]. The second avenue of these possible futures will be discussed later in this chapter, but it's important to draw the basic conclusion here that the overall movement of a real estate 'data frontier' is therefore imagined as expanding across a frontier of opacity in the current real estate market. Where everything should ultimately be incorporated and financialised, where real estate investment opportunities should be planetary in scope, and where all investors can "find, assess and acquire off-market opportunities" (*LandInsight* 2019). Or, perhaps even discover and make offers for houses before they even go to the market through 'sales triggers' based on combining land registry data with other social indicators (*Keypla* 2019). In other words (and this is perhaps the most predictable conclusion of this chapter), real estate data analytics actors believe *everything* should be on-market and that all members of society should in some way be understood as investors. And, that there is a moral virtue in planetary real estate and data analytics should move us towards this ideal. But how does *Dashboard X* fit into this discourse surrounding the imaginary spectre of a global land registry, and what more can be said about the sort of gaze this imaginary implies?

7.1.2 Doubling down on high modernism

Although the example of De Soto's ideas becoming embodied in platforms like *System X* chiefly postulates the integration of the Global South's urban housing stock into the global real estate investors portfolio, the example of *Dashboard X* speaks to trends more aligned with the urban north. In particular, *Dashboard X* is one example of an attempt to incorporate other forms of everyday life (not just houses and other property) into the bell jar of real estate capitalism. Whereas in the past "location, location, location" was an ever-overflowing domain that could only be reliably navigated by those with local knowledge, the implication is that a

[9]Very significant evidence for the latter was encountered in this research but unfortunately cannot be discussed here as it would risk the anonymity of participants

[10]Another important example for consideration of the global land registry discourse would be rural 'land-grabbing' (Pearce 2012; De Schutter 2011), however this is less relevant to the urban focus of this research.

wealth of other everyday use-values (not *just* a few walls, a roof, and some basic information about nearby amenities) can be standardised and brought inside of this new real estate panorama. And that just like a global land registry, these new metrics can 'unlock' value by enabling investors to commensurate the locational attributes of different assets on a planetary scale. Hence, the more subtle social relations that are believed to relate to or generate real estate value—including those hitherto mysterious activities of the Creative Class or hipsters—can now be brought inside the bell jar, their value 'released' as other new and expanding financialised forms (Brassett et al. 2010; Christophers 2010; Harvey 1982). And so, all those previously informal and even extra-legal urban events and processes, like raves and illegally-occupied artist studios, now have nowhere to hide from the board room. And the urban environment can therefore become increasingly measured and quantified as a 'rational landscape' for capital accumulation (Harvey 1989, p. 23). *Dashboard X* thus typifies the promise of real estate data analytics to "immediately get an overview of the investment opportunities in each city area ... and quickly analyze an area even if you're not familiar with it" (*Mashvisor* 2019). And through its representational techniques it offers the possibility of transforming the value of existing material assets (like Build-to-Rent housing, which will be discussed shortly) into new abstract forms ready for their "invisible, parallel life" (Soto 2000) alongside their physical existence. In the case of *Dashboard X* this might be the *Gi* metric and a population of middle-class would-be bohemians, or a WalkScore and an area's tree coverage. It just depends on who wants to begin imagining the contours of a new asset and who is prepared to develop the representation required.

Through the previous consideration of the contrast between the use-value and exchange-value of housing, as well as how we come to *know* about real estate values, there is now an interesting comparison to be made between tools like *Dashboard X* and historical innovation in real estate markets. Since whereas early developments in land survey for the purposes of treating land like capital typically focused on the obliteration of locally-embedded units of land measurement, the global land registry discourse also suggests that *Dashboard X* and other products are clearly intent on

increasingly and rapidly incorporating these types of unit back into the market's collective imaginary. For example, the best case study of this historical process is perhaps Gunter's chain (Shaw 2018; Weaver 2003; Linklater 2002), which is both widely regarded to be intrinsically connected with the economic ideas and practices of William Petty (see Petty 1690)[11] as well as variously charged with destroying all previously existing means of land survey which might have been considered 'outside the bell jar.' And, which were not regarded as useful to a functioning market. Examples of such means as units might include the *seterée* (how much land could be sown with half a bushel of seed) and the *yardland* (how much land it took to feed a family). Both of these examples were locally variable measurements that depended on factors like soil quality, and both were intrinsically connected to their use-value by the local population (Linklater 2013; Shaw 2018). But most importantly, where the use of both measurements required and constituted a type of location-dependent and embedded knowledge of land value that was distinct from the abstract technical knowledges required and constituted by the chain. Or, to use the Greek terms for these different forms of knowledges, *mētis* and *techne* respectively (Scott 1998, p. 313). So by contrast to historical examples, the ultimate promise of products like *Dashboard X* seems to be that the *mētis* of a local broker, surveyor or estate agent can now be re-incorporated into the *techne* of a data analytics tool.[12] And, where all useful real estate *mētis*—knowledge about real estate that is experiential, contextual, situated, partisan, vernacular, and perhaps even passionate or mysterious to some—therefore can and should be captured and contained within a sophisticated, unitary, decomposable, verifiable and universal

[11] Petty's writing and early surveys of Ireland are often credited with historically transforming the relationship between land and capital, and in particular treating land *as* capital. Not to mention the birth of several modern financial institutions (for an overview of this see Shaw 2018).

[12] For readers not familiar with this distinction between these different types of knowledge, James C. Scott's (1998) analogy is that to the difference between a harbour pilot's knowledge of navigation in and out of a particular port (*mētis*) versus more abstract knowledge of navigating on the open sea (*techne*). This example is expanded upon by Scott (1998, p.316) in a useful and detailed manner that contrasts *mētis* as the 'art of locality', or a locally superior form of knowledge, against the universality of *techne* as a more ideal system of knowledge that is organised analytically into small, explicit, logical steps that are decomposable and verifiable. Scott also regards it as a recurrent theme of Western philosophy and science to reformulate systems of knowledge to prioritise forms of *techne*—giving the example that even knowledge of chance itself has been reduced to *techne* by statistics and probability theory.

techne. Or, a global land registry where all forms of metric relating to a property are registered, no matter how contextual. Since thanks to "data-driven insights on street and neighborhood levels" (*ProvidensAI* 2017) all investors can "navigate the world like a local" and "create value" (*HouseCanary* 2016) "across different geographies" (*Kensee* 2016) using a "single source of truth for urban data" (*Urbint* 2017).

The interesting difference typified by *Dashboard X* (but also clearly present in these other products) is therefore that there now appear to be claims of a reverse process occurring within the real estate data analytics domain: the contemporary equivalents of such historical units and local knowledges are now being increasingly re-enroled in the market through devices that now promise to offer a form of universally accessible *mētis*, and hence the claims of 'locality' in Section 4.3.1. Or, that "expressions of interest made by people every day" as "part of daily life" can be used to understand human behaviour and "find the perfect location" for your investments (*IdealSpot* 2017). However, whilst the superficial reading of this might be that technologies like *Dashboard X* are in fact *not* solely concerned with the exchange value of real estate and its technical knowledge as such, this is of course not the case. What is actually happening is the reinforcement of the market priority of exchange value. And thus the aim to disentangle *all* social processes for the purposes of market exchange, including the commensuration of value and the pursuit of profit. But similarly to De Soto's flawed bell jar analogy, these promises therefore make a further misconception in thinking that *mētis* can *ever* be captured as a form of *techne*: by definition it's either *mētis* or it isn't, and it is always locally-specific and contingent no matter how much data you have. And so, despite the well documented failures of previous grand schemes to standardise human environments and activities (markets, resources, production, etc.) through data and advanced representational techniques that misunderstood the value of this knowledge—particularly those planning schemes associated with high modernism (Scott 1998)—real estate data analytics is (like its predecessors in other fields) making a bold new promise that it will not fall foul of the same mistake in prioritising *techne* over *mētis*. Instead, there is an implicit suggestion that it can somehow now muster the technology and

innovation required to render all valuable *mētis* legible as *techne*. Or, to have its *mētis* cake and eat it up with databases. And, given the wider promises of data analytics documented by Beer (2018), as well as the technological advancements associated with Big Data (Kitchin 2014a), it's perhaps not surprising that there is a renewed belief that *this time* all types of knowledge can, will and should be accounted for. Or, that it's "just a matter of time" (Consultant 2) before we "cycle to the point where there's a global coverage" (Software Developer 2) of any process that can reasonably be deemed relevant to real estate market values.

Hence, the global land registry discourse indeed ultimately implies that there is 'nowhere to hide.' And the growing abundance of products like *Dashboard X* suggests that the real estate market is expanding its panoramic gaze to include any relevant social processes previously thought to either be essentially incommensurable aspects outside of any gaze or bell jar ("They used to say that if you want to sell your house... you can't put a number on freshly baked bread! ...but *Dashboard X* is getting there in how all those little factors can make a place..."—*Sales Executive 1*), or within the domain of local experts ("navigate the world like a local"—*Spatial.ai* 2019). And to some within the market this might seem like a new claim, made possible by exciting new innovation, Moore's law and so on. However, much like the conceptual flaws inherent to Hernando De Soto Polar's bell jar, there is a loud echo of previous epistemic blunders in failing to understand the mistakes that can be made in the pursuit of a unified, global truth to any socio-economic matter. And whilst there is novelty in making a claim that the more esoteric and culturally relative aspects of locale can now be incorporated into technical tools offering a panoramic global gaze upon real estate, under critical assessment this novelty is also essentially just a 'doubling down' on the promises of yesteryear's epistemological 'monism.' And in this case, that *mētis* and *techne* can be as one within the dashboards of tomorrow's real estate markets. In this respect, the global land registry discourse also represents aspects of "a past that has not yet passed" (Barnes and Wilson 2014). And it appears that real estate data analytics products are still ultimately heading for

the same insurmountable epistemic barriers that have caused many other historical promises of economic, social, and market transformation to ultimately fail.

7.2 Perfect exchange

> "The *International Property Securities Exchange* (IPSX) is [soon to be] the world's first regulated securities Exchange dedicated to trading companies owning single commercial real estate assets. The Exchange provides an alternative public capital markets option for real estate asset owners to progress an Initial Public Offering of their assets on a fully regulated market."
> —IPSX website (2019)

> "Imagine the 'person on the street' buying shares in a company owning the building he works in—or even the Premiership football stadium where he watches his favourite team play. Add to that a real estate yield, tangible asset backing together with the protections of IPSX's regulated market and you have a compelling proposition."
> —CEO of IPSX (2019)

> "Want an easier way to invest in residential property? BrickX is an award-winning platform that provides a simple and low cost way to access the property market. Australians can now instantly buy Bricks, the new way to invest in residential property. A Brick represents a fraction of a property"
> —BrickX website (2019)

The present emergence of a serious and credible project to initiate the world's first real estate stock market (IPSX) is indicative of a concerted effort to promote increased liquidity, transaction speed and versatility in real estate markets—characteristics which are hitherto sorely lacking (Baum 2017). Indeed, along with a raft of recently launched crowdfunding investment platforms (Wardrop and Ziegler 2016), there is a growing trend towards approaching these problems by treating real estate as an asset which can be traded in increasingly divisible and rapidly exchangeable forms. And, which is also increasingly open to all as a society of investors. Other examples of this include the Australian platform BrickX (Rogers 2016), as well as various UK and US equivalents (such as LendInvest or Cadre) that promise investors of all sizes a new potential to enter the real estate market through the purchase of smaller and smaller portions of both specific individual

properties and portfolios (from as little as $50 in Australia to £100 in the UK). Typically, according to their marketing claims, these platforms either aim at 'fixing' the market through acting as "a new source of liquidity" (IPSX 2019), a source of "short-term property finance" (*LendInvest* 2018) and "a much more diversified way to invest in real estate" (*RealtyShares* 2017). Or, they make claims of democratising real estate investment to include even 'members of the general public' (IPSX 2019) who might otherwise be "locked out of the market" (BrickX 2019). Indeed, the companies declare that a "greater plurality of investors" and a democratisation of frictionless access are all key to market growth (Unger 2019). Hence they all hope to offer "unparalleled access to real estate deals worldwide" (*Brickvest* 2019) where "everyone can invest in real estate" (*Property Moose* 2019) because "building a portfolio [with them] is simple" (*PeerStreet* 2019). And as part of becoming a savvy investor, many of these platforms also naturally offer their own proprietary analytics to analyse such assets[13], and some crowdfunding platforms have already allowed individuals to "list your investment for sale at any time on our secondary market for zero cost to you" (*Property Moose* 2019).[14] With the impending launch of *IPSX* in 2019—backed by British Land, Henley Investment Management and M7 Real Estate—and the growing popularity of crowdfunding platforms generally (Belleflamme et al. 2015; Wardrop and Ziegler 2016), there are signs that this trend of increasingly subdividing assets for rapid market exchange will increase.

Rather than dwell here on the implications and roles of these companies in the financialisation of real estate as 'just another asset class' [15], the important thing to note here about this discourse in relation to data analytics and *Dashboard X* is the manner in which these platforms all unfurl an imaginary of what I will call 'perfect exchange.' Here, marketing claims and discussions in the marketplace appear to imply that the traditional restraints of real estate as an asset limited by illiquidity, inaccessibility, spatial fixity and prone to deterioration can, in fact,

[13]It would be very easy to imagine *Dashboard X* embedded in such an interface!

[14]In the case of *Property Moose* this secondary market was suspended in 2018 due to regulatory concerns, resulting in a backlash from investors (*Trustpilot* 2019).

[15]Obviously this is an important issue, but it is discussed elsewhere throughout this research.

be increasingly alleviated by dividing assets up into smaller, more versatile and *interchangeable* portions for the purposes of market exchange. And, in reference back to the thought of Jean Baudrillard (2001), this discourse effectively implies that as representational market devices these tools (via the datafication process) can all overcome a barrier of 'impossible exchange' whereby the technology supposedly affords an increasingly perfect interchangeable equivalence between individual assets and their component parts. This implies everything can be exchanged for everything, provided the platforms and data tools exist to provide the quantified metrics and market necessary for these transactions.

In the first and most obvious instance, this effectively implies that we can and should be moving towards a world where representational technologies can (as De Soto hoped) keep the entire physical and virtual lives of real estate perfectly in sync. In other words, the most extreme and rudimentary conclusion of this discourse appears to imply that one day the bricks in *BrickX* should not simply be assigned at a rate of 20 per property, but could be broken up ad-infinitum, or perhaps literally broken up into all the bricks of a building—one-to-one.[16]. Here, amidst the financial deregulation necessary for IPSX and BrickX, Baudrillard's "ironic revenge of the object" (Baudrillard 2001, p. 29) would therefore become (in its most literal sense) the deterioration of those bricks whilst their virtual counterparts are yet exchanged and go on 'living' through continuous rapid transactions across diverse geographies and social boundaries. Perhaps where a phantasmagoria of constant brewing crises might evolve around the materiality of the bricks in the form of water ingress, damp, graffiti and mortar re-pointing. Therefore, this particular reading of the perfect exchange implied by such discourses and the assemblage is, in a basic sense, that of hyperreality and Borges' fable of the map (Baudrillard 1994; Borges 1973). Or, as the gaze of data-driven real estate is developed, the

[16]Another example of this desire was encapsulated in one surveyor's desire for annual pricing index books for building materials like bricks to be superseded by a reliable, dynamic market pricing program that could populate estimates for contracts and tenders in real time: "all it would take is for a provider to provide that, yeah, 'We're going to provide all your live rates!"' There are a number of reasons why this would be very disruptive to the market, and would not favour many interested parties, but as the surveyor said, "that's the scary thing... it's not there yet, but the technology is there, you know, all it would take is for a provider to provide that."

more market actors will come to dwell in its ever-more detailed, legitimate and financialised map. Whether as landlords, tenants or would-be investor subjects, all whilst the original bricks begin to disappear entirely.

However, a more interesting and important extension of this analysis moves further beyond a reading of digital real estate geography where "code is as important to a building as its bricks and mortar" (Shaw and Graham 2017, p. 908). It is also important to consider the implications *Dashboard X* and associated products raise as interventions whereby social processes themselves (and therefore forms of use value and *mētis*) are subjected to a discourse of perfect exchange. In the case of *Dashboard X*, there is an imaginary posed whereby anything that contributes to the value of real estate should be subject to quantification in a manner where new and emerging metrics (like *Gi*) can relate and commensurate assets in relation to interchangeable and implicitly exchangeable social processes. The implication is therefore that all urban consumption and/or use-values can be pulled into equivalence: API endpoints can commensurate even the *atmosphere* in bars, and whereby walking distances to amenities with reviews on TripAdvisor can be considered *either* equivalent between Los Angeles and Brussels, or simply weighted accordingly to recognise whatever is deemed to be their difference (all of which is regarded as *merely* technical matters). By then tying these activities to assets (in databases, in metrics, in calculative frames, etc.) the implication is that they are indeed virtual properties of these assets, disconnected and reconnected to the assets again and again in the endless and ever-changing work of market valuation. In this imaginary, each VISA transaction for *Flat White* coffee can become another notch in the metrics for a block of flats around the corner—perhaps *cold brew* coffee is *two* notches? (Marsden 2018)—and future real estate traders will look to these 'social' metrics in order to allocate to any mispricing "where we think we have an informational edge" (Investment Manager 2).

7.2.1 Crises of commensurability

There is also much to support and extend this analysis of a 'perfect exchange' discourse in more contemporary areas of critical data data studies, many of which

identify the roots and synergy between data analytics and marketing as a domain where markets have sought to increasingly commensurate use-values, affect, and other cultural domains (Andrejevic 2014; Doorn 2014; Grossberg 2010; Cockayne 2016).[17] In one related analysis, instead of 'impossible exchange', Lawrence Grossberg (2010) asserts that market actors are in fact scrambling to respond to a wider 'crisis of commensurability' under modernity (Grossberg 2010). Here the crisis is not just one of reducing all use-value to exchange-value, but a more general problem relating to "the apparent claim [or imaginary] that *all* values can be commensurated through economic machines, that 'economics' is, as it were, the necessary medium of translation" [italics added for emphasis] (Grossberg 2010, p. 324). This returns to an increasingly value-form-agnostic and voraciously data-hungry aspect of market commensuration via new data analytics products where all 'general social knowledge' (Marx 1861) and 'the affective practices of life' (Grossberg 2010, p. 324)—and to use the term from the previous section, *mētis*—are regarded as subject to recursive perfect exchange, ad infinitum. New real estate data analytics products are therefore responding to this valuation crisis with ever increasingly claims they are "uniquiely combining comparables" (*edozo* 2017)[18] to deal with the increasing multitude of "competing loci" and "modes of being-in-the-world" together (Grossberg 2010, p. 324).

In *Dashboard X*'s case this is exemplified by the mess of such modes and *mētis* that comes together in one reductive concept and a single metric to account for the gentrification process: is *Dashboard X* about where young professional organisation men want to go, or is it about where broke artists actually go? Does it really work in Cape Town *and* London? The fact it manages to stake claim to all these forms of value is therefore both its strongest (most appealing) and weakest (most

[17] Although somewhat anecdotal, I'd like to note that the amount of individuals I encountered in the field of real estate data analytics start-ups who had previously worked in AdTech seemed disproportionally large. Whilst this could be due to a range of factors, such as people simply jumping careers from an established field into a new one, it is nevertheless interesting because these actors undoubtedly brought ideas from AdTech with them into the real estate domain, and the quotes in Section 7.1 are one good example.

[18] The CEO of *edozo* is himself another former advertising professional turned real estate data entrepreneur.

crisis-prone) point: as it combines and reduces a series of competing imaginaries around the production of value through a process we *might* call gentrification, all with their own 'logic of dislocation' (Barnes 1996). Thus it is attractive to market actors in its claims that it has uniquely isolated a series of affective human use-value in the urban environment that somehow mediate future patterns of possible capital accumulation. Moulded along the way by negotiating the requirements of those existing real estate market actors who might use such a platform, the discourse of perfect exchange suggests that any absurdity around the impossibilities of *Dashboard X*'s multi-modal valuation task can be overcome: that the plasticity and inherently contradictory nature of *mētis* can be captured in a series of reductive, isolated and increasingly small parcels of *techne*, giving the illusion that each brick or music event is *locally* known and *globally* exchangeable when in fact it is not. It is these assumptions that produce a possibility whereby, building upon the data of other platforms as an enormous "standing reserve of bits" (McKelvey et al. 2015, p. 580), *Dashboard X*'s *Gi* metric can be attached to a series of new virtual assets and exchanged as such—work likely done by people like myself, *Company X*, and all those seeking "reductive human desires and imaginaries" around processes like gentrification (McKelvey et al. 2015, p. 580). And, it can be argued therefore that the constant reduction and datafication of social activities and production of real estate 'dividuals' (Deleuze 1992) or 'data derivatives' (Amoore 2011) in the city is now being incorporated into the basis of real estate 'simulation machines' (McKelvey et al. 2015). Here, it is implied that all buildings, people and social processes can be broken down into representative parts and reassembled as required by the investors' imagination in order to suit the creative deployment of capital flow into myriad new asset forms and investment practices. All whilst the gentrification process is itself assigned a new type of simulated 'normal' that can be easily ascertained for each and every city (which will be discussed further in the next chapter). Any portfolio benchmarked with the *Gi* metric is therefore an increasingly simulated real estate portfolio, reflecting a notion of gentrification that exists as much in the collective imagination of the market than it does in anything like an objective

and critical reading of material reality. The gap between the representations of such a simulation and the material reality of gentrification is thus obscured by the perfect exchange discourse via something like a 'lie of virtuality' (Dourish 2017), or a simulacrum of gentrification.

