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A vehicle for valorising the labour power of commuting: the politics of mobility fixing in Shanghai's Dockless Public Bike Sharing Sector

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Abstract

This paper seeks to contribute to ongoing debates around the politics of hybrid mobilities, smart cities, surveillance capitalism and mobility fixing. Based on a set of qualitative interviews with key stakeholders and secondary sources, the paper uses the emergence of dockless public bike sharing in Shanghai between 2016 and 2018 as its case study. In order to explain the emergence of dockless PBSS and illustrate our contention that this system seeks to create surplus value from the work of mobility (in this case cycle commuting), we examine the processes of valorisation that have occurred in order to both position PBSS as a worthy activity (and therefore remunerate participants affectively) and produce use values for the data generated by users. In doing so we also highlight the ways in which these processes of valorisation seek to ensure that the mobility work of users is not aligned with the products of that labour in order to avoid calls for this mobility work to be remunerated as wage labour (which would reduce any surplus value extraction). Ultimately we argue that these processes of valorisation are not only invasive, but exclusionary in that they prioritise select aspects of social practice that address matters of (governmental) concern, rather than a more rounded interpretation. We argue that there is an urgent need to recognise mobility practices beyond registers that simply prepare the ground for their marketisation.

Section 1: Introduction

In the field of mobility, the interactive capabilities unique to the smart city have arguably been deployed most clearly in what has become known as Mobility as a Service (MaaS) which Marvin et al (2016) define as the, 'intersection of intelligent infrastructure, digital economy and e-citizens' (Marvin et al 2016:1). In 2016 Dockless public bike sharing (PBSS2.0) was introduced in Chinese cities with the prospect of transforming urban transportation and putting cycling centre stage in the (MaaS) sharing revolution (Ma 2018; Sun 2018). We use the term PBSS2.0 to distinguish the flexible dockless system of bike sharing where a GPS enabled mobile phone and App is used to locate, unlock and return bikes in contrast to

docked/ fixed architectures of PBSS1.0'. The term PBSS2.0 also recognises the ability of users to feedback into the system in real time through the app interface, a feature also common to hybrid docked/dockless systems.' This new form of dockless/ flexible bike sharing set itself apart from previous systems in that it is financed and managed by private operators, and bikes are located and hailed using a mobile phone. On the face of it, this is a very simple system with obvious benefits to the user – the provision of a very low-cost bike which they have no need to store or maintain, and can pick up or leave almost anywhere they like (Chardon 2019; Ma et al 2018).

Since their introduction, the growth of PBSS 2.0 operations in Shanghai has been extremely rapid: having only started commercial operations in 2016, by August 2017 there were 1.5 million public bikes in the city, with two Chinese firms Mobike & Ofo dominating the market alongside many smaller firms, the vast majority of which had disappeared by mid 2018 due to intense competition (Ibold & Nedapil 2018). The initial expansion and success of market-led PBSS 2.0 also rapidly marginalized and replaced the existing government operated (and largely unsuccessful) docked PBSS 1.0 in Shanghai (c.f Lin & Spinney 2020; Sun 2018).

Despite their rapid growth, when looking at the financial performance of the two market leaders, Mobike and Ofo, it is clear that bike rental in and of itself is not a sustainable business model. The financial statements relating to Meituan-Dianping's (Chinese leading web-based shopping platform) acquisition of Mobike in 2019, showed that Mobike's monthly deficit was up to CN¥ 500 to 600 million (£50-60 million). Ofo, at a similar enterprise scale with Mobike, also spent around CN¥ 600 million on monthly operating costs (Crunchbase.com, 2019:n.p). To give another example, the fast-rising Hellobike (another bike share firm in China) had a reported 2017 revenue of CN¥ 128 million (£13million), yet its net loss for the year was 4 times greater at CN¥ 480 million (£50 million) (Ibold & Nedopil 2018:n.p). In line with many other platformised mobilities (Stehlin et al 2020), such numbers suggest that renting bikes alone is not anywhere close to putting these companies into profitability, implying that another source of revenue will have to be derived from their operations if they are to survive.

The inward investment patterns of Mobike and Ofo tell us a lot about what it is hoped those sources of revenue might be, and how their focus might shift if they are to survive. Of

particular interest is the presence of the internet giants Tencent, Baidu and Alibaba amongst the main investors of PBSS 2.0 (see also PBSS 2.0's spectrum of capital: JIGUANG Confidential, 2018:12). The presence of these tech companies represents a key distinction between PBSS1.0 and many hybrid systems which are largely funded through taxpayer subsidies and operating revenue. Indeed by 2020, according to local news media, all PBSS2.0 operators in China were being supported by a rich "internet daddy' (see https://finance.sina.com.cn/chanjing/cyxw/2020-06-22/doc-iirczymk8274453.shtml).