Meanwhile, an even better example of this multi-modal agnosticism towards competing logics and theories of real estate value can be found earlier in Section 3.1.1, where my work at *Company X* was almost destined to be concerned with the development of an 'open valuation framework' for *System X*. In this project, the ultimate goal would have been to work towards introducing a valuation dashboard product that allowed users to select their own variables and refine a valuation model towards what they felt were the key comparables. By including user data fed back to our database (for example, what variables the user picks and in what combinations), along with time series data and machine learning, the first idea was that we could work towards better understanding "how each user differs in their preferred view or understanding of property value" (see Section 3.1.1). And second, that we could include these different views and understandings of value in our product's valuation, thus providing a legitimate space in the market for each individual's diverse and *unique* conceptions of real estate value. This project thus cuts to the core of the perfect exchange discourse in the sense that such an imaginary allows not just for the simultaneous consideration of multiple competing logics of real estate value, but even provides them with a technical way to co-exist. Thus claiming to both navigate the barrier of perfect exchange and also overcome any crisis or politics of commensuration. Naturally this prospect also held a potential appeal within *Company X* since it even opened a possibility whereby any politics of dissonance around real estate value within *Garage X* could be done away with. Instead it suggested we might be able to more simply just 'count' real estate value rather than doing the work of debating or narrating them with ideas like suburban tree cover, all-night raves, and Old People's Cafes. If everything is exchangeable then all *Company X* would really have to do is "profit by merely counting" (Bratton 2015, p. 199); with users who can be safely left to their own

devices, logics and incommensurable cultural domains as the platform does the work of containing them[19]. Out in the marketplace, the discourse of perfect exchange suggests a similar idea: instead of squabbling over competing valuation frameworks, here's a machine that does all the valuation work for you! Hence, the *Gi* metric may be one of many infinitely exchangeable measures and calculative frames that could be incorporated into a theory of real estate value. And the perfect exchange discourse alleges that as long as something like *Gi* can be counted then it is also a legitimate consideration of valuation. And what responsible investor would want to risk ignoring it when it's available at the click of a button? Perfect exchange thus engenders an imperative of its own: if everything can be exchanged and all value theories are potentially valid, then you need these platforms! But each time this imperative is pursued, the crisis of incommensurability will deepen with each new understanding of value that is introduced.

The theoretical implication here is therefore that the marketing claims observed around platforms like *Dashboard X* represent all the ambitions of "impossible yet manageable calculating machine[s]" (Grossberg 2010, p. 299). Each offering a "provisional tool to keep at bay the spectre of incommensurability" (Doorn 2014, p. 371), as well as any politics or dissonance that may arise with it. Including between different locales where multiple, competing and incompossible forms of *mētis* circulate. All the while, actors like myself (during the fieldwork) will continue to wrestle behind the scenes with the residual overflowing and contradictory crises that stem from this discourse and its lie of virtuality. As well as a perpetual "resilience of the vernacular" (Scott 2012, p. 23)[20] and revenge of materiality that will always reveal the essential impossibility of such perfect exchange. And regardless of how many data analytics products are used, real estate assets will therefore continue to problematically straddle the boundary of any 'bell jar' or 'data gaze'—as

[19]Ironically, to support this notion, I recall a discussion about recruiting a new and talented data scientist from another field where one justification as to why he should join us despite his concerns around Brexit's impact on the real estate market was that the health or direction of the market was largely irrelevant to our operation—if anything, a crisis might get us more clients!

[20]Just as James Scott explains "there is no standard field", neither is there a standard neighbourhood, illegal rave or artist studio. Or, no matter how good the barista, no cup of coffee is the same as another.

ultimately mutable and unstable objects that can never be purely of or within the market. The more forms of value that are layered on top of this boundary zone in the form of various metrics, metaphors and meanings—and the perfect exchange discourse suggests we can have as many as we want—the deeper any crisis of commensuration will get as this bricolage of value-forms and *mētis* are engaged and performed as market practice.

7.3 Generation rent

> "A growing number of young people have given up on the idea of buying their own home... in London, 82 per cent of 20 to 45-year-olds say they will never be able to buy a property."
> —Emily Cadman (2015) on 'Generation Rent' in the *Financial Times.*

> "He explained that his company was a renter's "club" and an "ecosystem" where verification and trust would make renting a 'great experience' and where the process would be covered by a "unique insurance model" with "many layers" that they had developed themselves to make sure that "all that conflict" in the renting process (between landlords, tenants and agencies) would be "taken care of"... he said that all the administration, trust, verification and practicalities were "grey areas" and that they would "take all that grey away"... it wasn't location dependent, it'd cost just £3.99 a week, you'd have no deposit, easy and flexible tenancy where new flatmates could be seamlessly swapped in and out of the property, where everything was fully insured, with many benefits ("lifestyle discounts"), full flexibility and all of this linked to your credit score (a theme that was repeated at the conference the next day). All of this would "allow landlords and agencies to step away totally", provide a 'slick exchange', a 'gated community' (for trust and verification)."
> —Excerpt from Fieldnotes, taken during a CEO's pitch for his recently seed-funded (and presently still operating) rental platform.

As I have already explained elsewhere, the residential real estate market is currently the main area of activity for digital real estate platforms in general (Shaw 2018). And within this sector the most common type of platform is that which offers some sort of connection between tenants (renters) and landlords (from home-owners to large institutional landlords). Whilst these platforms are not all primarily concerned with data analytics—many simply aim at offering improved transactions between participants of two-sided markets—the proliferation of new

businesses and investment in this area of innovation is an important context to introduce the relationship between new digital real estate platforms and what has, in the UK, become referred to and even self-identifies as 'Generation Rent' (Cadman 2015; *Generation Rent* 2019). Or, the broad trend that young people in the United Kingdom—and this includes age brackets from 18 up to 44 (*English Housing Survey* 2019)—are increasingly turning to the private rental sector because they are either priced out of home ownership or cannot find social housing, and might be forced to rent in perpetuity (Evans 2015). Indeed, and perhaps unsurprisingly, throughout the fieldwork and interviews, assumptions about the rental market generally were discussed on a daily basis as a pervasive theme and component of real estate generally. Analysing Generation Rent as a discursive theme is therefore tricky in the sense that it was such an expansive theme, but there are nevertheless two important aspects of this topic that should now be considered. First, the anxieties and uncertainties they present to any real estate investor pursuing profit in this sector need to be outlined. Following this, the significance of these anxieties will be considered in relation to the overall construction of a Build-to-Rent BtR asset class. Including the way in which *Dashboard X* is well positioned to appeal to any investor seeking to alleviate such anxieties and gain 'calculative agency' in respect of this new and as-yet unknown asset. This section therefore demonstrates the manner in which real estate data analytics products are regarded by market participants as crucial to the construction of contemporary real estate asset classes.

7.3.1 Market anxieties

The first area of marketplace anxiety observed is best typified by the quote above from a CEO of a company describing itself as a "renter's club." Standing to address a room of young men hoping to engage in a sponsored hackathon the following day, his address was permeated with language that presented renting as something which should both be fulfilling and enjoyable, as well as devoid of any complicated politics or power relations—and he encouraged us all to "get in the mode of selling solutions" which would "make the grey go away." By 'grey'

it was clear that he meant all of the problematic marketplace relations between tenants, co-tenants and landlords; including any transaction costs such politics and administration might incur. And, the present London-based success of companies like Goodlord (Bradley 2018) suggests the extent to which such solutions are gaining traction in the rental market for those who want such 'grey' to go away. Like Goodlord, typical platforms in this field might handle a range of activities like generating contracts, digital signing, tracking payments, insurance schemes, referencing and reputation scoring. Similarly in the United States, some large institutional landlords are experimenting with 'reward points' schemes for SFR housing that aim to encourage good behaviour and timely rent payments (Fields 2016; Fields 2019a), and some offer to improve the credit scores of tenants. Indeed, another hackathon at London's MIPIM conference was full of proposals for this area, with two groups of eight focusing their 'solutions' directly on the politics of Generation Rent (and a further three on other problems faced by Generation Rent) to deal with strained relationships between tenants and landlords. For example, one group I stayed in contact throughout this research and followed for a year as they gradually developed their product into a 'tenancy passport' that could track an individual's 'right to rent' (i.e. enforcing and dealing with new UK immigration law, which was later overturned by the High Court as a breach of human rights law and discriminatory against immigrants, see BBC 2019), as well as their landlord-rated behaviour and payment record. During this process of developing a prototype (which eventually got them into serious talks with one UK council around managing social housing tenants), it was interesting to observe the manner in which the older industry "mentors" that we met gradually guided the group away from a tool which could also vet landlords (that they initially hoped could make "everyone become good participants in the market") towards a passport system that was only intended to discipline its tenant subjects on behalf of a large institutional landlord. Or in other words, towards where the real business interest was.

Whilst it is not uncommon for digital platforms to promise 'fixes' to politics in different spheres of human activity (Gillespie 2010) (but where such politics

is typically only obscured by design rather than ameliorated), it is the extent to which this particular marketplace discussion reflects a real anxiety on the part of institutional landlords which makes it interesting here. For example, whilst it was often difficult to broach 'hot topics in cool settings' (see Section 3.1.2) (for example, by asking investors what they personally thought about the structural injustices of Generation Rent), one large conference presentation in London (with an entry ticket price of several hundred pounds) revealed the extent to which many people in the room were aware of the political issues around Generation Rent without ever mentioning the topic openly. In this case, the use of an automated, unvetted and anonymous question system for a panel of institutional investors—where questions were sent via SMS to a large projected screen and could be voted "up" or "down" according to the audience's interest—indicated that most audience members wanted the panel to answer questions like "Will innovation in PRS (private rental sector) really benefit tenants, or just landlords?" and "Is BTR (build to rent) just capitalising/taking advantage of generation rent?" Given that one panel member was an interviewee that I had struggled to address such topics with, it was interesting to see the awkward way in which they were forced to respond to these questions by dodging the issue and suggesting that "soon most young people will only be able to rent" and that it was therefore up to them, and the market collectively, to "unleash all kinds of flexibility" and "improve the product" to "make the renting experience better." In other words, despite clearly scrambling to invest in and find solutions to neutralising the notorious politics and power around the tenant-landlord relationship[21]—not to mention pursuing technology that re-inforced discriminatory policies like "right to rent"—key actors repeatedly claimed that these innovations were mostly about giving renters what they wanted as *customers*. And, that in doing so they were merely responding to external conditions in an appropriate manner. This is, after all, a much more comfortable claim to make. Despite the fact

[21]This is naturally a source of insecurity any large institutional landlord considering developing BtR schemes since a large population of unhappy tenants in one asset could obviously cause a lot of damage.

that a large proportion of Generation Rent do not want to be renters, investors, or customers (*Generation Rent* 2019; *London Renters Union* 2019; Wainwright 2014).

The second area of anxiety perceived in the marketplace around Generation Rent concerns the absence of any clear definition of who this group are and what they want. To this end, a multitude of competing imaginaries around Generation Rent were encountered that range from claims that they are "millenials" who are "less focused on the long term" and "prioritise experience over ownership" (Kotecha 2018); to people who expect to live somewhere as part of a "lifestyle brand"; to others saying that they simply want home that's "safe, comfortable and that fits their purpose" (Paltiel 2019). In pursuit of a way to rationalise and explain this group of renters, all sorts of theories are being developed in the marketplace that try to provide broad cultural explanations as to what motivates and drives Generation Rent. And, to understand how they perceive real estate value. These range across entirely unsubstantiated claims about 'millenials' generally (as a vaguely interchangeable term with Generation Rent), to more developed accounts of a cultural shift from people wanting to own their house and instead occupying 'space-as-a-service' (Slumbers 2019; *Space as a service* 2018). In this vision, accompanied by the rise of co-working developments like *WeWork* and pop-up rentals for retail like *Appear Here*, new real estate development for Generation Rent must aim at "turning property into a service sector, and finally detaching it from its bricks-and-mortar foundations" (Thame 2018a).[22][23] To do so, others claim that inspiration must be taken from the fashion industry in the development of branded developments with lifestyle considerations built-in (Phillips 2019b), and new residential developments for Generation Rent are therefore increasingly engaged in a 'amenities war' (Thame 2018b) where things like Uber ride allowances and

[22]It should be noted that modular and pre-fabricated constuction technologies also facilitate this idea—where pre-fab BtR schemes could be "rolled off the boat in two weeks and ready to go" (as our client fantasised) and modular buildings are understood more like "hardware stores" (Consultant 2), or a collection of individual parts ready to be recombined just-in-time for occupancy.

[23]The obvious link to other platforms, services and the wider context of 'Tech's New Rentier Capitalism' (Sadowski 2019a) could be discussed further here, but is unnecessary to the arguments of the chapter.

Deliveroo fees are included as part of renting (Baynes 2017). However, amidst all this discussion, the reality also appears to be that the sort of developments on offer to Generation Rent remain simply unaffordable to the vast majority of young people in the UK, and that there is no concrete evidence to suggest these living 'solutions' are in fact what Generation Rent wants or needs. Hence, this confused and contradictory discourse belies the fact that Generation Rent as imagined by the average market participant is both wildly diverse and likely does not exist in any one form. In other words, there is reason to suspect that although the term and notion of 'Generation Rent' was encountered repeatedly over my time in the field of London-focused real estate, it was never particularly clear what this meant other than lots more people are now renting. The resulting anxiety around this category appeared to revolve around the lack of an understanding or market characterisation of who the renting subject was, or should be, and how they perceived value in the real estate market. And without this crucial market information, how can any investor be sure they are backing the correct asset?

7.3.2 Build-to-Rent as emergent asset

These two areas of uncertain anxiety around the politics and subjects of Generation Rent should now be considered amidst the very recent emergence of one of the UK's newest and rapidly-growing real estate asset classes: Build-to-Rent (BtR) (see Figure 7.1 and McNeil 2018). In this example, for which *Dashboard X*'s use was primarily intended[24], the United Kingdom is presently witnessing a proliferation of large private rental developments on a scale and model never previously encountered in the private rental sector (Wilson, Russell, et al. 2017). Typically consisting of at least 50-100 units per development, and either aimed at or initiated by large institutional investors, BtR assets presently lack a precise market definition[25] but it is widely agreed that they are directly aimed at Generation Rent or "those for whom home ownership is unrealistic, but access to social/affordable housing is

[24] As outlined in the chapters on building and selling *Dashboard X*, the product was developed with a specific client in mind who was backing a major UK-based BtR project.

[25] For example, see contrasting definitions from the Greater London Authority (2016) and the Urban Land Institute (2016).

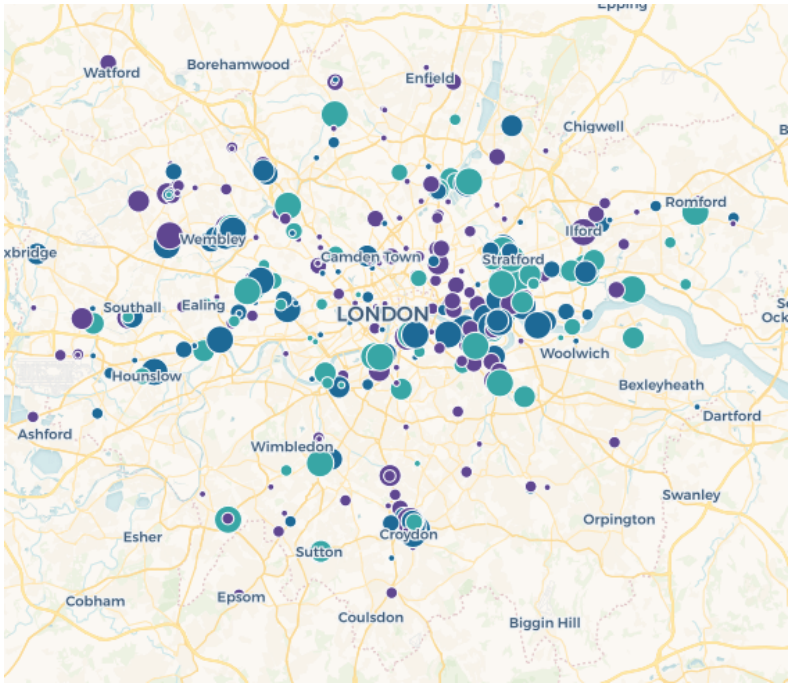


Figure 7.1: According to data from Savills and the British Property Federation (2019), there are currently 72,767 BtR units in London which have either been recently completed or are in development. All are aimed at the institutional investment market. There are a further 66,741 units around the United Kingdom and these figures represent a 22% overall increase in UK BtR development between 2017 and 2018.

also unlikely" (Wilson, Russell, et al. 2017). Hence, although investors are eagerly aiming to deploy many billions of pounds into the new UK BtR asset class (Evans 2015), it presently lacks a clear definition, historical precedent or even a consensus on how this emergent asset should be valued in monetary terms (Hardman 2018).

This consideration of the new BtR asset class must now be framed by a reminder that market assets do not occur naturally—they must be constructed and framed (MacKenzie, Muniesa, et al. 2007)—and that other research has demonstrated the manner in which similar uncertainties around the recent emergence and construction of the SFR asset class in the US (post-2007/08 financial crisis) is also related to similar anxieties and discomforts for would-be investors as they seek to understand and engage with the new financial products that have been developed around this asset in the last decade (Fields 2018). Indeed, real estate market actors have stated in their own terms that they need to first establish a "production line" (Rich 2012) of the asset in question and where the early phases of constructing an asset are

characterised by anxieties that stem from a deficit of calculative agency vis-a-vis objectifying the subjects and characteristics of the new asset (Callon and Caliskan 2008; Fields 2018). For example, many of the anxieties around the politics of the tenant-landlord relationship described above have also been documented in the emergence of the SFR housing asset, where actors have responded by seeking solutions that can help "capital markets get into homes" (Director of mortgage-backed securities rating agency quoted in Fields 2018) via datafication of social activities and the renters themselves (Fields 2016). Since although "its going to take some time for the market to evolve to a point where people have some comfort on this dimension" (director of mortgage-backed securities rating agency quoted in Fields 2018), the signs are that the equivalent early stages of constructing and framing UK BtR assets are now well under way. Indeed, to deal with the uncertainties arising around the new asset, many actors have stated succinctly that "it's all about the data!" (*FUTURE:PropTech marketing email* 2018). Just as "datafication is a critical aspect of agencing the SFR housing market" (Fields 2018).

7.3.3 Metrics for a hipster *mētis*?

> "Build to rent developers need to think about data... [they need to use it to] find the right site and offer something unique... developers should start these projects with an in-depth analysis of their chosen location."
> —Build-to-Rent Sector Panel at FUTURE:PropTech 2018 (McCarthy 2018)

> "The residents can see into the hipster barbers, the indie coworking space and the cool oyster bar, and it feels like a community there, a place where everyone is meeting"
> —Susan Cooney, Build-to-Rent brand manager for M&G Real Estate (Phillips 2019b)

It is now important to highlight the logical extent to which a market device like *Dashboard X* appeals to these discourses of uncertainty which are presently circulating around Generation Rent. And to explain how such devices are perceived as playing a role in constructing a BtR asset class. In the first instance, the way in which we marketed aspects of *Dashboard X* occasionally fed directly into anxieties around the politics of Generation Rent. For example, it was often discussed and

advertised in more public forums as having a dual purpose of helping the renter-as-consumer find out where they both wanted and could afford to live. Indeed, one PR consultant explicitly directed us to this framing as a way to bypass the negative connotations of gentrification, and that we should present an idea of the renter-consumer as something 'less political'. However, whilst this is an important observation it is rather the second anxiety—about the subjects of Generation Rent themselves—which should be discussed here, since this is where *Dashboard X* most coherently speaks back to the discourses around BtR as an emerging asset class exhibiting a deficit of 'calculative agency'.

In relation to this (and in reference to Chapters 4 and 5) it must be understood that it's hard to understate the significance with which the present BtR marketplace is concerned with the activities of the so-called Creative Class, and especially 'hipsters'. And, despite the contradictions and contestation around these categories in the public domain (Grand 2018), academic study (Peck 2005; Markusen 2006), and marketplace itself (as evidenced through reflection on the fieldwork), they are nevertheless seen as crucial both to "attracting the millenial renter ... to the next Williamsburg" (Evenhar 2018)[26] and thus profiting from this emergent asset class. Indeed, it's well documented that notions of the 'creative city' and its hipster population are now intrinsically linked by investors to the notion of real estate value creation (Machell 2014; Flew 2012; Peck 2005). Which can itself be strategically engaged as a logic behind certain investment decisions (for example, see USMRF 2016) and the concerted political effort by investors to produce 'creative places' (Ponzini and Rossi 2010), and BtR schemes which prioritise 'hipster authenticity' (Roberts 2018). In other words, the success of certain sites for BtR development is now seen as highly dependent upon an economic dimension commanded by hipsters as the pioneering 'shock troops of gentrification' (Grand 2018). Or, a straightforward alignment of real estate investment with academic analysis suggesting that "the

[26]As referenced earlier, Williamsburg is seen by many—public and investor alike—as a particularly 'hip' area of Brooklyn that is widely regarded as one recent example of particularly aggressive, and highly profitable, gentrification.

valuation of hipster culture as emergent cultural capital is also bound up with forms of class distinction and value in gentrified urban neighbourhoods" (Grand 2018, p. 9).

However, due to the relatively recent emergence of the BtR asset class—as well as the popular contestation in the public imaginary around exactly how to define a hipster (Grand 2018)—there is arguably a very significant calculative deficit around how to engage this emergent asset in a manner that adequately accounts for the prized hipster and their relationship with value creation. Nevertheless, as a social type that has been variously defined as trend setters, elite or 'knowing' consumers, and subjects that bear a striking resemblance to Bourdieu's 'cultural intermediaries' (Bourdieu 2010) there is a corresponding and clear belief amongst many real estate actors that hipsters are somehow crucially important to the emergence of a profitable BtR asset class (including as evidenced in previous chapters). Indeed, it seems that there is a dual understanding of the group as both consumers of the asset as well as contributors to or producers of its value, or 'prosumers' (Ritzer and Jurgenson 2010), alongside an understanding that hipsters are both a trans-local phenomena but also highly contextual in terms of the 'symbolic order' they produce in any one particular city or neighbourhood (Zukin 2010; Maly and Varis 2016). Hence the question of *Dashboard X*'s potential clients: "can you do this for *any* city?"

Because of this, developing an account of a local hipster subject is important in the first instance to creating and understanding a requisite 'housing consumer' for BtR (Rogers 2017). But it is also crucial to understanding how to strategically select the appropriate sites that meet with the symbolic order of the hipster as a subject with a particularly local and 'knowing' expression of cultural aptitude, as well as a certain aesthetic of engagement and exhibition (Maly and Varis 2016; Savage 2015). Or in other words, despite being understood as young 'creative' middle-class people found in gentrifying working-class neighbourhoods worldwide (Grand 2018), where they typically contribute to the perceived value of an area, they also adopt particular consumption practices and tastes depending on the specific city in question. And these are practices, cultures and knowledges which are constantly being remade (Friedman, Savage, et al. 2015). This makes them a tricky subject

to pin down, and arguably especially so for an older generation of 'organisation men' investors who likely do not engage in the same practices of constantly and even 'emotively' remaking symbolic values (McClay 1994). Hence the organisation men may seek out a 'data artist' from the "new world" (Entrepreneur 1) and say "you're the guys who know about this tech, you know the future things!" (Surveyor 5). Furthermore, although real estate actors might regard hipsters as essential to value prosumption with regards to emergent BtR assets, some may even *fear* them as a sort of opposite or 'other' that embodies a form a nihilism to established orders of symbolic value (McClay 1994); including all previously consecrated and rarefied forms of 'high culture' which are now so often desecrated, inverted or simply rejected by the hipster as a new form of elite (Grand 2018; Bourdieu 2010). Hence, the contemporary hipster's role has often been defined as that of the cultural 'intermediary' or omnivore (Grand 2018; Zukin et al. 2015). And part of what defines this social group is also the speed and readiness with which symbolic orders of value can be engaged, adapted and rearranged.[27] In other words, the symbolic order of value produced by hipsters in any one place is, by definition, unstable and liable to shift (often rapidly). And understanding these desirable prosumers of value amidst Generation Rent requires being able to easily access and measure this quintessentially plastic, young, middle-class, local and contextual hipster *mētis*.

Therefore, amidst this requirement it is clear that *Dashboard X* offers a useful account of who exactly Generation Rent were and what their most important members valued (at least it did in London, but also through drawing upon narratives from other cities like New York). Indeed, it offered a *quantified* vision of the hipster subject (as part of a fully fleshed-out calculative frame) upon whom this asset was dependent, as well as a way to play into strategies of producing value in the asset. This is embodied in the claim by one prospective client that it was "exactly what

[27]It's little wonder therefore that BtR discourses are so ready to emphasise the importance of 'branding' (Thame 2018a), since this quintessential domain of prosumption vis-a-vis social media is also where the hipster comes 'into their own.' The revival of Pabst Blue Ribbon beer is probably one of the best known examples of this phenomena (Cheddar 2018), and the idea that the same could be done for a particular neighbourhood now appears as the ultimate fantasy of the contemporary BtR investor. Or in other words, how do we locate the Pabst Blue Ribbon neighbourhood?

we need" because we can use it to tell if "we need to put in a coffee shop or a gallery to keep them" (where 'them' is Generation Rent's renters). Or, as declared by real estate investor panelists: "neighbourhood data can be used to see what offerings are not currently available in the area [for a BtR development" (McCarthy 2018). Hence, although my own critical reflection leaves me doubtful as to exactly *who* the device really accounts for—and how successful it would actually be in practice—to any BtR investor it would undoubtedly be appealing as a device which did nevertheless present some form of calculative agency around the characteristics of an emergent and currently overflowing asset. In particular, the fact that it offered a metric for this form of elusive, gentrification-prosumer is arguably the ultimate draw: a concrete means by which to measure the subjects of Generation Rent, account for their local knowledge of symbolic value and processes of its prosumption, and then pull them into a more distributed and global cognition around the new BtR asset. Or in other words, "cultural capital goes metric" (Beer and Burrows 2013, p. 64). In this way, products like *Dashboard X* can play a part in legitimising BtR assets and the activity of investing in them (Preda 2009a) through contributing a means of marketisation by which actors can assemble, observe, commensurate, assess and even 'pacify' the emergent asset (Çalışkan and Callon 2010; Murray Li 2007).

To conclude, it's clear that market anxieties around Generation Rent are found in discourses which circulate in close proximity to conversations about an emergent BtR asset class. To successfully construct and develop this new asset, it is plain that market actors must do work and find tools and devices which can contribute to the construction and framing of a legitimate and relatively disentangled asset, free from uncertainty and without the present deficit of calculative agency. Just as market actors have done for SFR housing in the United States. A large and increasing renter population in the UK is one thing, but its connection with structural inequality resulting from the economic crisis and the premise of housing multiple residents in single developments brings with it political anxieties around the power relationships this entails (for example, these conditions increase the damage that could be done by a rent strike). Furthermore, that investors don't really seem

to have one single account of the 'Generation Rent' subject (including what they expect from BtR housing and how they would value it) raises further uncertainties as to exactly what forms these new assets should take. Therefore, a tool like *Dashboard X* is highly appealing to investors in terms of the manner in which it responds to these uncertainties with a clear and distinct metric that accompanies an account of Generation Rent as a consumer subject with certain local 'hipster' desires, characteristics and values. Amidst the marketplace's anxieties about this new asset class, simply being able to gaze upon the heat map of *Dashboard X* is arguably a soothing and comforting experience for any investor exposed to the contradictory and uncertain discourse circulating around the BtR market. Since it offers one potential solution to the problematically incommensurable nature of its currently emergent assets.

7.4 The imaginary of data-driven real estate

This chapter has outlined a series of key theoretical and political implications of a 'data-driven' real estate imaginary, as forwarded by three discursive themes present in the marketplace that reflect certain visions and norms as to how and why data analytics platforms should be implemented within the marketplace: a global land registry, perfect exchange and Generation Rent. Or, that real estate should analytics should ideally (and sometimes as a moral imperative) move us towards an exhaustively global real estate marketplace for the perfect exchange of new rental housing assets. It has also explained the manner in which developing and deploying products like *System X* and *Dashboard X* has a practical capacity to facilitate the construction, legitimisation and marketisation of such new assets, like BtR. By building upon other more general work on the construction of markets and assets (Preda 2009a; Fields 2018; Çalışkan and Callon 2010), as well as Beer's (2018) specific examination of data analytics imaginaries, this chapter has therefore isolated and developed a more specific and nuanced account of the current understanding and adoption of real estate data analytics platforms. Not only does this allow examination of some specific theoretical and political implications of

these imaginaries, but it has also afforded insight into exactly how real estate data analytics products are coming to know and see the real estate market. Or, what sort of gaze and possibilities they may entail. To conclude this chapter, two important aspects of these implications will now be reflected upon.

7.4.1 The expansion of rentier capitalism

Discourses surrounding the notion of a 'global land registry' and 'perfect exchange' have demonstrated the manner in which actors are pursing a norm of panoramic market visibility: where all previously off-market assets, social processes and forms of *mētis* (local knowledge) are incorporated into future real estate markets. In this imaginary, it appears that by providing the representative means to increasingly subdivide and compartmentalise all once-incommensurable objects and processes in new real estate markets, a new potential arises to produce and create new and expanding financialised forms that can be kept in sync with their material counterparts. For capital this represents new possibilities and avenues for investment into previously off-market areas and assets, including those investors who have been described recently as "somewhere between anxious and desperate" (Fields 2018) to deploy their 'wall of capital' (Aalbers 2016). The implication is that such actors can now pursue data-driven real estate as a means find, rationalise and *know* these newly constructed post-crisis assets (like BtR or SFR) on a global scale as vehicles for accumulation.

However, following deeper discourses around the 'mystery of capital'—like the pursuit of growth, hidden value or 'dead capital'—there even appears something of a moral imperative to expand the real estate market in a way that increasingly enrols all participants as stakeholders (whether they are aware of this, consenting to this, or otherwise) (Muniesa 2017). Or, that these innovations should bring more capital 'to life,' and even solve certain structural problems caused by factors external to the real estate market. In other words, this imaginary also implicates a significant population of disenfranchised urban dwellers who do not necessarily wish to be stakeholders in such a society of a real estate investors—"the unwilling subjects of real estate financialisation" (Fields 2017). Two such groups have arisen

repeatedly in the discourses above, including the urban poor of the Global South and especially the newly emergent 'Generation Rent' in the Global North, to whom this case study of *Dashboard X* and BtR is most relevant. Indeed, by denying the use-value of property and focusing exclusively on its exchange value as a real estate asset—including with a heightened surveillance on all local social processes that circulate around such assets—these discourses also imply a growing urban population of renters around which new assets can be built, and a means by which to better understand market perceptions and subjects of value. And, whilst the notion of a global land registry and perfect exchange seem to suggest an increased opportunity for all to participate in the real estate market as investors, the reality remains that such willing stakeholders arguably do not exist (either in London or a Brazilian *favela*) and nor does other research suggest that they would benefit from this transition amidst any real estate market. Hence, there is a depoliticising aspect to each discursive theme above that roughly translates to: real estate data analytics can solve poverty, allow everyone to participate as equals, and make renting a great experience. In more intellectual terms, this translates to the grand claim that the 'invisible, parallel lives' led by newly emerging real estate assets will somehow contribute to a collective economic gain from this 'value creation', rather than solely as a series of vehicles for the generation of profit from this growing disenfranchised and unknowing population of tenants. Therefore, there is a distinct political economic dimension to the vernaculars of the data-driven real estate imaginary, and the spectre of rentier capitalism looms large throughout all three themes discussed above. That these discourses also circulate around the present construction of the BtR asset class also supports other very recent research that is beginning to illustrate the connections between this emergent asset class and the increasing financialisation of housing in cities like London (Fields 2019b). As well as anticipating the possibility of a trajectory towards a majority-renter society (Fields 2019a).

7.4.2 Real estate dioramas

Although the purpose of the next chapter is to provide a consolidated account of how *Dashboard X* sees and performs the real estate market (as a market device), there is nevertheless an initial theoretical observation that can be made here as to what sort of 'gaze' the data-driven real estate imaginary implies. These observations rest on certain epistemological claims made around data analytics and the philosophical problems they imply. To begin with, beyond the basic claim of a global land registry as something which is simply a database of all planetary land ownership, there are bolder claims in these discourses that promise to incorporate and record new forms of local knowledge about real estate assets that can offer investors new and "hyper-local" means by which to commensurate real estate across the globe. And to "enable property assets to evolve into so much more than just bricks and mortar" (*Equiem*). As outlined above, this means that real estate assets can be seen from an ever-expanding range of perspectives, often which offer almost boundless creative potential to produce or imagine new ways of measuring and knowing their value (as advocated by De Soto and others). Including by promising to enrol increasing amounts of locally-specific and embedded knowledges—*mētis*—within devices as technical tools that possess the power to standardise, commensurate and measure value across diverse global geographies. Not only this but there is an apparent agnosticism towards these symbolic orders of value that implies all theories of value—all those competing modes, meanings and metaphors of economic space that might be considered 'logics of dislocation' (Barnes 1996)—can be incorporated into these tools. And, that any perspective can be captured.

In its enormous ambition however, this imaginary contains several conceptual contradictions and inconsistencies in terms of both how it imagines the idea of a formal inside/outside to the real estate market, and the manner in which it assumes a form of epistemological monism whereby *mētis* can be contained within its new and innovative market devices. *Dashboard X* typifies these promises of disentangling and formalising more and more previously incommensurable social relations and activities, despite the fact that all these phenomena will, by definition,

continue to lead distinct, overflowing material existences in a place that will always remain partially informal and outside of the bell jar. Or, at the very least, as a frontier boundary that will always straddle this border (Mitchell 2007). And, in particular, that *mētis* will remain as *mētis* once it has passed into technical representation. When in fact it becomes *techne* by definition. Hence, despite the implicit claim that real estate data analytics can produce a panoramic visibility and transparency (by further consolidating the technical gaze of real estate measurement), this imaginary in fact seems to suggest a much more dispersed and suspiciously versatile view of real estate. And so whilst products like *Dashboard X* seem to claim to incorporate the 'art of locality' (Scott 1998, p. 316) they simultaneously seem to fail to understand the essence of such art.

Therefore, instead of a consolidated means of measurement (like the chain, see Shaw (2018)), the data-driven real estate imaginary currently embodies a seemingly voracious and agnostic approach to the production of new metric means (and as outlined in practice through the previous chapters). Where a move into the realms of local knowledge (including affect and taste) can bring forth metrics that are evaluated alongside traditional and established measurements like square footage, energy performance or yield. Whilst this may change as the field matures, the current climate of real estate data analytics therefore appears to have an air of 'anything goes' in-so-far as anything that can be captured in data should be captured, and all capture holds the potential for an ever-expanding and encompassing disentanglement of global real estate (exchange) value. Because this implies more of a dispersed gaze[28], this section will conclude with the reflection that the multiple data analytics products which are complicit in the data-driven real estate imaginary may rather represent the emergence of myriad real estate *dioramas* rather than a single real estate panorama. Or, a vast series of necessarily frozen and technical views through which real estate markets can be observed, rather than a single source of market truth that can produce a defining representation of the world. There is hence much caution to be exercised around the notion that such products can indeed keep virtual

[28]This is also something hinted at by Beer (2018).

assets in sync with material reality (not to mention reconcile an increasing multitude of modes-of-being amongst the mess). But the imaginary allure of real-time speed is also undoubtedly one aspect of data-driven real estate that supports such a belief in the 'consolidation of systems' as a way to escape the radical uncertainty brought on by the current multitude of real estate dioramas (Baudrillard 2001, p. 18). In reality however, once the diorama has been 'staged', the way it constructs the world is already out of date. And this is supported by the manner in which earlier chapters explained my own self-doubt as I contributed to 'staging' *Dashboard X*. Since, it was already predicated on out-of-date *mētis*, as it had been a long time since I was really the young marginal gentrifier that once participated in all that 'senseless culture' which the investor is drawn to yet cannot really understand. The next chapter will now build upon the theoretical and political implications outlined in this chapter, as well as the role of *Dashboard X* as a 'diorama' for the construction of the BtR asset, in order to draw some final conclusions as to exactly how *Dashboard X* sees the world in practice.

8

Seeing like *Dashboard X*

Through examining the path taken by *Dashboard X* as it developed from *Garage X* and began to come into contact with various real estate market actors, much has been covered about the details and peculiarities of steps taken along the way. This ranges from the social and cultural conditions of its emergence, to the performativities upon which its translation and adoption depended upon. Along the way, certain important actors and interventions have been highlighted for the role they take in these processes. The purpose of this chapter is first to draw together and synthesise these chapters into an overall account of *Dashboard X*'s particular way of seeing real estate. Second, by building upon the sorts of questions asked by Scott (1998) and Vertesi (2012) about other socio-technical scopic devices and regimes—as well as the notion that the production of science is a contested domain of power-knowledge in the Foucauldian sense (Haraway 1991b)—this chapter also asks not just what view does *Dashboard X* have, but also how can this way of seeing have performative power in the world? And within urban real estate in particular?

This chapter will therefore return to a more exclusive focus on the case study of *Dashboard X*, as opposed to the more general focus of the previous chapter. It also makes the assumption that *Dashboard X*, or a very similar type of product, could indeed find a client soon. Since regardless, even if in practice its adoption as part of this research remained to be fully realised, aspects of *Dashboard X* can nevertheless

already be witnessed in vestiges of its methods, metrics and knowledges that have become embodied in other forms of distributed cognition for real estate investors. For example, including through their use and interaction with *System X*'s automated valuation models (e.g. walking distances to bars and intensities on geohash-based heatmaps), my colleagues in *Garage X* (the belief that artists and hipsters somehow produce value in the urban environment), or the quasi-public arenas where I live-demoed and talked about *Dashboard X* in the context of the knowledges presented in the previous chapter. In other words, some traces of *Dashboard X* are already doing their 'seeing' as parts of other market assemblages, and there are institutional investors out there in the real estate market who now would like to access something *like* it. This is precisely why it is important and relevant to ask: if *Dashboard X* was itself being used out there in the urban real estate market, then what sort of world would it be performing and making possible with its gaze, for who and why?

To answer these questions, this chapter will first reiterate and reflect upon the fact that although the design of *Dashboard X* was a distinctly creative endeavour, it was also necessarily assembled to see in a way that real estate market actors wanted it to see. This largely prefigured way of seeing was crafted to meet certain expectations, and the first of these is that it must be capable of bringing the Build-to-Rent (BtR) asset into being. Or, that *Dashboard X* was desired and intended primarily for 'making up assets,' and it must therefore lend its data ontology to a knowledge of BtR. Hence, this sight therefore necessarily implies a type of knowledge about the world. In this case the knowledge accompanying the vision is akin to a forcefully naturalised science of gentrification as an inevitable bottom-up process, and driven by an emerging idea of (and desire for) something like a 'hidden hand of the hipster.' Following this, it is argued that *Dashboard X* is a device that sees and knows the urbananisation process in a way that is performative of planetary gentrification. And, that by being out there in the world, the way that *Dashboard X* sees is not just indicative of the real estate investors' desires, but it can also help make these desires become real. Therefore, *Dashboard X*'s particular performance of hyperreal estate is also not really based on any original gentrification process, but is based on

making real the investors' prefigured desires of the world. And therefore, it is also a way of seeing with significant political implications for those 'unwilling subjects of financialisation' (Fields 2017) that need to make use of urban space and housing. The chapter then concludes that this way of seeing can be understood as serving a form of what Atkinson and Bridge (2005) describe as 'new urban colonialism,' or frontier speculation that can simultaneously remake and destroy the contours and spaces of new urban real estate markets. Hence, the only way in which *Dashboard X* represents an objective way of seeing urban space is when it is employed to further a form of strategic knowledge. That is, not as knowledge which reveals any grand hidden truth (or value) out there in the world, but a way of seeing which can rationally align and perform the desires and interests of those real estate investors that will ultimately come to utilise its vision as part of their investment strategies.

8.1 Assembling *Dashboard X*

To varying degrees, this ethnographic case study has analysed a real estate data analytics product across all theoretical registers of what Rob Kitchin (2014) and others (Kitchin and Lauriault 2014) have referred to as a 'data assemblage,' including roughly eleven separate registers ranging from systems of thought to data materialities, and data practices to the marketplace itself (Kitchin 2014a). Or, similar to Foucault's (1980) dispositif, a heterogeneous ensemble of discourses, technical processes, actors, apparatuses and artefacts that come together to exercise and reproduce a certain kind of power within society. Including the enactment of strategic knowledges through data analytics products. And so through focusing on the real estate market via engagement with institutional investors focusing on London as a potential zone for investing capital in BtR assets, this case study has been able to highlight a number of the most important processes, actors and discourses that are emerging around *Dashboard X* to help realise its widespread adoption. And, as part of that adoption, to produce and maintain certain strategic knowledges about the real estate market and its assets. Or to enact a certain gaze upon this field, and bring into being certain market agencements and possibilities.

From this analysis, it's now possible to draw concrete conclusions about which actors are most important in this process, and what dynamics characterise the adoption of *Dashboard X*'s vision.

Before coming to some more nuanced points about *Dashboard X* as a data assemblage, a basic finding of this study must be highlighted that aligns uncontroversially with the current market discourse (but, as will now be explained, is more complicated than it seems). That is the fact that the present phase innovation within the domain of what I have termed elsewhere as *Platform Real Estate* (Shaw 2018) is undoubtedly re-configuring certain power relations within actually existing real estate markets. The field is one which can be characterised in terms of its hitherto analogue sensibilities. And, as many of its commentators claim, it is also unquestionable that a seismic shift is occurring in terms of how real estate investment occurs, how assets are valued through increasingly automated and data-driven means, and how the post-crisis 'wall of money' described by Aalbers (2016) and others (Waldron 2018; Fields 2019b) is deployed in the assets of real estate yet-to-come. And amidst this transformation, driven as much by shifts in other relevant sectors like finance and financialisation writ-large, it seems clear that certain means of doing real estate business and valuation (including the role of many 'organisation men' within the world's largest funds) will inevitably have to cede *some* degree of agency, power and prestige to those developing and controlling the real estate data analytics platforms of tomorrow. This is already ongoing, and even the most skeptical interviewees would not deny this shift. But more importantly, this shift is also not happening entirely on the terms of Silicon Valley's/Roundabout's new prophets of capital either (Shaw 2018): it's part of a broad translation of innovation agencement that faces certain pre-defined terms to its advancement. Or in other words, that the market will not "just change the valuation process like that" (Surveyor 3). These terms necessarily mean the technology will still need to negotiate and serve the collective desires, needs and knowledges of the currently existing real estate market.

To illustrate this better we must return to the primary research purpose of this study as identifying the most important emergent actors in this socio-technical shift towards new real estate data assemblages. And to consider the crucial role of myself as the 'data artist' (see Section 4.4) that was needed to (creatively and gracefully) span the boundaries between these two worlds. And, in positioning myself as an active party amidst this web of multifaceted relations, one thing I did not expect was to discover that I myself might be such an important actor in the adoption of the products. Originally my intention was to simply step into the field, and to participate and observe in a way that would aid me to pick out the most important actors from arm's length. And I wasn't prepared to discover that I myself might end up being a key participant in the story of this particular data analytics product. On the one hand it might be expected, since I was after all engaged as a 'project manager', but in reality nothing was ever certain (including my job title and role).[1] There are two important conclusions as to why this was the case, and both reveal relevant findings for other data analytics products in the real estate market as a whole. And, even if my own sense of self-importance is inflated for this particular study, both reasons for the importance of my role vis-a-vis *Dashboard X* could easily be extrapolated to other data analytics products and platforms in a manner that emphasises certain important aspects of their social relations and characteristics.