Zuboff asks the question, "If Google is a search company, why is it investing in smart-home devices, wearables, and self-driving cars? If Facebook is a social network, why is it developing drones and augmented reality?" (Zuboff, 2019:127). We can ask a similar question in relation to PBSS2.0: if Tencent and Alibaba are search companies, why are they interested in bicycle rental? In this paper we suggest that the most convincing answer is that companies such as Tencent and Alibaba with a pre-existing interest and expertise in extracting and analysing behavioural surplus data, see in PBSS 2.0 a way of expanding the scope of their extraction operations by gaining access to data regarding another social practice, in this case the daily mobility of cycling. As Zuboff states, an interest in a wide array of activities that appear to be, "…scattershot across a random selection of industries and projects are actually all the same activity guided by the same aim: behavioral surplus capture" (Zuboff, 2019:127).

Whilst PBSS2.0 is rapidly evolving and evidently can have a role to play in urban mobility systems, this chapter seeks to bring a much-needed critical perspective to bear on the largely obfuscated workings of such platform urbanism (see also Lin & Spinney 2020; Stehlin et al 2020). As a result, in some ways this paper is not about cycling at all, but about the ways in which the bringing together of two forms of mobility – virtual and physical - create the grounds for new avenues of accumulation and surveillance to emerge in the smart city. Indeed, as Zuboff (2019) argues, applying a broader critical lens to such systems strips away "… the illusion that the networked form has some kind of indigenous moral content, that being 'connected' is somehow intrinsically pro-social, innately inclusive, or naturally tending toward the democratisation of knowledge" (Zuboff, 2019:9). Drawing upon literatures in surveillance/ data capitalism, political-economy, and mobilities we theorise PBSS2.0 as a hybrid apparatus of smart-phone and bike deployed to generate behaviour in order to extract

surplus value from it. Following Zuboff (2019) we argue that PBSS2.0 is constitutive of an emerging ecosystem of objects that represent an unprecedented penetration of data capitalism into everyday social reproductive activities.

In line with this, this paper builds upon the work of Spinney (2016) on mobility fixing - the idea that problems of accumulation are addressed through mobility - but takes it in a slightly different direction. Here we argue that PBSS 2.0 represents a form of mobility fixing because in bringing together physical and virtual mobility, new opportunities for accumulation emerge for surplus value to be extracted from already existing/ newly induced social reproductive practices. In such a reading, the surfeit of mobility produced by unsustainable land-use patterns in the modern city represents a form of labour power that within the apparatus of PBSS1.0 could not be put to productive use; many of its potentially commodifiable traces remaining 'latent' and unrealised (Standing 2014:966). However, due to the new socio-technological arrangements of PBSS2.0, many latent traces of mobility can now be 'valorised', which we define as the process through which capital is produced and increased.

What we focus on in this paper are processes of valorisation that are initiated in order for the work of the PBSS2.0 user to be (sur)rendered into the raw material for potentially valuable predictive products. These processes of valorisation include those aimed at consumers in order for them to interpret the activity as valuable and meaningful and engage in it in the first place, but also those activities that seek to separate the value produced from the labour of mobility in order to maintain a potential surplus. As we argue here, these processes of valorisation are effectively processes of economisation as the interests of different actors are aligned or obfuscated in order for commodity relations to be extended "…into spheres not currently subject to the logic of accumulation" (Jessop 2002:29).

The structure of the paper is as follows: In section 2 we situate cycling in broader work on mobility, smart cities and platform urbanism to make a case for more critical examination of the links between virtual and physical mobility, and data. In section 3 we focus on the relationship between PBSS2.0 and surveillance capitalism, conceptualising processes of valorisation that seek to both position PBSS2.0 as worthy and monetisable, but also maintain its separation from the world of waged labour. In section 4 we bring these insights together

to make the argument that valorisation of social reproductive mobility activities is becoming central to fixing problems of accumulation. 'Smart' technology, and in particular the ability to create new opportunities at the intersection of virtual and physical mobility underpins this endeavour. In making this case we also caution that these processes of valorisation are not only invasive, but exclusionary and unjust.

Writing on transport and justice has burgeoned in recent years (Koglin 2017; Koglin & Rye 2014; Lucas et al 2019; Martens 2017; Verlinghieri & Schwanen 2020). Whilst much of the literature has focused on distributive justice, social exclusion, issues of measurement and accessibility (Martens & Lucas 2018), others have started to flag injustices at the heart of hybrid mobilities and platform urbanism. Sheriff et al (2018) for example show how micro-mobility platforms reinforce spatial injustices by only operating in already highly mobilised CBDs. Stehlin et al (2020) alternatively highlight a potential shift away from democratic governance in planning due to privatised control of the data required to govern urban mobility through digital platforms (1262). Just as Koglin (2017:33) and Koglin & Rye (2014:216) have emphasised the marginalisation of democratic participation in post-political physical urban planning for cycling, this risks being compounded by injustices wrought in the virtual realm by a lack of transparency.