The first observation of my role comes from the performativity perspective, inasmuch as the social conditions for the development of *Dashboard X* were stringent and had to be overcome for its success. *Dashboard X* was coming together in a world where I was needed precisely because I was a part of *Dashboard X* as an assemblage, and a part that was capable of satisfying a series of crucial criteria around the building and selling of the product. In the first instance I had the social background and traits to be able to enter and negotiate this world in the first place—something that I observed many others fail at, despite having all the

[1] In a field where most start-ups do not become successful, and most businesses fail, it was at times a scary surprise that I was taken so seriously and that I came away with an understanding that the only thing preventing *Dashboard X* becoming adopted in the marketplace was that I had myself become a conditional part of its assemblage.

technical competencies required to succeed, and something I succeeded at as much because of my 'gifts of grace' as anything. Gifts of grace which aligned nicely with the elite, white and male world of real estate (Allen and Williams 2018; Hatcher 2016; Minton 2017), but which offered just enough symbolic edgy-ness to look different in the right 'hipster-hacker' ways. And which lubricated the presentation of a product that appeared in the right place at the right time, and as the first available tool to put a number on something that someone powerful wanted. In other words, just like the Black-Scholes-Merton model (MacKenzie 2007; MacKenzie 2006a), *Dashboard X* may ultimately get adopted for some reasons (or conditions of felicity) that are otherwise ultimately quite trivial or unpredictable in relation to its actual apparent technical capacities.[2] In addition, it was also noted that in order to enter the world of real estate, that *Company X* already had many organisational connections with the global real estate investor network. And so *Dashboard X*, as a trans-local assemblage, also had the connection points necessary to begin to interface with real estate market actors. In this sense, one condition was that we had felicitous access to this actor-world in the first place, and we were arriving as much as comrades as we were disruptors.

The second observation relates to the fact that *Dashboard X* sees real estate in a manner that was directly informed by how I saw real estate (including value, hipsters, gentrification, and so on). This is not a novel finding by any stretch, especially in fields such as critical data studies[3], but it is nevertheless important to illustrate this particular case due to the fact that I did not actually have a particular strong conviction about what I saw: I saw things like marginal gentrifiers, 'flares' of 'senseless culture' bringing value, a world full of young middle-class men walking

[2] As part of my wider research (Shaw 2018), I have applied this analysis to the historical example of Gunter's land surveying chain, and its own conditions of adoption versus other available land surveying technologies. Some of which were similarly devoid of any technical essence, including: Edmund Gunter making the instructions for the Chain available in English, not Latin; the socio-technical obduracy afforded by its particular calculations; or its material form (see Shaw (2018) for more discussion).

[3] For example, there are plenty of studies and analysis of algorithmic bias as being demonstrably racist or culturally-specific as a result of those who programmed or trained the models required by different technologies (Turner Lee 2018; Buranyi 2017; Amaro n.d.).

along to independent bars, and so on[4] because it in this role was my job to see them. People seemed to want me to see them, and the triumph of being able to make them seen them was part of what drove my (otherwise quite precarious and risky) labour. But all along I was well aware that these visions were driven by unstable knowledge at best and, upon reflection, deeply problematic at worst—as this chapter will now explain. That is to say that *Dashboard X* sees in a way that is not just informed by how we saw as data analytics developers, but that how we saw as developers was informed as much by our role within the business we were employed as it was our own social background or history. We had to find something to see that someone (a client, the institutional investor) wanted to see, we had to create something that meant they couldn't see all the problematic dependencies on other platforms, and we had to do it all in a novel and exciting way.

Given that the rhetoric about the ethics of how we design platforms and algorithms has increased in recent years—from the popular and dumbed-down cry to 'remove bias' from algorithms to the overly academic declaration that we must "design the [planetary] Stack-to-come" (Bratton 2015)—this is an important point to make: those with the social capital and technical competency to get into a position where they are building products like *Dashboard X* are also constrained in what they build or design on the basis of much more complicated dynamics that precede their appointment. These dynamics are driven both by the nature and culture of the labour in which they are engaged, as well as the particular platform-dependent logics with which they are creatively engaged. No developer is in a position to suddenly say that real estate value is driven by working class families and wheelchair-access public transport, because even if they managed to produce a model to quantify this frame it would be met with a lukewarm or disinterested response from the market. There are certain expectations in place already from a market that already wants the answer that meets with its pre-existing

[4]A notion and way of seeing that I now realise is eerily similar to the problematic urban figure of the flâneur as "a figure of masculine priviledge and leisure, with time and money and no immediate responsibilities" (Elkin 2016; Balducci 2017; D'Souza and McDonough 2006). Eery because I now wonder if I subconsciously picked up on that particular idea.

knowledges and paradigm of value. It just needs the answer presented in the latest prestigious mode (data science), and to suit its capacity to make rapid deployment of capital (into new assets). Hence, whilst the role of actors like myself in ensuring the adoption of *Dashboard X* is crucial, they are not in a position to bring any unexpected values into this gaze.[5] The idea (and broad perception of almost every real estate professional that I met) that we were sat in *Garage X* working on heroic projects to see the world in a new 'transparent' light of truth was, in this respect, absolute nonsense. And so just as economic calculation and boundary construction is related to pre-existing power relationships and constraints (Preda 2009b, p. 85), how exactly these failed to play out (in this case in finding a client for *Dashboard X*) has revealed who really wields the power (the investors, not the start-ups) and what they want to do with it (which will be discussed in the next section).

It is therefore possible to conclude that although there is a particularly important role within the data assemblages of real estate data analytics for the boundary-spanning actor or data artist—those who can productively mediate between numbers and narratives to produce and circulate new metrics—that the data artist can only really enact an assemblage that sees what data-driven investors are ready and willing to see (in this case, decision makers in the world's largest real estate investment funds). There is certainly a powerfully creative element to this role within the data assemblage, but the power of this role is more relevant to the conditioning the labour and position of those developing the technology, not to how products like *Dashboard X* come to see the market. The desiring gaze of the market is what ultimately drives and conditions the triumphs of the job. And if certain market actors are going to cede a small degree of power to these new prophets of platform real estate (e.g. by engaging them with a platform subscription) then one key condition is that only individuals with whom they are socially comfortable can come on board, and more

[5]One factor in my thought process upon choosing to leave *Company X* and return to my job was that my role of being a data artist also lacked any real agency in this respect. It was very exciting in some ways, but ultimately we were not going to change the world in any unexpected way—or, there was not really any hidden value to find, only the triumph of manufacturing creative interpretations of what everyone ultimately expected. Second, whilst it's undeniable that I miss the excitement and creative enjoyment of this world, I don't miss the uncertain and problematic nature of the strategic knowledges that I was contributing to enacting.

importantly only if they contribute to the agencement of data assemblages that see the world in a manner they are happy with, and enact knowledges that entail the possibilities they desire. Anything else would be rejected outright as threatening. That is, if you even got inside a fund's boardroom to present your ideas in the first place. The data artist's creativity is thus limited within a certain register of what is an acceptable gaze to construct (or 'design'). To consider what the gaze's constituent 'palette' of colours might be and *do*—metrics, knowledges, possibilities and performativities—the next two sections will consider what *Dashboard X* was needed to see, and then turn its attention to the most important and particular aspect of this emerging gaze as a global vision (and Grand Truth) of gentrification and urban development. Following the next two sections, the mechanics and politics of this overall gaze will be further defined and reflected upon as hyperreal estate.

8.2 Making up assets

As developer, project manager or data artist, one of the primary roles I performed in the *Dashboard X* assemblage was that of the constant labour involved in moving between narratives and numbers. As described in earlier chapters, to produce metrics like *Gi* I had to do a great deal of (often circular) work to strip and narrate data and numbers as I worked towards establishing a legitimacy for this metric as part of the alethurgy required to bring an overall calculative frame into being. As described by Ian Hacking (1991, 2006), this process is not unlike a 'looping effect' whereby establishing (or manufacturing) the truth of this metric had to pass through various stages of focus on classification, objects, institutions, knowledge and experts. Along with 'engines of discoverability', Kitchin and Lauriault (2014, p. 9) have explained that these processes can be understood as an essential function of data assemblages like *Dashboard X*, and my labour was to direct them towards the existing knowledges of the real estate investment actors that wished to engage with these processes. Or, as emphasised in the previous section, I had to do this work with an eye towards what the client wanted from this particular data assemblage.

However, whereas Hacking's (1986) original use of this framework was geared towards a consideration of how these processes were engaged in 'making people up' (the social construction of categories of people, and how these categories then come to shape the people they categorise), my initial reaction to this was to reflect on how *Dashboard X* and the *Gi* metric were 'making places up.' That is to say, they were bringing new categories and measurements of urban space into circulation (e.g. the geohash, walkable space, consumption intensities, relative change over certain pre-defined periods of time, and so on), and in a manner that others have considered applying a similar framework to as the 'making up of space' (Lauriault 2012). But the intended application of *Dashboard X* was more specific than that: it was geared towards making up 'the site' for BtR assets. And therefore, in effect, it was 'making up assets.' Returning to last chapter's reflections on Fields (2018) discussion of Single-Family Housing, it is clear now that this was the primary intended purpose of *Dashboard X*: to address the deficit of calculative agency for BtR and "create a production line" of the asset in the same way big data analytics has done in the USA for the Single-Family Housing asset (Fields 2018). In other words, it was needed to help BtR become a thing that a fund could calculate and deploy capital into.

That is to say, the primary purpose of *Dashboard X* in this case study was to perform the alethurgy required to bring the BtR asset into being by providing much-needed means by which to see this asset, and therefore to invest capital into it. As a new asset, with a number of overflowing and unstable knowledges flowing around it (as discussed in the previous chapter), the most powerful and desirable use of *Dashboard X* was therefore in bringing these BtR asset contours into vision. And, as a business, we could exploit this by being one of the first organisations to develop a device that could put a number on certain aspects of its being. *Dashboard X* therefore has the capacity to make the "single existential statements" (Callon 2007, p. 318) containing the context, theory or model necessary to begin to build a scientific account of the BtR asset. But where the real desire is not about finding an asset that is correct in its scientific account so much as it can merely provide *an* account—truth and non-truth do not matter as much as the performative successes

and failures of the account (MacKenzie 2007). Or, whether the *Gi* metric can bring about a world where the BtR asset exists, and subsequently where the *Gi* metric is needed in order to function. The former process is what the real estate investor wants, and the conditions of the latter are simply whether or not they are willing to work with (or enrol) *Company X* and *Dashboard X* to make that agencement real—as discussed in previous chapters, in some ways they were and in others they weren't. In taking the time to follow *Dashboard X* through this process it has been possible to understand more about the actors involved in its translation and what can and cannot succeed towards this end—or, to exhibit the struggle between which worlds, programs or agencements that are trying to prevail.

Indeed, several years after I began my journey into the world of *Dashboard X*, quotes appearing in a more recent article (Phillips 2019a) about BtR in London demonstrates the degree to which the type of gaze this device offers is already increasingly important:

> "There is a lot of money coming in to build to rent right now, and a lot of pressure to invest."
> —Rightmove Director Miles Shipside in June 2019 (Phillips 2019a).

> "When it comes to which site is better, A or B, that is where you can find peripheral data that can help support your case," he said. "We look at overall flows of capital and where public spending has been directed, as these are strong indicators that this area will gentrify."
> —APG Senior Portfolio Manager Paul van Stiphout, June 2019 (Phillips 2019a).

Therefore, as things stood at the beginning of this research, BtR was a relatively unknown form of real estate investment, and so *Dashboard X* was successful because it promised a novel 'data ontology' (Kitchin and Lauriault 2014) for the asset. Or, a way it could be seen and therefore exist. Given a market full of funds desperate to find ways to deploy its wall of capital (new opportunities, vehicles, assets, modes), this is one reason why *Dashboard X* found a degree of success. And therefore, why both I and others building new calculative frames were well rewarded for our labour. Amidst a lack of ontological stability and an overflowing sea of Knightian uncertainty around BtR, we were offering a powerful solution (at the perfect time)

to the deficit of difference that characterised an asset that was only just beginning to come into being. We could alleviate the pressure to invest—a distinctly social need that owes little to the rationality of truth or falsehood and everything to the social work in which we were engaged. This was therefore the most important work of the *Dashboard X* assemblage, and what it should see was therefore almost *anything* as long as anything was some form of quantified aspect of what a BtR asset might look like, or some description of the world in which a BtR asset should exist. Any and all of that, as long as done in the desirable data-driven fashion by the right people, is what could help a global BtR market be realised. *Dashboard X* therefore offered *power*. Hence, from this perspective this case study concludes that the newly emergent data-driven science of real estate investing is functionally dependent on rhetoric, or "the persuasion of the relevant social actors that one's manufactured knowledge is a route to a desired form of very objective power" (Haraway 1991a, p. 184)—where the objectivity of this power is to *know* the BtR asset. This knowing process is the 'becoming asset' of turning a thing into capital, and products like *Dashboard X* are powerful because they can form the attributable scope of these assets through these social activities (Muniesa, Doganova, et al. 2017). Ranging here from presentations in the boardrooms of London to the "cultural lunches" in *Garage X*. All come together in the assemblage of one powerful market device across all of the spaces and histories examined in this research, crafting the world as it goes into effective objects, and a "power field... of world-changing persuasions" (Haraway 1991a, p. 185). Indeed, the individual quoted above is already enrolled in the wider rhetorical agencement of *Dashboard X*, including those vestiges and traces of value forms that it originally helped introduce into the world of real estate investing. Since regardless of its ultimate adoption as a market device, *Dashboard X* has already seen the BtR asset and actors out there are aware of this. And so *Dashboard X* has now made its intervention to a degree, whether through direct or indirect observation.

8.3 The hidden hand of the hipster

Amidst all the data, categories, metrics and singular existential statements about what a BtR site (and therefore asset) could and should be, the biggest alethurgic work that *Dashboard X* was doing was in fact much broader in terms of how it looked upon London, and cities in general. As described above, the calculative frame offered by *Dashboard X* also contained a context, theory and model necessary for a scientific account of BtR assets. And therefore *Dashboard X* didn't just tell investors about how it saw a particular BtR site, but it also contained a relational account of the city around these sites, and therefore gentrification in general. Most ambitiously, this implied that this science could (subject to further development and technical 'tweaks') be applied globally, as a global science of gentrification and urban real estate value. In other words, *Dashboard X* saw and rendered legible a process of urbanisation that was global, and which had an essence that could be problematised for investment purposes and translated into strategic knowledge for real estate capital at the global scale. And as part of this essence, *Dashboard X* also postulated the marginal gentrifier as part of this account: a group of special people 'out there' in the city, that somehow caused gentrification to occur, and in a manner that had a certain naturalised inevitability. In this 'essentialist' account of hipster-centric value (Barnes 1996), gentrification was a normal, natural and inevitable process, and *Dashboard X* provided the scientific account by which to capture this process and render it meaningful. Throughout the work involved in building and selling *Dashboard X*, however, it has been mentioned a number of times that I myself had significant concerns and doubts around this account of gentrification (both in objective and ethical terms). These concerns now need to be addressed in more detail throughout the next sections, and with reference to other contemporary and more advanced (academic) understandings of gentrification, in order to highlight some of the most pressing theoretical and political implications of *Dashboard X*'s performative uses and gaze in the context of urban real estate.

As a point of departure here, it is clear however that *Dashboard X*'s global view of gentrification does seem to meet with a relatively recent turn in urban

studies towards 'gentrification generalised' (Smith 2002). Or gentrification as a process that has 'gone global' (Atkinson and Bridge 2005). *Dashboard X* is, after all, ultimately looking to apply its vision to all corners of the world as part of a wider technical offering (including *System X*) that wants to produce a global land registry, where all market processes and local knowledges are standardised and formally laid out in relation to all future possible BtR assets. Observing the spread of these products, and their gaze, is therefore aligned with a developmental notion that the gentrification process can migrate 'centrifugally' (Atkinson and Bridge 2005, p. 2) outwards from centre to periphery: from Global Cities of the Global North and into the hitherto 'un-gentrified' and un-developed margins outside of the bell jar. Provincial Northern British towns; ex-Soviet cities; the slums of Rio. All to follow some sort of gentrification 'blueprint' (Lees et al. 2016, p. 111). Both in a processual sense, and in terms of the easily-replicable policies and investment practices that are yet to come. Processes De Soto (and many real estate data analytics founders) would no doubt see as a moral duty to bring 'all-which-is-not-gentrified' inside the bell jar. And to compound this vision there is a compelling account of a 'global gentrification class', or ever-ready and willing agent of gentrification. The "emissaries of global capital flows" (Atkinson and Bridge 2005, p. 5) that naturally push forward the movement of a gentrification 'frontier' (Smith 1996). And whether this group are called a 'new' middle class (Ley 1996), pioneer gentrifiers (Butler 2003; Butler and Robson 2003), my own muddled mash-up of the 'marginal gentrifier' (Rose 1984), or simply just 'hipsters' (Cowen 2006) is not the most important matter at this juncture. Rather, what matters most is that *Dashboard X* sees gentrification as a natural urban process with an inevitable driving force behind it that dictates its most important capacity as a process by which capital can be deployed and accumulated in the urban built environment. Or in other words, there is a *hidden hand of the hipster* that drives value processes, and *Dashboard X* can see it in action, whether as a glowing frontier of micro-breweries across East London or an artist exploration into Brooklyn. *Dashboard X* sees all these places as bright, energetic glows of consumption-driven resources; a relative real-time 'virility' of

all urban space, quantified through the *Gi* metric and rendered legible for capital investment. And, amidst my experiences talking to prospective clients for *Dashboard X*, it also seemed inevitable that eventually someone might ask about Mar Mikhaël in Beirut or Cihangir in Istanbul (both reputably 'hipster-neighbourhoods' in recent gentrification, e.g. Fawaz et al. 2018; Yetiskul and Demirel 2018). If anyone asked whether *Dashboard X* could look at them too then the answer would certainly have been an enthusiastic "Yes!!", with only the mildest of caveats (tweaks, checks, data, all technical matters subject to easy resolution).

8.3.1 Performing planetary gentrification

Contrary to this view of the world however, most recent academic literature on gentrification denies the existence of any singular global gentrifier class as a (human, individual) agent of gentrification, either in the Global South or North (Lees et al. 2016). Whether seen as agents performing their class-identity or habitus (Rofe 2003; Butler 1997), as a globalised role for choice and consumption (Ley 1996), or as a class of creatives (Florida 2002; Florida 2014), a mixture of detailed gentrification studies and a critical political economy approach has thoroughly exposed a number of problems with this particular explanation for the gentrification process from an academic perspective (Lees et al. 2016). In other words, this recent turn in gentrification studies strongly denies the possibility of a singular global gentrification class (and with reference to numerous empirical studies).

Rather, in developing a global understanding of gentrification—planetary gentrification (Lees et al. 2016)—it has been demonstrated that this process can be better explained and understood as something that might be happening everywhere, but that it has very distinct differences and contexts whether in the most commonly (over-?)studied environs of New York and London, or Ankara (Yetiskul and Demirel 2018) and Tblisi (Gentile 2018). From this critical perspective, the way *Dashboard X* sees gentrification in *some* ways therefore remains caught up with a particular sort of modernist, twentieth century, and Western perspective on the city. It imposes a view of gentrification as something which is the outcome of rational personal choices

based on consumer sovereignty (Dear 2003) and the class remaking of urban space (Smith 1996). Here the city is viewed in a concentric rings of core-periphery, with a form of 'spatial elitism' (Blaut 1993) that inscribes certain geographical models upon the world. And where those who wield the most power get to inscribe their particular chosen model (which returns us to the conclusion of the last sections inasmuch as it was the investors who wanted to see the world like this).

Ultimately though, whilst gentrification has undoubtedly moved into very different urban contexts, the truth or falsity of an *academic* reading of gentrification versus what *Dashboard X* sees in the world is partly beside the point if we want to develop this performative account of *Dashboard X*. That task requires that we ask questions not about the truth or falsity of *Dashboard X*'s gaze under critical scrutiny (the discussion wouldn't last long!), or even data science in general, but rather about the ways in which *Dashboard X* does indeed already actually have a quintessential science of seeing. In other words, it's about how its science is being put in place and to what effects (Preda 2009a, p. 23). In that respect, the fact that *Dashboard X* does profess to see a (arguably non-existent) singular global class of urban gentrifiers as part of a science of gentrification is not the main issue. The main point is that in doing this (erroneously or otherwise), that *Dashboard X* can be seen as positively performative of a particular overall process. And here, as a market device, I would argue for two overarching reasons that the overall performative potential of *Dashboard X* is one which further deepens a process termed by Lefebvre (2003, 2014b) and others (Brenner and Schmid 2012) as 'planetary urbanisation.' And more specifically, as a component of this process that is enabling new forms of global 'hyper-gentrification' when considered from this recent planetary critique (Lees et al. 2016, p. 80).

In the first instance this is precisely because *Dashboard X* represents a "becoming worldwide" or mondialisation of strategic gentrification knowledge (Lefebvre 2014b, p. 205). It may be modernist lens in many functionally problematic senses, including the aforementioned 'doubled-down' sense (see Section 7.1.2), but it is nevertheless a global lens. A lens that mobilises its own particular real estate diorama, its

own situated "data as stories" (Neff et al. 2017, p. 94) from London and New York, and for deployment everywhere as a standardised model of development and speculation. This sight represents a forceful naturalising of global hipster-driven value in the urban built environment as everywhere and anywhere—"100% ... big urban areas" (Developer 2) were the domain of all CX's products, and that domain was growing. Nowhere was 'non-urban' in this gaze (Brenner and Schmid 2012). In this respect, although the gaze of *Dashboard X* was based on some foundational ideas that sketched graphs of cores and peripheries (see Section 4.3.2), the reality was that its overall gaze also dispensed with many other conceptions of the "fragmentary analytical tool" (Lefebvre 2003, p. 29) that characterises pre-planetary understandings of the urban.