We also argue that such practices are exclusionary in that they prioritise select aspects of social practice that address matters of (governmental) concern, rather than less measurable or commodifiable aspects. We argue that there is an urgent need to recognise mobility practices beyond registers that simply prepare the ground for their marketisation. Following Dowling (2016), we question processes of valorisation that tether social reproduction to a productivist logic of economic growth and capital accumulation; and argue for "…alternative conceptualisations of value to those that congeal value in quantifiable, monetisable metrics" (Dowling 2016:464). We acknowledge that we are clearer on what these conceptualisations are not (e.g the commodification of the traces of mobile practice for profit), than what these alternatives might be, but reflect on some possibilities in the conclusions.

Section 2: Mobility, in the smart city

Writing in 2006 Sheller & Urry laid claim to a broad 'new mobilities paradigm' and set out a diverse agenda for mobilities researchers. One of the themes they highlighted was the need to study the intersection of virtual and physical mobility. They argue that hybrid mobility (between physical and virtual) should be a central field of enquiry and that mobilities research should question how such intersections are "…mobilised, or performed, through ongoing socio-technical practices, of intermittently mobile material worlds" (Sheller & Urry, 2006:211).

Due to the increasing convergence and 'always on-ness' of physical and virtual mobility, De Souza E Silva has argued that we are seeing the emergence of hybrid spaces that flow from "…the combination of physical and digital spaces, along with the social use of location-aware technology" (de Souza 2017:21). Such hybrid spaces emerge from the conjunction of our ability to be always connected; to be physically mobile whilst in virtual space; and to be virtually mobile in physical space. As Kitchin & Dodge (2011) have argued, "…the nature of many objects and the material processes that constitute everyday life are being remade in quite radical ways—objects are being alternatively reconfigured and defined, they are gaining additional capacities to do additional work in the world, and the world can do more work on and through them" (Kitchin & Dodge 2011:59).

The use of technology in the field of mobility is hardly novel, but in recent years many existing technologies have been re-branded/ re-assembled under the umbrella of 'Smart' technology and located under the smart cities banner. Townsend (2013), defines smart cities as, "places where information technology is combined with infrastructure, architecture, everyday objects, and even our bodies to address social, economic, and environmental problems" (Townsend, 2013: 15). Krivy (2018) meanwhile states that those who champion the Smart City, "…share a conviction that the ubiquitous presence of digital, interactive technologies in urban environments, households and as citizens' personal devices will optimise patterns of consumption and communication, and assert the centrality of interactive Big Data – as real time streams and cumulative patterns – in perfecting urban dynamics and governance." (Krivy 2018:8). Hence the SC is many things to many people, but as Krivy goes on, in line with other urban entrepreneurial paradigms (such as the creative city; sustainable city), this elusiveness

is part of its appeal as it can be adapted depending on the goals of those who deploy it (Krivy 2018:8).

Behrendt (2016) has argued that smart cities and intelligent transport are closely related because of their reliance on networked and sensor technologies (158). She makes a distinction between the Smart City which describes the broader urban environment and infra-structure, and the Internet of Things (IOT) as the physical/ virtual objects that constitute these networked environments (ibid). Behrendt goes on to argue that the integration of cars and public transport into the IOT have been the key areas of interest in the domain of smart/intelligent transport with an emphasis on driverless cars and car sharing (Burns, 2013; Greengard, 2015: 167ff in Behrendt, 2016:158).

Kitchin et al (2017) note that much of the attention related to the SC has been of a technical nature, concerned with how to create and implement "…suitable smart city technologies, and associated institutional and infrastructural supports such as data standards, protocols, policies…" (2017:20). This is clearly the case with PBSS2.0 where empirical investigation has been largely focused on instrumental, operational and managerial aspects. A number of studies have focused on the economic, environmental and health benefits of PBSS (Caulfield et al, 2017; Lin et al, 2011, 2013; Shen et al, 2018; Lu, 2016). However, the bulk of PBSS research has focused on operational issues, with substantial research on parking (Lin & Yang, 2011; Midgley, 2011; Paul & Bogenberger 2014); maintenance (Furth et al 2016); location (Shi et al 2018; Zhang & Mi, 2018); and redistribution of bicycles (Schuijbroek et al 2017). Whilst insightful, this is a largely instrumental literature geared towards convincing policy-makers of the benefits of PBSS and giving best practice advice on how to implement and maintain systems to maximize benefit and profit (though c.f Chardon 2019 for a critical review of bike sharing).

An interesting side effect of the shift to increasingly hybridised forms of mobility – part of what Stehlin et al (2020) call 'platform urbanism' - is the ability of such mediums to both produce, record and combine different elements of ourselves in what has been termed 'datafication'. As Millington has commented, a variety of software apps (such as fitness tracking, Location Based Social Media, and mobile gaming apps) increasingly harness the

possibilities available from the intersection of physical and virtual mobilities for individuals to quantify and know themselves (2014:480). Moreover as Kitchin and Dodge state, this proliferation of internet-enabled things facilitates and shapes everyday tasks and routines in both banal and profound ways (2011:61).

However alongside the ability of such coded objects to provide personal insight and utility comes the ability of corporations to know, commodify and share everyday user practice by gathering and selling data on their habits and preferences (Williamson 2015). As Stehlin et al contend, platform urbanism represents an 'emergent mode of "smart city" development' where urban space becomes a mineable resource of data generated by everyday practices (1253). To-date Zuboff (2019) has published the most convincing and complete account of this phenomena in 'Surveillance Capitalism'. Her focus here is largely on the big Search and social media giants like Google and Facebook. She makes a convincing argument that uses and updates Marixst political-economy to argue that surveillance capitalism utilises the collateral traces of online behaviour to constitute a behavioural surplus (Zuboff 2019:78). This is then combined and processed with other 'raw' data and monetised in the form of 'predictive products'. As this suggests the increasing ubiquity of smart mobility technologies comes with 'an ever-growing tsunami of indexical data' (Kitchin et al, 2017:20) the study of which requires a critical approach.

Within the IoT/ smart cities nexus, cycling – and PBSS specfically has received very little critical attention (ibid) despite - as Schwanen (2015) has noted - the relatively early symbiosis of cycling and apps. A small number of studies have tackled issues of governance in PBSS. Griffin and Jiao (2018) for example have analysed the efficacy of crowd-sourcing public preferences for docking locations. Fishman et al. (2014) have explored the role of the state in the regulation of shared bicycles, showing that it has at best been loosely strategized. Guo et al. (2014) highlight the additional problems that PBSS brings to government with requirements for new legislation, industry supervision and infrastructure support. Echoing this, Yoon et al (2012) point to the time-lag between the appearance of PBSS as a new urban innovation and any corresponding governance and management structures. Huré & Passalacqua (2017) argue that new "government-market-society" forms of coordination

found in PBSS2.0 reflect a response to failures of both the market and government intervention in previous iterations of PBSS.

A number of studies have examined the use of behavioural surplus in relation to cycling with regard to self monitoring (Piwek et al., 2015); health tracking (Griffin and Jiao 2015; Mone 2015); and sports (Romanillos et al., 2015). As Behrendt comments, these are all examples of the datafication of cycling where information on use and experience is collected and analysed at scale (Behrendt, 2016:158). Whilst some research has been published in relation to the tracking of leisure cyclists (Gossling 2018; Musakwa & Selala 2016) and sale of data to municipalities, aside from an exploratory study by Spinney & Lin (2018), no studies exist into the relations between public bike sharing and the use of rider data. Indeed as Hall and Ince (2017) state in relation to sharing economies more broadly: "…within this multiplicity of economic and organisational forms, the universally positive idea of sharing has…acted as a smokescreen for sharing-focused businesses to undertake various strategies of capital accumulation that impact negatively on their clients, workers and broader economic environments (5). In a 2019 paper, Chardon for example demonstrates that limited benefits accrue to city administrations from PBSS which he argues represents a less just and sustainable transportation option in most cases. Spinney & Lin (2018) have begun to explore the ways in which PBSS reshapes social and economic relations, concluding that relations being produced through PBSS 2.0 – to use McLaren and Agyeman's (2015) term – are transactional rather than transformational in the way they re-orient different actors toward each other. As Stehlin et al (2020) note, it seems that platform mobility is less concerned to produce "…governable individuals than about producing subjects whose activities generate the data used to govern" (1263; see also Lin & Spinney 2020). In this paper we seek to build upon these insights to highlight in more detail the processes of valorisation through which users are enrolled and become productive in the context of PBSS as a form of surveillance capitalism.

Section 3. Valorising the work of mobility in PBSS2.0

Zuboff (2019) defines surveillance capitalism as, "a new economic order that claims human experience as free raw material for hidden commercial practices of extraction, prediction and sales" (8). She persuasively argues that we are entering a new era where surveillance – embedded in our everyday lives - becomes the foundational mechanism in transforming investment into profit: "under this new regime, the precise moment at which our needs are met is also the precise moment at which our lives are plundered for behavioural data. The result is a perverse amalgam of empowerment inextricably layered with diminishment." (Zuboff 2019:53). French & Smith (2016) highlight that the dawn of surveillance capitalism – pioneered by the likes of Google and Facebook - is being enabled by rapid growth in the personal information economy where multiple devices track and record seemingly mundane details of everyday life, conjoined with innovations in the ability to digitally extract, synthesise and visualise this data (5). As Zuboff argues, this business model is reliant on the creation/ extraction of what she calls 'behavioural surplus'.