For example, and following more specific recent development of the planetary urbanisation lexicon (Brenner and Schmid 2012), *Dashboard X* actually sees in a way which in many ways aligns more with more post-planetary trajectories than modernist genealogies of urbanism. Its dissolving and ever-expanding geo-hash grid succeeded in blurring and re-articulating urban territories in a manner that suggested the complete dissolution of traditional neighbourhoods; reframing gentrification and the *Gi* score at each level, with contours that changed and re-calculated with the scroll-wheel of a mouse. A hot area might have straddled two or three existing neighbourhoods. Or it might cover an entire suburb, or just a small street corner; it didn't matter. Zoom in further and the glow proves to emanate just from one street-corner; pull out and it joins with all of Mare Street as a crescent form; further still and the intensity morphs further into a band out through Stratford. This territorially-agnostic gaze changes and recalibrates at every scale, defined by a flowing and recursive index of change. Indeed it wasn't always immediately visible in the interface where exactly in London a place was (sometimes the heat obfuscated names and roads entirely), but surprisingly this didn't seem to bother anyone I showed it to. The most exciting thing was looking at the device and reconciling it nicely with your inevitable pre-configured expectations, plus the odd surprise or twist you didn't know about. Its representation was therefore more like a weather map,

and less like any traditional urban form. Micro-climates and macro-climates; cloud-cover that cares little for which district boundaries it rains on; and a warm front spreading out to the Global South-East. All that *Dashboard X* could see on its own was a rationalised and multi-scalar urban fabric that articulated a glow of potential value and reduced all urban space to an ever-divisible index that could be resolved at the planetary scale. Indeed, had it developed further towards a final product, the most exciting thing I can imagine would be to know where the most concentrated space or frontier of 'energy' was. Which geo-hashes would shine brightest if we got the contract to expand our prototype out from London and consider the global? To imagine the excitement and discussion this would have generated with any of our potential clients still fills part of me with glee, even years after having ceased to work on the project. Just thinking about where the hipster's final frontier might be is immediately fascinating. A fringe of Buenos Aires? Glasgow... Shawlands? Kiev... Kendal? Mombasa? *Dashboard X* saw all of these places as part of the same standardised, naturalised and inevitable process of gentrification; driven from the bottom-up by rational populations of consumption-driven hipsters.

Therefore, *Dashboard X* also aligns itself with planetary urbanisation in the sense that it is performative of a speculative urbanism across multiple centralities (Brenner 2014; Merrifield 2014): implosions and explosions that disrupt more traditional understandings of the urban. Indeed, although *Dashboard X* was created with an eye towards the core-periphery relation, the equation is designed in a way that necessarily and deliberately looks toward and emphasises the margins—the measurement is one of relative change that deliberate seeks to make the core disappear and certain peripheries 'light up'. *Dashboard X* sees most urban cores as a shadow of already-gentrified space (see Page 150)—the saturated spaces of urbanised capital. This is performatively hard-wired into the calculation. And thus it furthers gentrification as a leading frontier, or wave-crest, which can exacerbate a 'neo-Haussmannization' (Merrifield 2013) of cities in a manner that will not strike an avenue down central Shoreditch. Instead it will permeate the urban built environment with flows and intensities of capital that don't always focus on the

usual suspects, and saturating the overall urbanisation process in pure real estate speculation. Showing which interstitial gaps and perhaps 'under-utilised' spaces are most ripe for a speculative infill of capital. To this end, it is no coincidence that Frank Knight considered the ultimate domain of entrepreneurial activity to be Knightian uncertainty (Amoore 2013, p. 10). And, that this was also the ultimate specialism of *Dashboard X* (see Page 120) as a device that could see an almost infinite view of marginal gentrifying possibilities, and seemingly from anywhere (and nowhere). In this way, *Dashboard X* therefore enables the positive performativity of Smith's (2002) gentrification generalised, but at the planetary scale.

The second over-arching reason why *Dashboard X* is performative of planetary urbanisation is that it supports Lefebvre's (2014) original assertion that social classes are hierarchized at the same time as they are inscribed into urban space. Or, that *Dashboard X*'s insistence and privileging of one particular gentrifying class is precisely what helps define it as positively performative of planetary urbanisation: it represents a performative form of 'automated spatiality' that recursively circulates the *Gi* metric as a measurement of cultural capital (Burrows and Gane 2006; Beer and Burrows 2013). It doesn't matter if, in reality, its results will have slightly (or very) different flavours in different places depending on local contexts (and that in reality there is no such singular pioneer gentrifier). It only matters that this is a device which is demarcating the entire planet as a rational landscape for accumulation-via-gentrification, and that some form of hidden hipster hand is (somehow) quantified and accepted as pushing this process of value creation forward the most. The use of *Dashboard X* means that the hand is therefore becoming inscribed upon urban space whether it is real (yet) or not—knowledge as obdurate middle-class supremacy. In this respect, it is perfectly aligned with the planetary urbanisation thesis that *Dashboard X* has a certain way of seeing gentrification that priviledges certain process and actors above all else. The truth of this vision is beside the point, and the outcome of enacting this strategic knowledge is what matters most. Perhaps this will play out later as a concrete form of 'hipster urbanism' (Cowen 2006), or maybe something more unexpected. But most certainly in the

present it offers a way of seeing that can enable concerted strategic investor decisions about the active deployment of capital at certain sites and within certain BtR assets or amenities ("Do we need to put in a coffee shop or a gallery to keep them?").

Dashboard X therefore sees the entire planet as a rational landscape for accumulation via the emergent science of a naturalised and singular account of gentrification as inevitable truth. Real estate value in the urban built environment is produced by a certain type of person and activity, and *Dashboard X*'s view of this enables this science to become a form of strategic knowledge for the global real estate investor. Amidst a context of real estate investment and a concomitant penetration of financialisation into everyday urban life (Weber 2002; Moreno 2014) this means that *Dashboard X* is now part of the co-performation (Callon 2007, p. 328; Mol 2002) of planetary urbanisation, and a means towards approaching the final frontiers of gentrification (slums in Brazil, Queenstown in New Zealand, most of Leeds). Or what some (Brenner and Schmid 2012; Brenner and Schmid 2015) call the "totalisation of capital" (Lees et al. 2016, p. 10), and a planetary ensemble of social relations serving and sustaining urban apparatuses of financial power (Moreno 2014). *Dashboard X* thus furthers a situation whereby the urban is the primary organising condition and infrastructure through which units of capital are centralised; it performs urbanisation as a socio-spatial process enabling the permeation and penetration of finance into the fabric of daily life (Moreno 2014). And, *Dashboard X* is therefore also emblematic of what Aalber's (2019) has referred to as 'fifth-wave gentrification'[6], in the sense that it is positioned to enable increasingly financialised urban landscapes through the concomitant rise of global corporate landlords and platform capitalism. In this sense, *Dashboard X* is working towards the performance of a never-ending urban landscape of perpetual rentier capitalism and gentrification everywhere, forever.

[6]Coincidentally, Aalbers also argues that fifth-wave gentrification is becoming naturalised through being supported by local state actors, but this is a significantly different discussion and argument.

8.3.2 Counter-performativities

In critiquing Brenner and Schmid's (2015) notion of 'totality' in the urbanization process, Kanishka Goonewardena (2018) recently drew attention to alternative conceptions of totality that are less committed to some universal meta-narratives associated with the current discourse on planetary urbanisation. As part of this, Goonewardena (2018) raises Jameson's (1991) discussion of 'totality' in modes of production as something including a variety of counter-forces and new tendencies within itself—residual and emergent forces which it must attempt to manage or control. In order not to get caught up with the same grand claims associated with this more recent planetary urbanisation discourse that Goonewardena critiques, this is also a good moment to consider what sort of counter-performative functions *Dashboard X*'s gaze may entail. Or, why planetary urbanisation (like planetary gentrification) can also contain important contradictions that speak to its overall nature, and therefore why *Dashboard X*'s role in the global co-performation of 'gentrification forever' is not so simple. So, apart from its origins in my own sketches and graphs of a more dated core-periphery understanding of the urban, what else goes against the grain in the lens of *Dashboard X*? What counter-forces within the device push against the view of an ever-expanding frontier of gentrification generalised? Two forms of potential counter-performativity embedded within *Dashboard X* will be considered here.

The first form is the easiest to draw attention to for its counter-performative potential but the hardest to define as any single particular effect. This is best described as a basic potential to cause future economic crises, and therefore the destruction of capital, through the instability of the knowledge produced and forms of value circulated by *Dashboard X*. This stems from the fact that, as laid out in earlier chapters, *Dashboard X* is a device which (like many other products encountered) relies on some very poor data sources and sits atop a swirling, overlapping mess of other platforms. As a result, it values the production of new metrics above all else, partly as a means to hide the complex 'discourse networks' (Dourish 2017, p. 49) beneath the number itself (and/or interface) and partly because new metrics

are attractive to the market generally because of their rhetorical power. Thus, in the same way that "an inferno rages in the soul of the commodity, for all the seeming tranquility lent it by the price" (Benjamin and Tiedemann 1999, p. 369), each metric conceals these chaotic relations and processes beneath. And despite an inferno raging in *Garage X* and the gentrifying neighbourhoods of East London, the *Gi* metric still affords a small tranquility to BtR. In many ways *Dashboard X* as a calculative frame represents an almost complete disconnection with space and place. Or, to quote others writing about the often absurd nature of financial modeling or data science, we were often losing "all contact with terra-firma" (Durand 1968, p. 848) and just "plugging in numbers" (Amoore 2011, p. 25). And colleagues were the first to admit that we "didn't really know the place, so had absolutely no idea whether it was actually right or not... [we were] going specifically off the values in the table and whether it matched the values that were there... it was definitely a sense of disconnection from the area you were looking at" (Software Developer 4). Hence, as we were constructing our 'data drag-nets' for the market's new ways of seeing (Fourcade and Healy 2016), there always seemed to be an abundance of potential reasons why different forms of counter-performativity could emerge amidst the 'unregulated gluttony' of pursuing our own particular 'infinite mobile visions' of the world (Haraway 1991b, p. 189). And so, as a data assemblage producing a particular type of sight and situated knowledge (akin to the real estate diorama described in the last chapter), *Dashboard X* sees in a way that is undoubtedly "riddled with unintended consequences" (Perng et al. 2016) that cannot be known in advance. This marks a significant departure from a world dominated by more traditional real estate actors (local brokers, regional experts, etc.) who had a much more locally-situated, embedded and qualitative method of seeing their local investment opportunities. Given that unintended consequences in global real estate markets rarely go well for anyone, the only point of solace here is that *Dashboard X* would likely only ever be a "supplemental" tool for investment decisions (Intvestment Manager 1), and therefore thankfully a situation where the entire urban BtR market runs on it will likely never occur (though this does not

mean it doesn't still take a co-performative role as part of other devices like *System X*, which may well yet come to dominate the entire field).

The second form of counter-performativity implied by *Dashboard X*'s way of seeing is easier to define but the impact of which depends very much on its widespread adoption in the marketplace. This relates to the fact that *Dashboard X* is designed to see a marginal concentration or new centrality of activity: it is oriented towards looking for the wave-crest of relative change, or an apex in space and time that represents the tightest grip of the hipster's hidden hand. This entails a strong potential for counter-performativity because in isolating this one defined space in time the use of *Dashboard X*'s vision also implies a destructive contradiction. Since, just as studies have long shown that as soon as artists arrive they are displacing themselves (Berry-Slater and Isles 2009; Zukin 1982), this implies the strategic capitalisation upon the gentrification 'moment' just as it hits its crest. And therefore the accelerated dampening of the process just as it has begun. Or, "capital captures culture" (Atkinson and Bridge 2005, p. 6; Zukin 1982; Zukin 1993), but faster. Hence, a counter-performativity that acts upon gentrification as a sort of cybernetic negative-feedback loop. Or, that no sooner has the hipster barbershop been opened in the BtR apartment block's atrium than it will be emptied and mothballed, or simply not regarded as that desirable any more. Hence the question and anxiety of "how do we keep them?!" In reality the process would of course be much slower than that[7] but what is important is that this still represents a potential speeding-up the investment cycle whereby the crest of the wave can be more quickly identified and acted upon—the hyper-gentrification mentioned by Lees et al. (2016). This again suggests the planetary urbanisation thesis, and the dissolution of a neighbourhood-focus on investment (instead of "What's the cool neighbourhood?", we just ask "Where's the crest?"), but can be better envisaged as a form of diffuse gentrification. Gentrification is everywhere, but if every investor knows and sees it in the same way through *Dashboard X* then the

[7]That said, circulating discourses around 'Space as a Service' (see Section 7.3.1) do seem to desire otherwise. Since someone can just move the shop (brand) elsewhere, perhaps advancing it to another frontier.

focused aggression on the most valuable sites and opportunities also produces an accelerated fall in the *Gi* metric. The investor thus becomes faced with the problem of counter-performativity inasmuch as they are destroying the very resource frontier that they wish to exploit. And hence a desire to try and replace a place's symbolic cultural value or amenities with more simulated alternatives. Or, to build the BtR asset and then build some inevitably inauthentic versions of the type of things the *Gi* metric measured. Amidst this condition, one sensible risk-aware step might be to develop a *Gi* volatility metric, and the demarcation of sub-prime gentrification would be next after that[8]—continually chasing for some quantified form of (situated, Western, Northern) 'authentic' value driven by the hidden hand of the hipster.

Put together these counter-performative potentials of *Dashboard X* suggest, as discussed in the last chapter at a more theoretical level (particularly in Section 7.2), that *Dashboard X* offers a way of seeing that only temporarily resolves anxieties and uncertainties around real estate value in relationship to BtR assets. This is because although *Dashboard X* will do many things that investors want, that it will also create other market relations "beneath the interface" (within the discursive networks to which the *Gi* metric connects) that will not be immediately visible in the virtual moment, or in the moment of investment. It therefore offers a type of situated knowledge that is very unstable in terms of how its adoption would play out in the real estate market, generating more uncertainties as part of its use, and the production of an urban form that would also begin look less like the world it is trying to see. A more homogenised form of urban space (Lefebvre 2014b), where difference becomes harder and harder to measure to the point where it may even have to be manufactured and replaced in order to maintain *Gi* scores—perhaps as part of a rush for the 'fools gold' of gentrification? Whilst this therefore moves closer to planetary urbanisation in many aspects, these internal contradictions would also likely cause crises in real estate value whereby increasingly rapid investment decisions would in fact destroy their own value at the point of deployment. That is, if the *Gi* metric could be relied upon in the first place. And so *Dashboard X*

[8]This would be one obvious extension of what others have called the 'social logic of the derivative' (Arvidsson 2016).

has the capacity to both create and *dissolve* new centralities and their real estate value, and the strategic mobilisation of this 'partial perspective' (Haraway 1991b) also contains its own contradiction. At this point, it should be noted that whilst many historical financial innovations often looked like they were making investment more objective, safe and certain via a more 'transparent' markets (good examples being De Saint Phalle's early innovations in stock boards (e.g. NYT 1929)[9] or the Black-Scholes-Merton pricing sheets (MacKenzie 2006a)), that ultimately they neither protected their users from economic crises, and to a significant performative degree can be said to have contributed to their occurrence. Largely because they hid similar discursive networks behind the numbers they presented, creating new relations along the way through market infrastructures that were just as "moralised" as real estate data analytics (Pardo-Guerra 2019). This is why the 'unregulated gluttony' of new real estate data analytics should be of concern to all—will they bring about the sort of stable real estate economy we want? From this case study it seems absolutely not, and its close relation to already-adopted platforms suggests they should be viewed as equally problematic.

8.3.3 Towards data-driven real estate

The way in which *Dashboard X* sees the world is clearly conditioned by the actor world from which it emerged to make its intervention in the global real estate market. As a delicate boundary object, and would-be market device, its construction and translation were mediated through the power relations upon which its vision depended, including: the social conditions of my labour in *Garage X* and performance in the board room; the organisational logics of platform capitalism; and a wall of money that needed to be deployed into a new form of real estate asset. But as part of this process, the looming possibility of *Dashboard X* (or a similar product) actually becoming adopted by the real estate market suggests a form of vision that is performative of planetary urbanisation, and a newly aggressive

[9] In doing background research around the use of early ticker-tape technologies, I followed the story of the *De Saint Phalle* bank through the New York Times archive and found it to be one of the most extreme, interesting and tragically violent stories of a financial organisation—one which had all the innovative market devices going, but still managing to go gloriously bankrupt.

and rapid process of global hyper-gentrification that can be driven by the use of market devices like *Dashboard X*.

Or, just like other assemblages of real estate knowledge and technology are performative of certain urban processes related to capital investment—like naturalised cyclical-markets fed along the way by investor sentiment and confidence (Weber 2016)—the way in which *Dashboard X* sees and normalises a new form of naturalised gentrification at the planetary scale is also indicative of a new performative capacity. In this case, to be able to see all the world's urban fabric with one abstract metric that relates to its relative gentrifying potential. And in so doing, also deploying the assumption that this form of value is driven by a class of rational gentrifier-agents that will naturally spread in waves across all urban space, producing immense real estate value in their wake. As a device it therefore promises to reveal the hidden hand of the hipster, but in this promise it also masks the assumption that such a hand exists to begin with—the ultimate 'god-trick' (Haraway 1991b) of its particular way of seeing. *Dashboard X* is therefore a particularly ambitious 'real estate diorama' (see Section 7.4.2), advancing its own particular form of situated knowledge.

This may sound like a big jump for a small and unadopted data analytics product, but the recent emergence (since after this research began) of several other tools, theoretical approaches or news articles around the same issue—data science approaches to quantifying gentrification and their deployment in data analytics products (Ilic et al. 2019; Reades et al. 2018; Rodionova 2016)—shows its a worthwhile study inasmuch as it is timely and increasingly relevant to the market's growing desire to put a figure on the gentrification process. It is now just one of many data-enabled gentrification dioramas available, each with their own performative capacity. And, fed by the sorts of dynamics discussed in earlier chapters,[10] it therefore seems correct to refer to any resulting urban process emerging

[10]Such as the cultures of 'responsible investment' (via data-driven practices, for example see Pages 83 and 119), "data imperatives" (see Section 4.2, and most of Chapter 5), including the desire for exciting dashboard-based products that can provide the information necessary to lubricate and speed-up the ease with which investment can occur.

from *Dashboard X*'s performative gaze (or the gaze of any similar product) as data-driven gentrification.

Data-driven gentrification is therefore, in the case of *Dashboard X*, what results from and is embedded within this way of seeing the world. The construction of naturalised and essentialised processes and forms of value that *Dashboard X* assumes as behind the gentrification process are the most obvious. Or that gentrification generalised is here to stay, gentrification has truly 'gone global' (from the limited perspective of actors involved in translating *Dashboard X*), and that this particular model of such processes should be applied to all urban space as soon as possible. In order to deploy capital into a new asset like BtR, finding out the *Gi* metric for a particular site (and perhaps screen-shotting *Dashboard X* into a presentation) is part of what is necessary to make investment go-ahead. And data-driven gentrification will become the result of this investment, including all positive- and counter-performative aspects of its particular design and adoption. In this case, that includes a performative capacity to feed the 'implosion-explosion' dynamic of planetary urbanisation (Lefebvre 2014b; Brenner 2014). Including through a gentrification process that might best be described as 'neo-Haussmanisation' on the scale of the whole planet (Merrifield 2013), but where traditional notions of centrality and periphery are broken down and replaced with a more diffuse and pervasive gentrification process that necessarily looks to the margins for capital deployment. The result of this way of seeing is therefore a wildly speculative form of planetary urbanisation, and the legibility of all urban space as such, in order to feed the new investment strategies of a global data-driven gentrification process.[11] And so, despite recent academic analysis rightly pointing out that planetary gentrification is *not* a standardised process, *Dashboard X*'s way of seeing is nevertheless capable to a degree of being exactly that same generalised 'force' of planetary gentrification that the local context of actually-existing gentrification realities will typically push against (Shin 2014; Lees et al. 2016). *Dashboard X*'s infinitely mobile vision is thus equally myth (in origin; in essence; in practice; in my stories about New York

[11] Just as other new evaluative infrastructures can support new forms of behaviours on the part of involved actors (Kornberger et al. 2015).

artists; etc.) as much it may one day be performative practice as part of data-driven gentrification. The truth or falsity of what it sees is not the main issue, it's what it is increasingly being able to see (and why) that matters.

8.4 The politics of hyperreal estate

Throughout the preceding three core chapters of this thesis (building, selling, knowing) a host of reasons have been cited why *Dashboard X* and associated data analytics products are emblematic of hyperreality. Covering all of Baudrillard's (1994) own 'five pillars' of hyperreality—contemporary media (data science technologies), exchange value (of financialised real estate assets), multinational capitalism (the clients), urbanisation (gentrification), and ideology (of both the wider market and actor network coming together in the translation of *Dashboard X*)—the thesis has outlined various ways in which *Dashboard X* can produce a form of hyperreal estate, including models upon which the market is coming to *rely* upon in order to construct and *make real* the assets of tomorrow which did not exist today (BtR). For example, this case study has explored the *building* of *Dashboard X* using methods taken directly from the world of marketing, and how this played out in a manner that is very similar to the development of calculative frames in financial organisations and (creative, abstract) processes of financialisation. In both *building* and *selling Dashboard X*, it has explained how a priority was afforded to theories of value that lay entirely in the realm of urban consumption, and for the express purposes of the further commodification of space and real estate. It has also explored the disappearing materiality of real estate assets and the distance at which *Dashboard X* simulates the new aspects and contours of real estate assets, as well as the speed at which it can bring together this view of the world (through the recombination of whatever data is available, and by any means necessary). Finally, it has explained the ways in which the BtR asset was 'seen' for the client in a manner that is suggestive of the precession of simulacra in real estate: where a model (or map) was required long before the territory (or asset) was understood (or even existed), and in a manner that was full of doubt as to whether the territory could even exist in

the manner the model assumed. And, as an asset that has recently been said to lack a defined method of valuation (in price terms), this coming together of *Dashboard X* and BtR is therefore in many ways a perfect case study of hyperreal estate. BtR doesn't really yet exist, but the map is already being made. And made according to a situated gaze, or diorama, that for various reasons is focused on something which is not yet in fact real, only in the process of becoming so.