To have a surplus of something means to have more than is required for a given purpose. Surplus value in the context of economic production thus refers to the creation of more value than is required to cover production costs (Tyfield 2009: 500). The extraction of surplus value is essential for the accumulation and reproduction of capital (and profit) and therefore represents the fundamental economic motivation underpinning capitalism (Mavroudeas & Ioannides, 2011:421). As Tyfield is at pains to point out, capital can never be self-regenerating, it can only 'revalorise' itself through manipulation of labour power[1] (Tyfield,2009:500). Surplus value is generated by exploiting labour which is divided into a paid and unpaid part: "the first part corresponds to the value of labour-power (and ultimately to the wage) and the second to surplus-value (and ultimately to profit)" (Mavroudeas & Ioannides, 2011:421). As

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[1] We want to be clear at the outset on the distinction between labour and labour power. Following Standing (2014), we define labour 'as the activity of working for wages or 'social income' (966); e.g work that has exchange value. Labour power on the other hand describes a broader idea of the individual (beyond the identity of worker) as possessing "…a bundle of capacities or capabilities, realized in 'skills' and latent in undeveloped 'talent'…" (966). The key conceptual difference here is the idea that labour power is 'capability power', because it highlights the fact that when engaged in an activity only some of the work being done is realised or valued as exchangeable labour; the rest remains latent because it is either not valued or uncommodifiable.

Mavroudeas & Ioannides (2011) state, there are a number of ways in which surplus value can be maximised in the production process: extending the duration of labour; the intensity of labour; or changing the technical constituents of production (426).

Given real-world constraints on the ability to reduce wages, extend the length of the working day etc, a central way in which surplus value is increasingly extracted is to utilise technology to exploit the labour of social and ecological life (Dowling, 2016:456) – forms of 'social reproductive' labour that are unpaid but without which paid labour cannot take place. Dowling states that social reproductive activities are those that, "…whether acknowledged or remunerated as such or not, constitute work which is of value in economic terms because of its role – not to say necessity – in producing the labour power required for waged labour to be undertaken with its appropriate physical, emotional and mental capacities, dispositions and subjectivities" (Dowling, 2016:453). Whilst social reproductive activities (including things like the journey to and from work) are vital in producing labour power, the capitalist ensures that these are excluded from waged labour because they would increase production costs and lower the rate of surplus value extraction. It follows that the more capital can either "…commodify and marketise (and thus charge for) social reproduction, or the more social reproduction is made invisible by uncoding it as work, the more its cost can be externalised." (Dowling 2016:455).

Certain forms of mobility – most notably the commute to and from a place of work - are therefore best conceptualised as 'reproductive work' in that they are essential to capitalist production but are themselves unproductive. As such the exclusion of travel time from productive labour time is essential to increasing relative surplus value because it effectively increases unpaid work time and therefore represents a reduction in the value of labour power. As Mavroudeas & Ioannides (2011:429) argue, "this means that workers are paid less than required for their social reproduction. This is sustainable in the long run so long as this reduction affects only the social component of the value of labour-power." This is evidently the case with travel time because (unless it is very long or arduous) the presence of a journey to work does not negatively impact upon the productive component of labour power.

However, precisely because of its exclusion from wage labour, the work of mobility cannot be monetised and exploited to the advantage of the capitalist. Yet given capital's restless search for new markets and sources of labour to exploit, it is advantageous for the capitalist to bring that very mobility into alternative circuits of capital as part of a process of valorisation whereby aspects of the 'unproductive' work of mobility can be transformed into productive labour. As Cerny (2006:690) comments, the competitive state[2] is not only one whose economic policies focus on promoting competitiveness, but one which attempts to incorporate competitiveness into everyday social reproduction. Accordingly, the role of particular fixes in urban governance has thus become much more oriented to the provision of new environmentalities that enable productivity to be enhanced in other ways. Gabrys (2014) argues that the production and performance of the subject, are governed by, "an environmental type of intervention instead of the internal subjugation of individuals." Gabrys (2014, p. 34) calls this 'environmentality' where influencing the "rules of the game" is accomplished through the modulation and regulation of environments (or 'platforms') rather than merely "subject-based or population-based distributions of governance." (ibid). As this suggests, the ways in which the work of mobility can be valorised through the creation of new mobile landscapes and related material-political relations becomes an important focus of attention.

Section 3: Valorising the work of mobility

In the following section we use the example of PBSS2.0 to discuss the different ways in which value forming labour is applied (valorisation) to the work of mobility in order to realise elements of the potential of labour power as productive labour. Here we employ Dowling's (2016) distinction between two ways in which labour can be valorised: the first is that of *self-valorisation* where the (entrepreneurial) individual is encouraged to ascribe value to work being done (and in doing so code it as positive and acquiesce to bearing the cost); the second is *capitalist valorisation* where surplus is produced by limiting remuneration/ externalising the costs of reproduction (Dowling, 2016:456). Whilst there is evidently a relation between the two, the distinction is useful in understanding complementary processes of alignment and dis-alignment through which worth is assigned to social reproduction whilst value (and therefore any need for remuneration) is obfuscated.

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[2] It should be noted that the state in such a reading is increasingly a collection of municipal actors.