But this research has also highlighted the ways in which hyperreal estate is more complicated and nuanced than a cursory reading of Baudrillard might suggest, and in particular has highlighted the array of other factors that are crucial to its production. In the first instance, it has been demonstrated that hyperreal estate is (contrary to the notion that real estate actors are being 'automated') as much social and cultural as it is technical, at least in terms of which actors have the power to drive its production. Or, that the coming-together of *Dashboard X*'s gaze relies more on dynamics that are as much part of the existing real estate market as it does on any heroic technical intervention or disruption by 'outside' actors. And, as argued above, many of the actors that may think they are driving some form of disruption (who might have roles like my own) are in fact bound by rules that long-preceeded them and will always inevitably shape the outcome of any new technology's translation or adoption. And running counter to this, it has also been illustrated that certain other socio-cultural tendencies of the real estate analytics domain (for example, to fetishise new metrics in an 'unregulated gluttony' of real estate valuation machines) are also informed by the more technical traits of the organisational logics and necessities that characterise platform capitalism. Like network effects, and other platform reliances laid out in Chapter 4. Or, that the value placed in new metrics and their control through devices like *Dashboard X* is as much about rhetoric, and the business of hiding what lies behind these metrics, as it is about their actual utility to investors (to put value in motion, to invest in the correct 'data-driven' mode). In this way, it is clear that hyperreal estate is more about *any* numbers, *any* indexes, and *any* metrics than it is about the mere price of real estate as it currently exists (see also Shaw 2018). It concerns an

organisational drive towards some actors being able to "profit by merely counting" (Bratton 2015, p. 199); the platform entrepreneur's exploitation of uncertainty and anxiety in the global real estate investment domain; as well as a growing culture of being data-driven that precedes any form of actually existing rational investor. And, following this trajectory (that there is more to the production of hyperreality than "meets the eye"), it is clear that the ultimate control of 'indexing machines' or 'semiotic apparatuses' (Lazzarato 2014) like *Dashboard X*'s *Gi* metric (and certainly what lies beneath *System X*) is of great importance to those with an interest in the easy deployment of the wall of capital that is presently descending upon the highly financialised global real estate market. Simply because it's machines like this that can now make certain future real estate markets (and assets) real, and thus their primary political implication is a matter of ontological politics (Mol 1999).

In general terms, these more nuanced observations around the actually existing production of hyperreal estate therefore raise ultimate questions of power-knowledge and the motives of market actors that seek to act strategically around the deployment of capital in the urban environment. It is the control of these sign-machines, through *both* socio-cultural and technological means, that is regarded as most important to the control of future real estate capital. And so, this therefore calls us to finally turn to the unequal social relations around the production of hyperreal estate (Rose 2012, p. 5), and to ask more about what they are intended to *do* and for *who*? And what the vision of *Dashboard X* is ultimately used for on the part of capital? To continue with this enquiry, the political implications of *Dashboard X* and BtR will be considered from the perspective of a group of actors who were almost entirely absent from the fieldwork (except in the interlude): the ultimate and intractable stakeholders in urban real estate markets, who are the denizens of the spaces around and within the planetary sites of BtR. This will be considered in terms of the politics of real estate valuation through *Dashboard X*, and the critical political economy of how *Dashboard X*'s particular form of hyperreal estate serves those who might come to wield its scopic technique as power.

8.4.1 *Dashboard X* as post-political agencement

> "What matters is to capitalism is controlling the asignifying semiotic apparatuses ... through which it aims to depoliticize and depersonalize power relations."
> —Maurizio Lazzarato (2014, p. 41)

It should now be apparent that beneath *Dashboard X*'s otherwise flashy interface, and the *Gi* metric, lies a chaotic array of overflowing and contested relations and categories. As well as a host of potential disagreements and forms of dissonance around what exactly the valuation of urban space and BtR assets should, could, and would be. Indeed, as a material-semiotic actor, the type of gaze and *science* that *Dashboard X* entails is one which is deceptively simple in its "god-trick" global gaze (Haraway 1991b), and yet so few of the real estate actors I encountered had anything but deep interest (and occasionally what seemed to be reverence) for its particular technical-operation and way of seeing. This included, but was not limited to, institutional investors at large global funds, stock traders, valuation surveyors and other real estate data analytics developers or start-up founders. Naturally the smart ones immediately saw ways in which it could, as a prototype, be improved, but so many genuinely senior and powerful real estate actors also felt that these required improvements were incidental—just a matter of time and some of those extra 'tweaks'.

In this respect, the tweaks and time needed to make the improvements necessary (had *Dashboard X* found its client) would clearly never have rectified any of the underlying and problematic counter-performativities or theoretical contradictions this research has argued lie behind the surface of its interface. For example, this includes its necessarily situated, dioramic gaze upon real estate and urbanisation; its problematic claim to reduce *mētis* to *techne*; the way in which it evokes an agnostic view of value forms and a correspondent 'crisis of commensurability'; its relationship with discourses of perfect exchange; its relationship to problematic metaphors of formal/informal markets and bell jars; and so on. In these respects, it will always be an artefact of monism, and an era of data science that may well one day be known as the era of 'doubling-down' on high modernism (see Section

7.1.2). And most importantly here, no end of tweaks to the design of *Dashboard X* (as the market wanted to see it) could possibly resolve the deep dissonance that its calculative frame and *Gi* metric entail in terms of what forms of hyperreality they are producing. Including what knowledges of the world and the forms of difference between its features (the BtR asset) it can help produce and *control*.

Hence, regardless of the issues above, there is one thing that *Dashboard X* does seem to be performing very well at, and that is the complete obfuscation of these matters when it comes to its performance as a would-be market device. That is, as a device with a gaze that can produce a clear science of real estate value based on a view of gentrification and the BtR asset (in terms of its location) which completely obfuscates any other account of these market processes of things that might not align with the desires of those who will ultimately come to use the device and enact this gaze. For example, *Dashboard X* makes a claim to a science of gentrification as bottom-up and driven by rational agents, more a "spontaneous hipster influx" (Mueller 2014) rather than a process largely fueled by capital and state (Lees et al. 2016). And this forcefully naturalised science can be used and circulated in a number of ways. This includes not just as a means to deploy capital in particular financialised forms or assets like BtR, but in a way that legitimises and forecloses certain debates around the very purpose and *raison d'être* of BtR. Or, just as *Dashboard X* produces a data ontology of BtR that brings it into existence[12], so too it does so in a way that legitimises BtR assets as a legitimate market inevitability and even moral good ("There's no choice but to rent... but as long as the big funds get control of the market they can ... provide a good product ... unleash all kinds of flexibility ... and make the renting experience better!"—Director of BtR Fund). Just like other observational devices did for financial markets in general (Preda 2009a). This scientific gaze upon real estate and gentrification therefore also comfortably forecloses all those awkward questions at industry events like "Is BtR just taking advantage of Generation Rent"? *Dashboard X* implies "No, absolutely

[12]I also discuss the use of data analytics to bring market assets into being in my general theoretical discussion of *Platform Real Estate* (Shaw 2018), in the sense that to exist as part of future global real estate markets, a building must have data.

not...", simply because it implies that BtR is strategically responding to the way the world is, and in the best, data-driven and scientific way (rather than positively performing planetary gentrification). Hence, everyone involved in capitalising upon the so-called Generation Rent is "let off the hook," and *Dashboard X* affords the view to all involved actors that actually their actions are, in fact, solving (rather than producing and co-performing) a "big urban problem" (Lefebvre 2003).

Therefore, *Dashboard X* is performing a leading (or at least contributing) role in defining the very essence of the problem of Generation Rent, or 'matter of concern.' Including gentrification, housing inequality, and so on. As an actor that is directly intervening in an undeniable controversy of London's wider housing market (Minton 2017; Wainwright 2014), *Dashboard X* is therefore enabling a way of seeing that "forecloses dissensus" (Rancière 2001; Swyngedouw 2011) around these issues and reduces them to a technical matter—a form of governance (Foucault 2007). It therefore produces a governmental way of seeing the value in outlying peripheral urban areas. This value is being produced 'out there' and *Dashboard X* is the tool to govern this value via the strategic deployment of capital into new assets that may not, in fact, be aligned with how the vast majority of the users of urban housing feel, or what they need—the 'unwilling subjects of financialisation' (Fields 2017) and fifth-wave gentrification (Aalbers 2019).[13]

Dashboard X is therefore a particular type of data assemblage that also sees in a 'post-political' way (Wilson and Swyngedouw 2014): it is a material-semiotic actor producing knowledge around a controversy that provides no entry points for disagreement or antagonism of the notion that the gentrification process can, or *should*, be forcefully naturalised in this way. Its universal meta-narrative of urbanisation does not, for example, include any account of the ongoing production of urban space through the circulation and accumulation of capital: it's just a world being made by hipsters that *Dashboard X* can help the market see, and then respond to better and faster. Therefore, *Dashboard X* is not just about obfuscating the overflowing relations and contestations of what gentrification *actually*

[13]It should be noted again that BtR is already being starkly critiqued from all corners in this regard (REF disagreement with BtR)

is because that's what makes (and sells) a good market device. Rather, it also reduces the disagreement and dissonance around the forms and intended uses of the values that it circulates, and the alethurgy it performs, because that's governmentally convenient and desirable. Controlling this device is powerful because it engenders performativities that nullify the politics of gentrification, and to return to the previous chapter's conclusion, it can therefore literally soothe market actors' anxieties around BtR. The consequence of this is, of course, decisions that can continue to ignore, or render insignificant, any disagreement or dissonance around gentrification. Like the Lockean "land improvement" argument of colonial times (e.g. Banai 2016), it is wholly justified to invest in BtR because this investment is based on a rational science of what is plainly the case already. The investor can therefore always point to *Dashboard X* and say (something like) "It's the hidden hand of the hipster!" And whatever is wrong about this, or goes wrong, there will always be an organisational culture whereby actions can be justified by those who both socio-culturally absorb the notion, and may even literally say "Listen, the data told us it was OK!" (Software Developer 3—securities portfolio management). *Dashboard X* therefore produces a market agencement that is increasingly post-political in its direction of the future possible performances of planetary gentrification, just as others would argue that many other data analytics products do the same in other domains (Amoore 2013). As a device like *Dashboard X* circulates its particular form of value and knowledge, is observed in the market place, or is even adopted, this uncontested post-political understanding of gentrification will become "written into the subjective bodies of the global real estate agents themselves", and the 'real estate cyborg' (Rogers 2017, p. 135) becomes one that is increasingly blind to the contestation around planetary gentrification. Blind not just in the sense that *Dashboard X* doesn't see it, but that it distributes a cognition that does not *know* or recognise it. The hyperreal estate produced by *Dashboard X* is therefore part of a market agencement that is increasingly orientated towards a no-holds-barred global pursuit of gentrification; it is making this pursuit both possible and entirely legitimate. This is compounded by the fact that, to some, this pursuit of 'hidden

value' through *Dashboard X* could even be regarded as a sort of moral horizon; as an agencement emerging from the cognitive consensus and 'virtuous encounter' between entrepreneur and investor (Muniesa 2017).

8.4.2 *Dashboard X* as device of new urban colonialism

> "The current nature and extent of gentrification raises questions not just about its interrelations with globalisation but also its manifestation as a form of new urban colonialism. The geographical spread of gentrification over the last twenty years has been reminiscent of earlier wavers of colonial and mercantile expansion, itself predicated on gaps in economic development at the national scale."
> —Atkinson and Bridge (2005, p. 2), in *Gentrification in a global context: the new urban colonialism.*

> "The Torrens registry came out of a white male colonial imaginary, taking further the time-saving technology that was being innovated in other sectors during that industrial era. MERS came over a century later, out of a financial imaginary that is also overwhelmingly white and male, taking further the time-saving technology that is being innovated in this digital era."
> —Sarah Keenan (2019, p. 299), in *From historical chains to derivative futures: Title registries as time machines.*

> "Gentrification is a process involving a change in the population of land-users such that the new users are of a higher socio-economic status than the previous users, together with an associated change in the built environment through a reinvestment of fixed capital."
> —Eric Clark (2005, p. 263), in *The Order and Simplicity of Gentrification.*

Amidst all the academic debate around gentrification, it seems that very few scholars would argue with a primary emphasis on the displacement (and dispossession) of land-users as its key consequence (Clark 2005). And in this case, with reference to *Dashboard X*'s representation of a 'wave-crest' of gentrification, this section will begin by noting that the crest of a wave is also defined as the "point of maximum displacement" (Cassidy et al. 2002, p. 341). And therefore, between (i) many real estate investors' claims to actively pursue gentrification (e.g. USMRF 2016), (ii) *Dashboard X*'s representation of gentrification, and (iii) gentrification as a displacement of land-users, there is little else to say other than that *Dashboard X* represents a technology with which to globally locate and perform

gentrification-as-displacement.[14] And, it is for reason of this displacement (and dispossession) dynamic that *Dashboard X* should therefore be considered in terms of its relationship to planetary gentrification's "manifestation as a form of new urban colonialism" (Atkinson and Bridge 2005, p. 2). That is to say, that the geographical spread of gentrification is increasingly reminiscent of earlier colonial and mercantile expansion, as predicated on gaps in economic development at the national scale. Here, it is argued that *Dashboard X* can enable real estate investors to act in a manner is emblematic of such a new urban colonialism, and for several reasons.

First, *Dashboard X* is a device that (as demonstrated throughout this research) perfectly expresses and connects market processes that can be linked to the root causes of planetary gentrification (Atkinson and Bridge 2005), including: the commodification of space (consumption, rent, exchange value, etc.), the polarised power relations between real estate market actors and the average denizen of gentrifying neighbourhoods, and what Wendell Berry (1977) calls 'vagrant sovereigns'—that is to say the powerful real estate actor who might want to "wake up in New York and pick up his iPad, login to our platform and go ... right ... what's going on with my properties in Brazil today?" (Surveyor 2). Or those who can use *Dashboard X* to pan through Shoreditch; Farringdon; "the broader geography of London"; or "search the whole world in a minute... in thirty seconds, right?" (Surveyor 4). *Dashboard X*, *System X* and other products encountered in this research all connect these vagrant sovereigns with the 'new urban frontiers' (Smith 1996) within which investment can lead to the best returns, and consequently the maximum displacement of land-users. In this way, *Dashboard X* becomes a tool for the spatial fixes of capital as they seek to "conquest" space for its "highest and best" land uses

[14]It should be remembered that many real estate actors also acknowledged this displacement tendency (if not publicly then privately). And that examples of encountering this included hiring PR experts who would switch the term for 'regeneration' whenever its negative connotations might cause unwanted friction (e.g. see Page 174), as well as one real estate representative of the Mayor of London at MIPIM who openly told me (possibly thinking from my name badge that I was part of the University of Oxford's estates department): "The problem with people in Custom House [East London neighbourhood, mainly council tenants] is that they can't afford to live there anymore"—nicely reflecting a newspaper article about the same event that year, titled "All the sickening things insiders told me about MIPIM, the London conference for property magnates" (Baxter 2016).

(Blomley 2002). Or, a device which can "force the proper allocation of capital to land" (Harvey 1982, p. 360), with a normative and naturalising tendency that comes from the science of data-driven gentrification and the metrics, values, calculative devices and knowledges that have emerged through and around *Dashboard X* (as described above). And, in light of *Dashboard X*'s post-politicised tendencies to make this 'proper allocation' of land use (BtR assets on sites in the wave-crest of gentrification), few would care to argue otherwise. In this way *Dashboard X* represents the "order and simplicity" of gentrification (Clark 2005) in the sense that it enables vagrant sovereigns to realise their vision (which is also partly the vision of *Dashboard X*) through the economic exploitation of the potentials represented by the *Gi* metric as a global index of planetary gentrification. Amidst the commodification of urban space (as opening up the space for this conquest), and the polarised power relations that characterise global real estate markets, *Dashboard X* is the perfect tool for the capital of this new urban colonialism, including the "impulsive roaming" of its vagrant sovereigns (where are large part of this roaming is more like "dragging and dropping" at the global scale).

To take this analysis further, it should be noted however that the process of new urban colonialism which *Dashboard X* enables is not just about first measuring resources and then acting to displace in one singular violent decision (that then directly results directly in displacement or dispossession). As a form of prospecting device, it also has all the hallmarks of a tool that can be used to further a form of 'phenomenological displacement' (Davidson and Lees 2010) that represents a slower violence, both more evocative of the complexities inherent to colonialism and more reliant on the deep systemic inequalities that gentrification thrives upon (Atkinson 2003). This stems from the fact that *Dashboard X* was clearly attractive as a device to enable the forms of 'tactical real estate' discussed in earlier chapters (see Page 143), or that investors wanted to strategically enact this knowledge through more subtle decisions that aren't as simple as just a singular act of buying a site and building to rent.

Instead, *Dashboard X* was attractive as a device by which to pursue strategies like building or supporting coffee shops and art galleries in a way that could 'incubate' the space around the site, and increase or maintain the *Gi* metric. *Dashboard X* therefore also lends itself to the pursuit of certain real estate strategies that *inscribe* the hidden hand of the hipster in urban space (e.g. by building hipster barbers, see Page 216). In other words, *Dashboard X* was also about making more subtle deployments of cultural capital (Bridge 2006). Thus revealing that this type of gentrification process is certainly not just 'bottom up', and that it's about fuelling the commodification of space to open it up for the conquest, or 'proper allocation' of economic capital and land-use. In this case, displacement resulting from *Dashboard X* is about "much more than the moment of spatial dislocation" (Davidson and Lees 2010, p. 403), it's also about 'structures of feeling' and the 'loss of sense of place' associated with displacement. Both of which new build gentrification (like BtR) has also been attributed to in London in the past, and also in a manner that embraces Clark's (2005) definition of gentrification in a manner that suggests that the 'vagrant sovereign' does not just target one class of land users (e.g. the working class), but will eventually come for all. Here, the result of *Dashboard X* strategic mobilisation of knowledge is both the brooding dissonance felt by regulars in *Pub Y* (see Section 6.2) as well as the more tangible (or outwardly violent) contestation in areas like Peckham or Bushwick, with both resulting from the constant and pervasive reformation of new centres and peripheries (Merrifield 2014; Rérat and Lees 2011). And like colonialism, the experience of this phenomenological displacement (where existing urban populations have to live amidst the consequences of this very real pursuit and construction of the hidden hand of the hipster) could be encountered as racist (Zukin et al. 2015; Casique 2013) or class-based (Grand 2018; Butler 1997; Ley 1996), but ultimately it is the surveying groundwork required by the vagrant sovereign as part of the ultimate dispossession that is yet to come. This groundwork is about constructing the assets and values for new markets in new frontiers, or the "symbolic forms of neo-colonialism" (Atkinson and Bridge 2005, p. 12), where the front-runners in the BtR rush will be rewarded with the greatest spoils.

This leads into a third point about *Dashboard X* as a device for new urban colonialism that now ties together the overall theoretical framework (around the construction of new values, markets and assets) with the political implications of its performativity as a form of new urban colonialism. This is because, if we reiterate the conclusion that ultimately *Dashboard X* is absolutely not about revealing hidden value (it's about constructing and producing new values) then we can see that this is a distinctly *forceful* production of new real estate market assets. That is to say that *Dashboard X* is part of a concerted and slow violence of new urban colonialism that *must* circulate its values if it is to succeed in reforming the world in its own image. Or, that the vision of *Dashboard X* also has the potential to appropriate space and urban history. Its origins within the white male dominated spaces of *Garage X* and London real estate networks (Allen and Williams 2018; Hatcher 2016; Minton 2017) raises the old questions of who gets to shape the way *Dashboard X* sees and who interprets this seeing (Haraway 1991a, p. 194). Given that this has already been answered now, and reasons have been cited throughout this research why subverting this gaze is impossible (nobody wants *Dashboard X* if it suggests an 'improper' allocation of capital), it is clear that *Dashboard X* has all the capacity to "privilege whiteness, as well as more class-based identities and preferences in urban living" (Atkinson and Bridge 2005, p. 2). Hence, its tactical deployment by any client is also a "white Anglo appropriation of urban space and urban history." Where my role was to selectively edit history based on my own access to a form of white middle-class hipster *mētis*, which would undoubtedly (to some extent or another) exclude any competing (but equally or perhaps more legitimate) voices in the history of the many neighbourhoods I told narratives about in order to attempt to translate this new market agencement. Alongside the neoliberal market-expansion ideology of De Soto (discussed in the previous chapter), it's clear that *Dashboard X* is a device which is oriented towards "sustaining the colonial rule of gentrification in some of its outposts" (Atkinson and Bridge 2005, p. 3), or the incorporation and dispossession of new urban spaces and frontiers of value by the real estate market's most powerful actors.