Dowling's distinction around valorisation fits neatly with what Zuboff (2019) calls the 'two texts' generated by the activities of surveillance capitalists: the first is a public facing text where the user is both reader and writer, and is made aware (selectively) of the data being produced, often through the interface of a smartphone app. This first text however links to and is the supply operation for a second 'shadow' text which is a 'read only' text for the surveillance capitalist and which is constituted from a far broader array of user data than is fed back to the user in the first text (Zuboff, 2019:180). Dowling's ideas of valorisation link to this because the first text works to extoll the benefits of the activity to the user, and in so doing represents a technique of self-valorisation because the individual is encouraged to ascribe value to the work being done. The second text relates to Dowling's idea of valorisation as a process of limiting remuneration/ externalising costs because it is precisely the labour applied to hide the second text that means the surveillance capitalist can argue that there should be no waged remuneration, because as far as the 'worker' is aware, there is no second text and therefore no product or surplus value being produced.

3.1 Self-valorisation: framing the worth of bike sharing

In line with Dowling's distinction, in this first section we examine the ways in which PBSS2.0 enables cycling as an activity, but also provides a framework through which users can interpret it as positive and therefore be 'affectively remunerated' for their work. Importantly, the value of the activity remains in affective registers in order to ensure that it cannot be seen as labour that has a wage value and should be remunerated accordingly.

Cycling has for some time been lauded for being environmentally sustainable, space efficient and healthy; digitally enabled sharing economies have been promoted as more pro-social and pro-environmental ways to organise consumption (Hall & Ince 2017; Richardson 2015). In line with this, the new opportunities afforded by PBSS2.0 are given value through associations between cycling, sharing, and sustainability, with the management of Mobike and Ofo situating the origins and activities of their operations as pro-social and driven by a desire to solve urban problems and improve the lives of citizens:

"Bikesharing has changed Chinese urban residents' mobility habits – people take 55 percent fewer trips by cars, and illegal motorcycles that used to provide 'last-mile' transportation solutions have been reduced by 53 percent. Every shared bike is a valuable data source that can help us to better understand urban residents' behaviour and to plot a zero-carbon path for not only Chinese cities, but cities around the world as they begin to adopt this technology" (Tan & Defei 2018:n.p).

"As we integrate eco-friendliness, technology, and commerce together, it will turn out to be something extraordinary. We can make eco-friendliness a lifestyle and a sustainable business model at the same time," (Hu Weiwei cited in UN 2017:n.p)

As these statements attest, whilst they are profit-driven companies, much like the leading surveillance capitalist firms, PBSS2.0 operators seek to valorise the operation of PBSS by framing it within a civic narrative of making the lives of citizens, and the management of cities more efficient and sustainable. Just as Dowling argues that volunteer projects tend to try and produce social value by reducing societal externalities such as the costs of homelessness, poverty and ill health (Dowling, 2016:459), in the transport sector, cycling has much in common with volunteerism in that the social value it is seen to produce principally combat externalities such as environmental pollution, ill health from sedentarism, and congestion from subsidised motor transport. To paraphrase Dowling, it would appear that the promotion of particular aspects of PBSS2.0 represents an attempt to meld an individualist form of transportation with a collective ethic "…thus exploiting social cooperation to produce a kind of 'win–win' situation to address a triple crisis of legitimation, social reproduction and economic growth" (Dowling, 2016:458). To clarify, the linking of PBSS2.0 with sustainability and sharing represents a process of valorisation because it legitimates as socially valuable what might otherwise be labelled just another rental company; enables the work of social reproduction (the commute) to be commodified as labour; and in doing so potentially enhances economic growth by enabling idle capital to be invested in an industry mining resources and manufacturing new (predictive) products.

3.2 The valorisation of urban efficiency

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One of the reasons why the kinds of real time user data generated by PBSS2.0 platforms are are seen as potentially valuable in such contexts is because of their actuation capabilities: "…the real power is that now you can *modify* real-time actions in the real world. Connected smart sensors can register and analyze any kind of behavior and then actually figure out how to change it. Real-time analytics translate into real-time action." (Zuboff, 2019:278). Indeed, Defei (Mobike Chief Engineer) goes on to state that PBSS2.0 data provides a much more granular, "real-time expression of each city's density and the transportation dynamics between where people live and where they work", and that alongside new open-source standards, it should be possible to aggregate and analyse data from different companies (Tan & Defei 2018:n.p).

The ways in which user data from PBSS2.0 are analysed and the predictive products manufactured from the data are also evidently part of a process of valorising PBSS by constructing it as a key part of the rational smart city. Central to this endeavour is a process of experimentation devised to try and ascertain the use value of PBSS route data. A 2018 article co-authored by Mobike's Chief Data Scientist states that, "MoBike is partnering with seven Chinese cities […] to use their data for evidence-based urban planning in public transit gaps, property development density, and to facilitate intelligent transport dispatch" (Tan & Defei 2018:n.p). Such opportunities were also something talked about by planners and industry representatives in our interviews:

> "It is valuable to use big data for city's future planning…since the bicycle is mobile and the index completely based on real situations" (Mr. Shen interview, PBSS Manager)

> "From the government's side, big data is very good to analyse and utilize, but has yet to start…we consider to gather data from parking, motor vehicles and non-motor vehicles use….we are now working on parking problems and we will ask them [PBSS2.0 companies] to give us data for analysing. (Senior Official interview, Shanghai Pudong Transportation Commission)

As these comments suggest, interviewees from different Shanghai municipal departments confirmed that they had an interest in using the data from PBSS operators to assist analysis of parking and route requirements of non-motorised vehicles. This confirms that there is a potential use for real-time predictive products manufactured from PBSS2.0 user data. However, it was also evident that PBSS2.0 operators were effectively trialling the analytic-industrial processes through which they could define the uses of the data in the hope of adding value to the data. Interviewees confirmed that the big PBSS operators had collaborated with university research institutes to understand how to analyse the data they had, but that any insights generated had yet to make their way to government departments with operational responsibility:

"The PBSS enterprises usually find and provide funding to research institutes, and institutes conduct data analysis and report for them […] This research usually refers more to symbolic functions or business lobbying; it is like Google develops a big data system for information development and management, in order to distinguish itself from other companies: I am Mobike and you are not Mobike; I have big data and rational analysis, and you don't" (Mr Hsu interview, Shanghai Urban Planning and Design Research Institute, 2017)

"Mobike has set up a public digital platform with THUPDI (Tsinhua Planning Design Institute) and Ofo has cooperated with the Research Institute of Highway Ministry of Transport. I think the quality of data that the company gives research institutes is poor because these are commercial secrets…and why would they share the real situation with the Institute or the public?" (Mr Fong interview, Shanghai Municipal Engineering Design Institute, 2017)

Evidently it is far from certain that these processes will yield surplus value, but the more apposite point is that the simple fact of trialling the analytics is part of a process through which as yet unvalued aspects of the work of mobility – the labour power of movement - that constitutes mobility are valorised in the eyes of city administrators (and end-users) by helping to position the data/ behavioural surplus generated as central to the production of a more rational, scientific and data-led planned city. These exploratory analytic processes are

then (at least in their early stages) less about solving urban problems, and more about valorising aspects of mobility as labour power by framing its worth in particular registers.

3.3 Functional and affective remuneration

Beyond its framing as contributing to urban civility and efficiency by PBSS operators, it is evident that users can actively enjoy using PBSS2.0, becoming invested into the enterprise as something physically enjoyable, useful and civically worthy. As such, the user is 'affectively remunerated' for their work, a term that Dowling (2016) uses to describe the 'affective gains' such as 'a heightened sense of well-being' and 'enhanced capacities/ skills that arise from participation in an activity (Dowling, 2016:453). Writing in relation to volunteering as a form of unwaged labour, Dowling argues that the affective structures produced "…can range from self-regarding feelings of individual merit to other-regarding feelings of empathy and connection, to charity giving (and receiving), to mutual aid and solidarity" (Dowling, 2016:457-8). Whilst Dowling uses the term affective remuneration in the context of volunteer labour, when applied to the sphere of mobility work, and cycling specifically, it is clear that there can be an affective reward for those who use PBSS2.0 as the moral feelings of doing good, and embodied feelings of being active and accomplishing a task form an affective reward for participating in the practice.

Integral to this enterprise is the PBSS2.0 mobile phone app as an interface that quantifies and plays back specific information to the user. Here we draw upon the work of Schwanen (2015) who argues for a focus "…on particular apps with their specific qualities" (2015:677) because of their diverse and often invisible effects (679). Schwanen also suggests that we should focus on not only the 'Telos – the mode of being' to which apps encourage us to aspire to, often indirectly beyond the realm of everyday mobility (680); but also the relation through which they 'capture' users such as competition or reward (681).

Both the Mobike and Ofo apps represent three main elements of the journey back to the user as important: time taken for the journey; calories burnt; and CO2 saved. The app clearly provides a teleological framework for becoming the 'right' kind of subject and interpreting the work of cycling as positive: the quick worker is civically responsible by being efficient and not wasting time stuck in traffic; the active worker is one who is healthy and productive; and

the worker who is emitting less CO_2 is being a responsible local and global citizen. In replaying to the worker all the good they are doing through the app interface – burning calories, saving time and reducing carbon emissions: the app attempts to produce a subject with an enhanced sense of citizenship. In the selective definition, filtering and quantification of particular qualities, we see certain aspects of mobility valorised as worthy in order to form a reward-based framework for affective remuneration.