Here we can return to Grossberg's (2010) discussion of implicit claims that these [data-driven] machines themselves might in some way be able to produce value—they obviously can, but the value they produce is largely to the heart's desire of the vagrant sovereign. They are machines that can make real the dreams of those who wield them. And they can do this by producing the hyperreal urban landscapes, societies and knowledges necessary for the new urban colonialism described by Atkinson and Bridge (2005), and the planetary gentrification (Lees et al. 2016) that meets De Soto in the globes most latest gentrification hotspots. *Dashboard X* creates a legitimacy of these desires, and thus "it's like magic to most people ... whether or not it is doable, [true, or achievable] it will continue and people will continue to believe in it." (Software Developer 4). And if "the essence of gentrification [was once] hidden from view" (Beauregard 1986), then *Dashboard X* reveals it in the best possible way for those that desire gentrification the most, and the investors say: "*that's exactly what we want!*" But it does not reveal anything particularly true, and it is only objective in the sense that this knowledge (and the wider condition of hyperreal estate) serves very real purposes. The most deliciously tantalising one of which is probably slum gentrification, where many argue that the ultimate speculative global gentrification market can be constructed (Lees et al. 2016, p. 140)—and so replacing the subprime markets of yestercrisis as the new asset landscape for the financialisation of real estate and urban change. And, in the process, denying other sources of value in its selective editing of history as part of a value practice that Grossberg (2010) goes as far as to suggest is value *fundamentalism*, or "one set of relations/values appears not only absolute but also as the absolute negation of any other" (Grossberg 2010, p. 325). *Dashboard X* thus contains the seed for a form of gentrification fundamentalism, and "planetary gentrification as a capital-led colonialisation of urban space" (Lees et al. 2016, p. 87). So for the becoming-asset of BtR, *Dashboard X* is the key by which to "displace locally, sell globally" (Rogers 2017, p. 65), much as "measuring and surveying colonial body was a key technology in the [historical] colonial appropriation of land" (Bennett 1987, p. 194; Rogers 2017, p. 77). And just as capitalism has been generally said to be "addicted to technological

change and endless expansion through economic growth" (Harvey 2001, p. 24), so too the 'real estate cyborg' (Rogers 2017) demands the latest cybernetic, distinctly war-like, strategic techniques for capturing the value in the wave-crest of planetary gentrification. Hyperreal estate is therefore trying to produce the most desirable and ultimate rational landscape for capital accumulation and the spatial fix, and *Dashboard X*-as-agencement includes its own strategic and weapononised knowledge to put value in motion. The violent displacement of gentrification is inherently part of the hyperreal estate that *Dashboard X first* sees, and *then* begins to reproduce.

8.4.3 Resisting the desires of hyperreal estate

I cannot deny I enjoyed the excitement of working on *Dashboard X*, and with my colleagues, and that I remain captivated by the question of which global space would score highest on the *Gi* metric if we rolled-out the product to cover *everywhere* (technical barriers and tweaks notwithstanding). But this masks the fact that, for the reasons cited above, there is also a part of me which wishes I had never embarked on the project because of its connections with practices that I personal find problematic. Even if, on a technical and creative level, I wonder about how exciting it would be to try and map a favela's hipsters or incorporate data from *Dahzong Dianping* (China's alternative to YELP). Overall, I think it was absolutely worth entering this world and conducting the research in the manner I did. But the reflections on these more problematic aspects, and especially the strong linkage of *Dashboard X* to a form of new urban colonialism, are also important as part of the findings of this research. This chapter will now end with some further reflections on how hard it is, when you're in the field, to understand that you're part of the "post-political assemblage" described above (with little recourse to dissent, amidst the "belly of the real estate beast"). And second, to emphasise the linkage between the colonial aspects of emerging real estate data analytics platforms and other debates around platforms, surveillance and privacy.

The first reflection here is on the continually evasive nature of the class of 'gentrifiers' that I was trying to enroll in *Dashboard X*, and why it took so long to

work out what exactly I meant by 'marginal gentrifiers'—which was so far from Rose's (1984) definition or others (Mendes and Caldwell 2013). In short, I believe in reflection that I simply felt more comfortable using this term throughout the research to make myself feel better: this was about a group of people like me; I was quantifying 'my own'; I was also somehow 'marginal'; and the nebulous definition suited my own conscience as much as it suited the narrative I was spinning about why *Dashboard X*, my creation, could access the desirable 'hipster *mētis*' and underlying reality of gentrification. In reality however, the term 'pioneer gentrifier' would have probably worked much better from both conceptual and marketing perspectives: it would have probably sounded more dangerous; more colonial; more male; more exciting; more heroic; more front-line; etc. But I think that deep down, I couldn't bring myself to use that term. It would also have meant facing the reality of *Dashboard X* as a device for new urban colonialism. To this end, I now believe that I felt happier narrating and simply *saying* the term *marginal* gentrifier, and implicating myself as one, because it somehow got rid of my own agency and power in the work I was doing. And, it made me feel and appear far more subservient to the project than I perhaps was.

This is an important reflection because it belies the degree to which personal and subjective desires flowed through the entire assemblage of *Dashboard X*. As much as the real estate investors felt soothed to look upon a world they desired through a machine that told them this was the one true scientific reality, and not of their own making, I believe that the entire construction of models in this domain was based on what White (1987, p. 149) referred to as the *content of the form*, or narrative capacities transform the present into a fulfilment of "a past from which [we] would wish to have descended." That is to say that just as the powerful actors I encountered in board rooms wanted to believe they were following a natural, and scientifically accounted, bottom-up process of gentrification (and not agents doing bad things—because the assets already exist and *Dashboard X* sees them!), I also wanted to think that I had brought my precarious and deep knowledge of the historical New York underground to the table. Rather than a betrayal of my

own principles, that traded on my power as another young white guy with a bit of technical knowledge and good graces (as this thesis has demonstrated). More so, even the most 'edgy' and seemingly capital-critical colleagues of mine were delighted to recite the notion that it was "cool that artists make places better"; that we can capture this reality; and that some people are just "living in a bad neighbourhood... yeah, if [our products are] done well then [they're] representing the world and not a lie" (Software Developer 1). Underneath these comments however, it only took a two-second breath of reflection for informants to add: "there are a lot of... subjective approaches though, so I'm not entirely sure about that" (Software Developer 1).

It might be an obvious conclusion in some ways, but the point is that any resistance to the colonising tendencies of hyperreal estate is not going to come from within the organisations building these tools. But the interesting thing is to know why, and why amidst the production of *Dashboard X*'s "conquering gaze from nowhere" (Haraway 1991a, p. 188), so few of the actors involved will ever be prepared, or capable, to "take responsibility for difference in material-semiotic fields of meaning" (Haraway 1991a, p. 195). This is because as actors they are already very much locked to the tracks they desire, and the stability of the assemblage is contingent on everyone pushing[15] towards on objective and coherent body of knowledge—the "ordering of difference" that has been shown above to be "intimately related to the oppressions and tyrannies of capitalism, colonialism, patriarchy and so on" (Rose 2012, p. 9). In this way, we were much like the chain-surveyors of historical colonialism (Shaw 2018; Keenan 2019): part of the machine, expendable in some ways, but also the "transcendental white males subjects" (Keenan 2019) who are most likely to survive any dislocation brought about by technologies like *Dashboard X*.

To return to these colonial linkages, it now makes sense to ask about the 'unwilling subjects of financialisation' (Fields 2017) that have to dwell in the urban space that *Dashboard X*'s own particular flavour of hyperreality now seeks to possess. The post-political aspects of *Dashboard X*'s way of seeing the world have been

[15]Or perhaps 'sprinting', to use the appropriate Agile principles of software development.

discussed, and why it's so hard to disagree as part of its assemblage (just like the land improvement arguments of historical colonialism), but is there room for those experiencing the displacement and dissonance of hyperreal estate to resist? Afterall, just like 'first peoples knew the power symbolised by chains and stakes' (Weaver 2003, p. 226), there's no reason why urban denizens everywhere cannot come to understand the role that these data analytics have in these processes of displacement. Just like the regulars in *Pub Y* understood what I was saying about the technology, even if they didn't quite understand how it was made or why the idea of value being circulated and expressed in metrics was so different from their own.

To address the issue of resistance in full is a separate thesis, and a subject I've written about as part of this research elsewhere (Shaw and Graham 2017): that large digital platforms controlling urban information also occupy the right to the city, and particularly through the ways that they reconfigure the new centralities of planetary urbanisation, surplus capital and the reproduction of urban space. That said, it is plain to see that just as Baudrillard (2009) repeatedly emphasised the significance of 'disappearing' to hyperreality (as part of its nature, and as a way to resist), and as Scott (1998) charted the ways in which other colonised people subverted other landscapes of control, that the evident linkage between *Dashboard X* and other online platforms raises implications of ontological politics that are much broader than just real estate. In particular, the dependencies between new real estate data analytics products and social media or 'data prosumption' (Ritzer and Jurgenson 2010; Comor 2010) are clearly part of this wider problem—and have been discussed as 'data colonialism' elsewhere (Thatcher et al. 2016). And, along the way, the continual press coverage of the looming privatisation of the Land Registry (Groom and Plimmer 2014; Plimmer 2016)[16] only compounds these issues: ultimately, the success of hyperreal estate (and any of its new urban colonialism) depends entirely on the massive accumulation of data ("by any means necessary", see Chapter 4) relating to the urban environments within which market actors desire to mobilise it.

[16] An organisation continually torn between the privacy of individuals' data and the data-hungry needs other start-ups like *Company X*.

The complex answer to the resistance issue is therefore to reiterate broader conclusions about resisting platform capitalism (e.g. Shaw and Graham 2017): that the fantasies of democratisation and 'hidden value' inherent to hyperreal estate must be transcended (as touched on in Chapter 7); that means by which to disagree within these post-political agencements be found (i.e. to contest and engage the dissonance described in Section 6); and perhaps that a Baudriallardian or Bartleby-eseque way has to be found for the unwilling subjects of hyperreal estate to 'disappear' or refuse to be part of the game (Shaw and Graham 2017, p. 918). A discussion as to how this might work is too large for this thesis to deal with, but a much more blunt conclusion regarding existing publicly-owned data bodies like the Land Registry is therefore that we must simply regulate and protect these existing sources of data relating to real estate markets from any excessive gluttonies of hyperreal estate (just as we fight the monopolies forming around other personal data that might be relevant to this domain). Or, that they shouldn't function as a 'standing reserve of bits' for the creative usage of 'data artists' that constructively service the desires of the 'real estate/financial complex' (*REFCOM - KU Leuven* 2019). And this is also important to avoid the most counter-performative consequences of *Dashboard X*'s unstable knowledge and partial dioramic perspective of real estate. And just as Haraway (1991b) has claimed modern critical theories are needed of how meanings and bodies get made, it's now clear that this critical account of how meanings, buildings and assets get made (and exist) in modern real estate markets is also important if we want to live in buildings that have a chance for a future. Indeed, the recent news that the world's first real estate asset stock exchange *IPSX* (Norman 2019) is soon to launch should only be seen as concerning for those who would prefer to live in a world characterised by less volatile and less financialised markets of hyperreal estate. In this case, a counter-performative crisis of "sub-prime" *Gi* value would not be something to look forward to.

8.5 Concluding discussion

> "Circulating metrics are the means by which markets can be realised and where objective knowledge enables the social world to fall into place. Metrics become indisputable truths, selected to produce apparently justifiable inequalities and to enable competitiveness through 'scientific forms of knowledge."'
> —David Beer (2016, p.116), in *Metric Power.*

Hyperreal estate is defined by the processes and actors that bring together a particular assemblage of data-driven real estate market practices in a manner that rapidly brings about a new way of seeing and performing market realities. Part of this definition is that hyperreal estate produces and performs markets and urban spaces in a manner that is intrinsically defined by the social cultures and contexts from which new market devices emerge. And in a manner that is controlled and defined by the desires of the real estate market's most powerful actors. As a data assemblage, *Dashboard X* and its particular flavour of hyperreal estate sees and can perform an urban world that circulates a science of gentrification to the convenience of the existing real estate actors that *require* this vision in order to deploy capital in new real estate assets in markets. In this case study that new asset is BtR, and where *Dashboard X*'s model precedes its actual existence as such.

Hyperreal estate is therefore based on very little that is in fact real, but it is capable and in the process of becoming real. Or in other words, *Dashboard X* sees the world in a way we know (if we study gentrification) does not exist, but through its use it would be perfectly capable of performing certain tasks to make that world real. This includes furthering the process of planetary urbanisation and a new form of hyper, data-driven gentrification that relies on the underlying knowledges that *Dashboard X* circulates about the urban real estate market. This includes *Dashboard X*'s capacity to conjure the notion of a 'hidden hand of the hipster' in a way that suggests value production in the built environment is largely contingent on a form of bottom-up process that *Dashboard X* can see and quantify. When, in fact, we know that gentrification is largely a top-down matter driven by the very same real estate actors that would prefer to imagine otherwise (both for convenience of

the investment and perhaps their own moral conscience). In this way, *Dashboard X* is capable of behaving as a post-political agencement whereby gentrification is forcefully naturalised as a scientific inevitability on a global scale: *Dashboard X* implies it's only a matter of time before the slums of the Global South follow suit and step into the light of its gaze, ready for speculative investment. *Dashboard X* therefore helps makes hyperreal estate distinctly *real*, and does so in a way that is directly informed by the desires of those powerful actors that wish the world was indeed this way. And in a manner that makes it easier for them to put capital in motion, and that even attaches aspects of a moral imperative to utilise and enact its particular way of seeing as part of the correct market response.

The theoretical and political consequences of this include the acceleration of planetary urbanisation and gentrification, driven by a new data-driven science of urban development that operates around the commodification of urban space and the polarisation of power relations (between the powerful white men of real estate and the denizens of tomorrow's gentrifying urban neighbourhoods). And with the most powerful of these 'vagrant sovereigns' at the interface (who might otherwise be sat in an office in the City of London, or perhaps on holiday in the Bahamas). In other words, all urban space is either subject to this commodification, or becomes the site of the strategic decisions and global knowledge that drives this new planetary gentrification. It is plain to see, therefore, that those who control the new market devices of hyperreal estate also control the means of producing new assets and financialised forms—the "indexing and symbolizing systems that enable the evaluation and control of differentials in value in and between different domains" (Lazzarato 2014), and therefore the means by which to realise and wield power within new urban real estate markets. As part of this, and the displacement that planetary gentrification brings, we see ugly similarities between colonial processes of market-making and dispossession that will come to bear on new generations of urban dwellers—the unwilling subjects of this financialisation and gentrification.

But *Dashboard X* is also riddled with unstable knowledge and counter-performativities that suggest all the trappings of a failed "God-view trick" in all its "monstrous"

situated knowledges (Haraway 1991b). Or a gaze akin to a real estate diorama, defined generally as the particular "seeing" market device associated with a particular situated knowledge. Crafted by a bunch of young guys in a mythical start-up garage and assembled through the elite organisational spaces of global real estate investment funds, *Dashboard X* is a partial perspective of real estate that is just as blunt as it is promising and dangerous—like so many other products I encountered, with all their reliances on poor data and incomplete understandings of real estate as it actually exists. They are "cacophonous visions" (Haraway 1991a, p. 196) and gluttonies of visual representations and metrics that far exceed real estate realities as they presently exist. Indeed, *Dashboard X* and other related products are part of a socio-technical assemblage so diverse and chaotic that many of its counter-performative consequences will be impossible to see. Where each new technological intervention is no doubt capable of a wide range of "original accidents" (Virilio and Rose 2007) that will be theoretically and politically undesirable and impossible to predict. Just like the ticker tape, derivatives pricing models and many other means of having "having a creative impact on the world" (Sales Executive 2) changed other markets, sometimes for the very worse—the same creativity occuring in *Garage X*, other start-ups in this area, and the mortgage-backed securities brokers who before the last crisis were "being incredibly creative in terms of what we were putting in securitisations" (Software Developer 3—securities portfolio management). These devices can therefore be regarded as an ongoing and cumulative impact on the way in which real estate has been "mediated through different technologies by colonisers, investors and real estate professionals" (Rogers 2017, p. 17). And *Dashboard X* is just one 'semblance' of the overall global hyperreal estate assemblage, by which I have tried to access "drops of experience" (Massumi 2011) about the hidden truth of the recent surge towards a data-driven real estate market.

To return to the idea of *Dashboard X* as a powerful real estate diorama and 'indexing machine,' I will close by making a historical analogy that I believe best expresses the theoretical (in terms of epistemology and practice) and political (in terms of power and colonialism) implications that *Dashboard X* poses for the

stakeholders of new urban real estate markets (willing or unwilling). This analogy is to the cabinet of curiosities or 'Kunstkabinet', and particularly its role in the contact zones of historical colonialism (Arens and Kießling 2018), as objects with "bizarre inventories" intended to illustrate the mechanistic order of the university and man's god-like power of creativity (Bredekamp 1995). Objects which created a microcosm or theatre of the world (Fiorani 1998), or 'diorama', and were intended to symbolically convey the owners control of the world through this microscopic reproduction. In other words, despite the inaccuracy with which the cabinet is displayed (which could be the data inside *Dashboard X*), the overall control of its manifestation (which could be the metric or overall calculative frame of *Dashboard X*) (as well as the labour creativity which goes into its production) is what ultimately matters as something which can perform something in the world. That performance could be persuading a new expedition for sugar in the 18th century, or the equally "world-changing persuasion" of putting your fund's capital into BtR in the 21st century. Either way, it's about conveying power through knowledge about a particular type of frontier in order to deploy capital into new colonial processes.

Once again, this also does not imply real estate investors who are any more rational than those fifty years ago or more, it only implies the investor as seeking the symbolic power by which to deploy capital. In this respect, interest in *Dashboard X* is no more about owning a rational, objective tool that truly knows real estate assets any more than *System X*, or any other product. It's about possessing something that puts investors in a certain relation to the world, which feels like it can provide hidden knowledge and therefore power—in a manner not dissimilar to other representational techniques like the photograph (Sontag 1979, p. 4). And, its instrumental use in the assembly of new real estate assets is its most practical form of power. Quite simply, its seeing can do what the 'wall of money' needs, which is to deploy itself in future acts and profit-oriented decisions to put this capital into motion, often via increasingly creative, abstract and even outlandish means or asset vehicles. The interesting by-products of this process, illustrated through the case study of *Dashboard X*, is the way it requires and produces new

forms of value along the way. Forms assembled through new metrics, calculative frames, devices and discourses. Yet its actual practical use and ownership remains highly performative, social and often distinctly irrational in its own particular modes of calculative agency and framing. Data science, as a *discipline du jour*, is therefore often doing far less than it would claim to render real estate transparent by any stretch; often re-assembling new devices that offer only a series of illusions and conflated forms of value, like promising locality and *mētis* but in reality only offering alluring narratives of blunt *techne*. Or, just as the cabinet of curiosity was emblematic of how "colonisers patronise the locals and exploit their knowledge and belongings" (Arens and Kießling 2018)—and often full of inaccuracies about what these knowledges and belongings actually symbolised (e.g. Keenan 2018)—so too can *Dashboard X* be used to mask a complete lack of recognition for any of gentrification's dispossessed as part of this asymmetrical trade-off.

To conclude with this historical analogy, this means that becoming a good responsible data-driven investor who rents a contemporary platform or market device of hyperreal estate is not dissimilar to a plantation owner becoming the patron of the Pitt Rivers Museum, or some other 18$^{\text{th}}$ Century cabinet of curiosities. It's a technology which affords a powerful source of narrative propaganda and ownership for those who wield a stake in its ownership. And it can be used to convey control of the world, through its own 'indoor', microscopic reproduction of the world (Fiorani 1998) as a diorama of hyperreal estate. This control can be used to persuade new actions and decisions of capital: from excursions into hitherto unknown regions of the world or neighbourhoods, to the invention of entirely financialised new assets like BtR. In the case of Dashboard X, this 'indoor' is of course a particular data assemblage and the interface (appropriated and crafted by myself, perhaps as an unwittingly yet also problematically-aspiring data colonialist), and the propaganda in question is the disentangling of urban real estate values through the messy spectre of planetary gentrification, and a scientific knowledge of the hidden hand of the hipster.

But just like the cabinet of curiosities, the interpretation of the objects within—artefacts, symbols, data points—is almost always politically suspect, and quite often inaccurate (Arens and Kießling 2018). Indeed, it could persuade people with access to vast sums of capital to make some distinctly irresponsible choices, and which may harm themselves, their colleagues, or millions of others. More broadly, its general deployment in the market place can contribute to a range of deeply political ideologies and discourses. Ranging from re-igniting flawed tropes of the Washington consensus on neoliberal development to the construction of new housing consumers, and the disciplining of market subjects. The dissonance between the forms of value imposed on these objects by those who assemble the objects within the cabinet or own or view the cabinet on the one hand, and those from whom the objects were taken (what was once shells and photographs, but is now data), will only really be felt by the dis-empowered. And the likelihood is that they will never even know of the cabinet's existence. For *Dashboard X* this is no different, and does the analyst really know whether that's an independent coffee shop or a Harris & Hoole? And haven't times moved on to Kombucha now? In the present urban context, of planetary gentrification and displacement, the cabinet is therefore an important cautionary analogy to *Dashboard X* and *System X*. Especially inasmuch as the values these technologies bring into being are just as ominous in their political economic implications. Implications that will eventually be felt by people who otherwise want little to do with real estate markets (however hyperreal they may be); aside from a place to live free from displacement and dissonance, free from Preda's 'society of speculators,' and free from the hidden hand of the hipster.

9
Conclusion

Through a 12-month period of deep participant observation in both a real estate data analytics start-up business and the wider London 'PropTech' field, this research has provided a 'nose-to-tail' ethnographic case study of an emerging data analytics platform: *Dashboard X*. From studying this prototype data analytics product, designed to index and score urban space in terms of its 'gentrification potential', a broad account has been provided of the general conditions of emergence and adoption for data analytics platforms in the real estate market. Furthermore, a more specific focus on this particular product throughout its design (building), marketing (selling), and wider positioning amidst market discourse (knowing) has enabled the research questions to be answered in a manner that reveals more nuanced aspects of data analytics platforms for real estate in terms of: the key actors that are emerging around these new market devices; what forms of value they are producing in the market; and what theoretical and political implications they have for stakeholders in urban real estate markets in terms of their impact on the wider urbanisation process and the ultimate end-users of real estate. Finally, this has enabled the research to contribute novel theoretical findings that emphasise the importance of thinking about these data analytics platforms as producing hyperreal estate values. Including considering the wider hyperreal estate process in terms of its capacity (through *Dashboard X* in particular) to further perform processes of

planetary gentrification, specific types of real estate knowledges, and certain forms of real estate investment practices. Most importantly, this includes an explanation of *Dashboard X*'s *raison d'etre* in constructing the newly emergent Build-to-Rent (BtR) asset class, which also illustrates how new data analytics products can be used to help construct entirely new asset classes that did not exist previously. This contributes a critical overview and account of data analytics innovation in current and future real estate markets that was previously (almost completely) lacking in recent academic research (though has been contributed to by this research and others since, e.g. Shaw 2018). And it advances a wider understanding of how data analytics products are changing real estate markets and urban space.

9.1 Emerging actors

> *RQ1. What actors are emerging around real estate data analytics platforms?*

An initial focus on the spaces in which *Dashboard X* was built (especially the 'start-up garage') helped the research to illustrate both the cultural and social conditions of its design. Including as originating in an energetic and masculine environment, where a form of 'hacker ethic' meant that success in this zone was intimately linked to both creative-technical capacities as well as the personalities and social backgrounds of those that built the products. Via considering the development of *Dashboard X* as a calculative frame, and alongside the company's main product *System X*, it was clear that certain logics steered our work towards the production of novel metrics as something with a business, marketing and instrumental value in themselves (long before they had come near the real estate market). For example, new frames and metrics also have an underlying value as part of wider platform capitalism context: they can obfuscate poor data; they can make analytics products appear as distinct from other platforms (upon whom they may rely for such data); and they have significant rhetorical power for the marketing of these emergent would-be market devices.

However, the most important work required to produce these new metrics and frames was often distinctly atechnical. Creativity in technique was certainly required to find out ways to construct and present the frames (often through secondary data that came from other platforms), but the main part of my own 'valuation work' was mainly focused on constructing narratives. Including stripping and re-applying narratives to processes of quantification in a manner that could gradually build-up *Dashboard X* as a calculative frame in which market actors might be interested. This leads to the identification of the most crucial actors in the adoption of new real estate data analytics products: boundary spanners like myself (as creative 'data artists') or my boss ("he strikes me as really good at the business part"—Software Developer 4) who could successfully and convincingly link between the messy world of platform capitalism and the expectations of real estate actors who have been previously used to very different cultures and organisational logics around their valuation practices. In this case, part of the conditions of emergence for *Dashboard X*, including the alethurgic work of making *Dashboard X*'s calculative frame become 'true', were that I was permanently in place as the boundary spanner required to lend authenticity to the narrative and then be able to translate any new market agencement that enrolled *Dashboard X*. Furthermore, and maintaining the white-male dominated world within the start-up garage, it was also clear that such translation depended upon the 'disruptors' not looking *that* disruptive: preferably we'd at least be other white men too, even if we didn't quite fit the old 'organisation man' profile of real estate days gone by.

Through the experience of building and selling *Dashboard X*, it is therefore argued that the production and adoption of new real estate values (via new market devices, their calculative frames and metrics) is not something that represents a particularly 'rational' step by real estate investors in the sense of using more objective tools. Indeed, the amount of affective value and narrative that goes into the design process is indicative of something more akin to behavioural economics. And ultimately, it seemed clear from my twelve months in the real estate field that those actors who were involved in the investment process just needed "supplemental

evidence" presented in the latest mode (data science metrics) to drag and drop into spreadsheets and PowerPoints; supplemental evidence necessary in order to *make deals happen* and allow capital to be deployed. This was ultimately the primary goal of *Dashboard X* in the context of BtR—something that could add another data point to the asset, and one which began to disentangle an important aspect of the BtR investment strategy (i.e. which urban spaces were undergoing gentrification).

9.2 Emerging values

> *RQ2. How are new forms of real estate value being produced by these actors?*

This focus, and fetish, for new metrics reveals both the gluttony of quantification currently present in the real estate data analytics domain, and also the very real rhetorical power that comes with being the first person to put a number on something. And if it's a big or obvious number then all the better (even if everyone knows its a prototype that needs a lot of technical tweaks!). Through the case study of *Dashboard X* is it plain to see that the real estate domain is chasing new metrics in a manner that suggests price is simply not enough for current and emerging real estate markets. And that many more new differences and categorisations between both currently-existing and future real estate assets must be found, and as fast as possible. Through the case study of BtR, as well as the general discourses and imaginaries circulating in the marketplace around data analytics products (global land registry; perfect exchange; Generation Rent) this has been explained as part of the new data ontology and gaze of the emerging urban real estate markets—from building to selling and knowing, the buildings of future real estate markets must have as much relational data as possible to exist, be seen and be financialised or traded. Hence, the emergence of *Dashboard X* and the values it produces, circulates and makes true are closely bound-up with the processes and performativities of assetisation and financialisation that simply need metrics of difference in any guise (which may not align with the real estate market's usual emphasis on pricing). And so to wield the indexing machines that dictate these emerging metrics is also a

power to control future market realities and possibilities in terms of what can and can't be sold, and where or how it is sold. In this respect, *Dashboard X* helped BtR asset 'come into being' a little bit more for our clients, and therein lies the chief rationale for its use. And so, emergent data artist actors are not just needed to help investors "tick boxes" (Consultant 1) or to translate between new and old ways of doing real estate investing (Entrepreneur 1), but they are also needed to help bring new data-driven real estate assets and market realities into being.

Throughout the second part of this research, there has therefore also been an implicit emphasis that new values are not just about new prices or even new metrics. Instead, as I have argued elsewhere, "the accelerated circulation of new [real estate data analytics] metrics can therefore enable urban space to become a *newly knowable thing*, with *new historical possibilities and market opportunities*" (Shaw 2018, p. 5). Or, in other words, the emergent values are not just about numbers but also about producing new knowledges of value, and normative (political economic) assumptions behind the numbers in terms of what they are for, about or do to the world. This knowledge is strategic and transformational in terms of what it can do to the real estate market. And so new market devices like *Dashboard X* (and their metrics) become (quite intimately) bound up with what powerful real estate market actors desire from, and can do to, the world by adopting and using them.

In the case of *Dashboard X*, this research has explained how this single device has in fact put into circulation (or contributed to, since it isn't the only device of its type out there) an entire knowledge of gentrification that makes some very grand, significant, and often incorrect assumptions about the world. In addition to furthering the wider normative belief in a global land registry, perfect exchange and BtR (or wider rentier capitalism) as the 'solution' to Generation Rent, *Dashboard X* also conjures a scientific account of gentrification as a newly disentangled process and forcefully naturalised inevitability. It offers a knowledge of gentrification as something produced from the bottom-up by a certain privileged group of discerning and (above-all) valuable class of urbanites—an idea dubbed in this research 'the hidden hand of the hipster'. What this therefore means is that a new form of

strategic knowledge comes into circulation whereby real estate investors can act tactically via the adoption of tools like *Dashboard X*. Or, that they can reproduce this knowledge by making certain decisions around the *Gi* metric that further this particular vision of the world, and select a new truth whereby gentrification can be understood as a standard global urban process. When, in fact, it is known not to be. Questions and decisions of future global real estate investment in BtR then come to include "Do we need to put in a barista pop-up to keep them? And if we do, is it producing enough data?!"

9.3 Hyperreal estate and its discontents

> *RQ3. What are the political and theoretical implications of these new values for established and emerging urban real estate market actors and stakeholders?*

Through examining how *Dashboard X* was built, sold and known by the real estate market at large, it has been argued that such a market device contributes to the production of hyperreal estate market values. Including metrics, frames and knowledges which are in fact based on very little which is hitherto real, and yet are entirely capable of being adopted, used and then performing the type of world they were designed to see. In *Dashboard X*'s case this includes planetary urbanisation and gentrification, as well as myriad unforseeable counter-performativities due to the instability of its particular dioramic and situated gaze. This is the result of its 'God-trick' claim to see everywhere from anywhere, when in fact it emerged almost exclusively from my own situated, limited, and wannabe-Bohemian experiences of New York and London at one particular historical juncture. Nevertheless, this was a God-trick that was possible to align with the visions and desires of a small number of powerful real estate investors.

Aside from the fact that this means *Dashboard X*'s own particular form of hyperreality contains a great many contradictions (promising *mētis* but offering only *techne*, commensurating everything and in so doing making everything more incommensurable) and implies a potential for concerning counter-performativities

(sub-prime *Gi* scores or the creative destruction of its own wave-crest frontier at the point of use), *Dashboard X* is nevertheless a device that also clearly has a number of very real uses to BtR investors—"it's exactly what we want!" Where "exactly what we want" is not about added transparency, objectivity or rationality, but rather about the rhetorical power of wielding a tool or "one superb machine" (Software Developer 1) that can legitimise, make-real and enable certain things, decisions and realities. In other words, the only truly rational reason for a would-be data-driven investor to use *Dashboard X* is for its power to *change* reality (as opposed to its power to *represent* reality), because in most other ways its dioramic way of seeing is inevitably limited, partial and often downright wrong. Or, in the terms of MacKenzie (2006), investors want it because of its powerful properties as an engine and not because of its more limited functionality as a camera. Hence, moving beyond the theoretical implications of its performativities and particular hyperreality, this usage also has significant political implications of the ultimate and unwilling stakeholders in future urban real estate markets. Or, for those people that might not desire a world of gentrification, BtR buildings, hipsters and rentier capitalism—and evidence has been discussed why there's plenty of people who absolutely do not wish to see such a world transpire.

Here, the capacity of *Dashboard X* to reproduce a form of planetary 'hyper-gentrification' (Lees et al. 2016, p. 80) is also indicative of its use in a process that has been deemed a new urban colonialism in terms of its capacity to displace urban denizens everywhere through its aggressive pursuit of new profit frontiers throughout urban spaces the world over (Atkinson and Bridge 2005). The marriage of *Dashboard X* with discourses from Hernando de Soto Polar and our clients' desires to "wake up in Tokyo and check their portfolio in Santiago" is emblematic of this aspect to new data analytics products for real estate. They imply the exploitation of the gentrification frontier at a global scale, where the impulsive roaming of investors as 'vagrant sovereigns' is also an impulse to profit from dispossession and displacement. Additionally, to return to the design of *Dashboard X* in a young white-male dominated start-up garage, where the conditions for success in this brave

new world of data-driven real estate also require 'gifts of grace' that are emblematic of the white male privilege in the world of real estate at large, it's clear that there is also a deeper socio-cultural 're-boot' of colonialism that is emerging in this domain. And, as the modern-day chain surveyors, we were often too deeply (and joyfully) engaged in the creative triumphs of transforming and creating this new hyperreal process to think much about how its new assets it would be deployed and used.[1] For this reason, as well as the instability associated with accelerated financialisation and the dioramic gaze of *Dashboard X*, there is every reason to be concerned about the proliferation of such new market devices as they enable new and increasingly rapid and perhaps rash (or irrational) processes of capital deployment around the world. In other words, this is a dual concern for either the volatility they may bring to the existing market, or for the displacement, dissonance and contestation that they may perform on the ground through planetary gentrification.

9.4 Reflections on implications

Whilst this research is necessarily limited in its study of a particular data analytics prototype, it has also managed (both via *System X* and other examples in the market) to draw conclusions that are more broadly relevant to the domain of real estate data analytics. In this respect, the research has moved between scales from the case study to wider trends, discourses and phenomena within real estate. However, via the consideration of theoretical aspects to how these new market devices come to see and know the world—such as their apparent tendency to 'double down on high modernism' and wider capacity to produce and enact new strategic and scientific knowledges about the world like the hidden hand of the hipster—it is also argued

[1] There's a critical discussion of early land-conquest and survey as "creative activity by means of communication" in Lefebvre's (2014) discussion of information technology in his *Critique of Everyday Life* which supports this argument, where he points to the manner in which colonial-era men (specifically) "created the world ... with their own imprint", and could then control the market exchange that resulted from this colonial expansion. Unfortunately however, as with his failure to foresee that people may also come to produce vast amounts of data (e.g. see Lefebvre 2014b), this discussion does not foresee just how creative present day information technology can be in creating new worlds and markets (instead claiming that such creativity is diminishing because of technology), something this research has demonstrated to be incorrect.

that this research also says a lot about data science more generally and its position as the current *discipline du jour* for all sorts of domains and markets. Indeed, building upon literature in STS, valuation studies, and market sociology, this research has also demonstrated how one particular, and very modest, data-driven dashboard can capture the attention of a host of very powerful actors. Many of whom had the capacity to summon vast capital in relation to transforming existing urban space around the world. Whilst this is not the only research out there to demonstrate this, it is nevertheless important to re-iterate that this research supports the endeavours of critical data studies and associated fields in terms of the fact it has explained the very real capacity of data science tools, and the actors that design and wield them, to change the world in ways we may not want, or may not expect. And, to mediate the way capital flows through our urban environment for the benefit of those who wield the tools that decide what is a valuable investment or a good real estate future. The importance of simply demonstrating that this is occurring out there, behind garage doors and in boardrooms, should not be underestimated. And to add a new illustration of the nuances of the process is invaluable. This ethnography of *Dashboard X* is therefore a valuable explanation of how new data science tools are being deployed to enable the "few [to] obtain the right to express and to represent the many silent actors of the social and natural worlds they have mobilized" (Callon 1984, p. 19). And how the knowledges that they produce can contain powerful embedded assumptions about what worlds are possible and most desirable.

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Appendices

A

Interview consent sheet

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Research Information & Consent Form

1. Study title

Hyperreal Estate: Digital urban information as engine or camera?
(CUREC Reference: SSH_OI_C1A_16_018)

2. Background and aims of the study

This research study aims to understand how digital geographic information and new digital property valuation platforms are changing the urban property market. What new benefits or limitations do they offer investors and how might their use change property markets and processes of urban development. This research forms part of my doctoral (PhD) research at the University of Oxford and you may contact me with any further enquiries using the contact details listed above.

3. Why have I been invited to take part?

You have been invited to take part either because you are involved with these processes in a professional capacity that includes: A) Working on digital property valuation technologies or other types of urban information / Smart City technologies B) Working directly with the property market in a capacity that might include owning or investing in property or its valuation, or C) You hold other expertise on this subject. If you did not fulfil at least one of conditions A, B or C then you would not be asked to participate in this study.

4. Do I have to take part?

You are welcome to ask questions about the study before deciding whether to participate. Your choice to participate or not is entirely up to you and, if you agree, you may withdraw yourself and your data from the study without penalty at any time, and without giving a reason, by advising me of this decision.

5. What will happen in the study?

If you are happy to take part in the study then you will be asked to sign the consent form below. Your participation would mean being interviewed by myself about aspects of your personal engagement and knowledge of matters relating any of the subjects listed above. The interview will last for around one hour and can be conducted in a location of your choosing. The interview will be recorded using a digital audio recording device. This recording will be used only for the purposes of transcribing the interview into text for my personal consideration in relation to this project. The recording will then be deleted immediately after this process is complete.

6. Are there any potential risks in taking part?

Other than taking some time, there are no other risks or burdens that will be imposed on you through taking part in this study.

7. What happens to the research data provided?

Any data you provide will be kept confidential and anonymised before publication by removing all personally identifying information from interview transcripts. Please indicate on the consent form if you wish to not have your data anonymised before publication. Your personal data will only be accessible to the researcher, and will be stored securely on an encrypted hard drive. After the research has ended any non-anonymised data will be deleted. I would like to ask your permission to use direct quotes from the interview.

8. Will the research be published?

The research will be published in the form of a doctoral thesis and articles in peer-reviewed journals. Part of the research may be published as a monograph. The University of Oxford is committed to the dissemination of its research for the benefit of society and the economy and, in support of this commitment, has established an online archive of research materials. This archive includes digital copies of student theses successfully submitted as part of a University of Oxford postgraduate degree programme. Holding the archive online gives easy access for researchers to the full text of freely available theses, thereby increasing the likely impact and use of that research. If you agree to participate in this project, the research will be written up as a thesis. On successful submission of the thesis, it will be deposited both in print and online in the University archives, to facilitate its use in future research. The thesis will be published with open access.

9. Who has reviewed this project?

This project has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee, and the doctoral researcher's supervisor Dr Mark Graham. If you wish, feedback can be made available about the project after the investigation has ended and results have been published.

10. Who do I contact if I have a concern about the study or I wish to complain?

If you have a concern about any aspect of this project, please speak to Joe Shaw (+447966639353 / joe.shaw@oii.ox.ac.uk) or his supervisor Dr Mark Graham (mark.graham@oii.ox.ac.uk) who will do their best to answer your query. The researcher should acknowledge your concern within 10 working days and give you an indication of how he intends to deal with it. If you remain unhappy or wish to make a formal complaint, please contact the chair of the Research Ethics Committee at the University of Oxford (using the contact details below) who will seek to resolve the matter in a reasonably expeditious manner:

Chair, Social Sciences & Humanities Inter-Divisional Research Ethics Committee

Email: ethics@socsci.ox.ac.uk

Address: Research Services, University of Oxford, Wellington Square, Oxford OX1 2JD

UNIVERSITY OF OXFORD

Interview Consent Form

Your signature below indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researchers.

☐ I have read and understood the above information sheet provided by Joe Shaw on his research entitled: Hyperreal Estate: Digital urban information as engine or camera? (please check box if you agree)

☐ I am aware that my participation in one or more interviews with Joe Shaw is completely voluntary, that I can withdraw participation at any time without consequences. (please check box if you agree)

☐ I am aware that the information that I provide in this interview with Joe Shaw is completely voluntary. I am aware that I can withdraw information at any time and that I have the right to review and edit all publications and presentations pertaining to the specific information that I provide in the interview. (please check box if you agree)

I do ☐ I do not ☐ consent (please check one box) that this interview with Joe Shaw be recorded on a digital audio recording device. I am aware that the interview can proceed without being recorded. Even if I do consent to have this interview audio-recorded, I am aware that I am free to request that the audio recording be turned off at any point during the interview or discussion.

I do ☐ I do not ☐ consent (please check one box) to having my responses attributed to me by name in the results of this study by Joe Shaw.

I do ☐ I do not ☐ consent (please check one box) that my information from this project may be used for future projects conducted by Joe Shaw.

I do ☐ I do not ☐ consent (please check one box) that my information from this project may be placed in the Archives at the University of Oxford by Joe Shaw.

I do ☐ I do not ☐ consent (please check one box) that the researcher, Joe Shaw, can retain my information from this project for his own records, to be kept in a secure location by him.

_____ (Participant to provide initials)

_____	_____	_____
Name of participant	Signature	Date

A copy of this consent form will be provided for you, and a copy will be taken by the researcher.

B

Interview cheatsheet

Live demonstration of *Dashboard X* (5-10 min) + discussion and questions e.g.

- Have you used any of *Company X*'s products before, or anything like them?
- Have you seen anything else like *Dashboard X*?

Opening discussion topics

- In your current role, can you describe very briefly what your day to day roles and responsibilities are?
- Do you use any form of digital analytics to do your work? If so, how?
- What aspect of your work do you use the technology for?
- How many other products do you know of like the one you use?

Specific discussion topics (depending)

- On digital technology, platforms and your work
  - Is it better at doing what you want it to do that what you previously used (if anything)?
  - Do you find the that the technology helps more quickly in making a decision?
  - Do you find that the technology provides more rational or objective insight?
  - Has the technology ever betrayed you / given you false information?
  - Overall, has the technology changed the way you work with the property market?
  - Do you feel that it's inevitable that you will use more and more data analytics in the years to come?
  - Were you instructed or trained how to use the technology, or is your interaction with it very free?
  - Is it supposed to be used in a certain way and do you ever deviate from that?

- On digital technology and the real estate market overall
  - Has the technology affected your view of the property market in any way?
  - e.g. The technology shows us things we expect to see about the market?
  - e.g. The technology shows things that we didn't expect to see?
  - Discussions could include: Prices, rental values, the wrong/rightness of the market (e.g. rent too high!), boom and bust, cycles, etc.

- On digital technology and other market dynamics
  - Can we easily use the technology (and data behind it) to see patterns (e.g. 'stories') in the market?
  - e.g. Does the technology help you do any predictive analysis or look at trends and future scenarios?
  - e.g. Does the technology let you look at more "human" trends in the market rather than just relying on quantitative cash flow calculations of what might be an attractive investment?
  - If so, can you give examples of how the technology might do the following:
  - What sort of patterns and stories can we read from the data?
  - Are they fairly cold facts or are they quite rich stories?
  - Does the technology help 'demystify' market dynamics in any way?

- On digital technology trust/risk
  - Does the technology change the nature of trust in property investing?
  - e.g. Are we more likely to trust the data than the individual opinions of surveyors?

- e.g. Do face-to-face interactions still ultimately underpin trust?
- Does your technology help you manage the practical way you account for value in processes like assessing risk?
- Does it help you in your understanding of risk?
- What kind of (direct or indirect) evidence does it help provide to evaluate risk?

Changing the subject and final notes

- Do you think the use of the technology (e.g. dashboards) reduces human-influenced decisions based on market sentiment?
- Have you started to see the ways in which the technology (e.g. dashboards) is changing your colleagues attitudes, behaviours and beliefs around property valuation and investment?
- Is the technology (e.g. dashboards) purely exploratory as a tool (searching for investment), or would you consider referring an investor to its output as a part-justification for a particular investment decision?
- Has the technology (e.g. dashboards) successfully alerted you to something you then acted upon or plan to act upon?
- Can you give examples of any actions or decisions that the technology (e.g. dashboards) has assisted with? Were they direct or indirect?
- Are there any issues around using data analytics technology that you feel no one ever mentions?