Figure: Images of app interfaces

The significance of <mark>providing a framework to interpret affects in particular ways</mark> is twofold: relating this to economies of action (instigated to induce desired behaviours), the app attempts to ensure that users continue/ increase the amount of cycling by playing back to them the productivity, health and environmental benefits of doing so. The reasons to do so are to ensure that the apparatus of extraction (that PBSS represents) enables users to meet goals (often set by the apparatus itself) so that they continue to participate in the generation of data. As Galloway has argued, subjects are 'liberated' in the society of control as long as they perform certain 'desired' forms of mobility (Galloway, 106 in Krivy 2018:19). More importantly however, the app and the information that it is tasked to record, quantify and feedback to the user provides a framework through which the user can not only interpret the work of cycling as positive (and therefore feel remunerated affectively), but also frames a calculative encounter through which they can actually 'measure' the amount of personal and civic remuneration generated through participation in the activity. In so doing, it is much easier for the user to place a value on the affective remuneration afforded by the activity.

However, as a corollary of this process, the more fuzzy and less quantifiable particular aspects of PBSS2.0 usage are, the more they are systematically devalued. As Dowling argues, "…where valorised, processes of valorisation themselves involve a systematic devaluation of the labour of social reproduction precisely in order to extract surplus value from it" (Dowling, 2016:453). To clarify, it is clear from the information played back to the user (journey time, calories, CO_2) that the aspects of mobile practice that are quantified all address matters of concern to the capitalist – urban efficiency, public health, and pollution. That is not to say these cannot also be important to the individual, but as Dowling goes on to argue, the work undertaken and

any intrinsic reward it may have, are recoded and inscribed with an "…ideology of entrepreneurialism and self-interest" which serves to re-orient the activity "…towards a logic of individual utility maximisation (albeit premised on social cooperation), thereby transforming the affective structures in which it occurs" (Dowling, 2016:458). Indeed, it becomes ever more likely that the aspects of the activity played back to the user are those that they will deem to have worth and value precisely because they are the ones that are made visible.

3.4 Valorisation as a process of obfuscation

One question we might ask is why an individual would agree to do the additional work of commuting by bike, or why they would agree to a third party making a profit from work they are undertaking if there is no monetary wage involved? Beyond the fact that they may already feel remunerated affectively, the primary answer here is that the user probably doesn't know that additional extraction of surplus is taking place, a process that Harvey (2005) has termed 'accumulation by dispossession'. As Fletcher and Rammelt (2015) summarise, all new economic value (and therefore profit) arises from a combination of surplus value appropriation of productive labor; the externalization of social and environmental production costs; and shifting value between different groups, (accumulation by dispossession) (Fletcher & Rammelt 2015:460). Using Harvey (2005), Zuboff argues that surveillance capitalism represents a form of accumulation by dispossession whereby assets are released at very low or zero cost (Harvey 2005:153 in Zuboff, 2019:99).

We argue here that this logic is clearly at work in PBSS2.0. If it were not, then the commuter would receive a wage (perhaps in the form of a dividend) from any profit generated by the sale of the data they generate in the act/work of commuting. Whilst the user is arguably 'paid' in that they get access to a free/ subsidised bike, they do not receive any kind of monetary wage or remuneration (beyond the affective) for the work of commuting (and the products that work may generate). If commuters were paid for the labour of their commute, the profit margin for the surveillance capitalist on the sale of user data would likely be reduced to the point where any profit was marginal or non-existent. As a result, dispossession becomes a key strategy to maximise the potential for surplus value by maintaining a disconnection between the labour undertaken and its exchange value/ surplus value produced. Indeed, the ability to

appropriate and valorise the everyday (unpaid) reproductive labour of citizens through the deployment of extraction architectures and machinic processes is fundamental to new forms of accumulation.

Zuboff argues that, "digital dispossession is…a continuous coordination of action, material and technique" (2019:100). One of the main techniques through which dispossession is enacted is in the form of contracts. These tend to be very lengthy which in itself is a strategy that discourages meaningful engagement with the relationship being legally enshrined, and encourages users to simply 'sign on the dotted line' and 'sur-render' their data. For example in one study of smart technology contractualisation, around 74% of users opted to not even see the terms of Service, and almost all of the remaining 26% scrolled straight through to hit 'accept' without reading the contract (Zuboff 2019:225). Research has found that on average the contracts accompanying smart devices would require 45 minutes for adequate comprehension, but the average time devoted is 14 seconds (226). Compounding this, the 'where' of contracts also matters. As these contracts come bundled with the mobile phone app, they are almost always 'read' and accepted at the point of use when impatient users - who can already see and touch the service/ device on offer - are much less likely to carefully read and digest the terms of service.

Further intersecting factors are the intangibility and timing of data extraction. As Zuboff has argued, "…dispossession operations rely on their virtual capabilities to kidnap behavioral surplus from the nonmarket spaces of everyday life where it lives." (Zuboff, 2019:137). As this suggests, it is partly the invisibility of the data being generated by PBSS2.0 that means we are more likely to part with it at no cost. If someone very obviously takes something from us – a physical object, or an hour of our time – we will generally fight to be remunerated. However, behavioural surplus as a 'trace' is intangible in at least three ways: firstly because it is an immaterial trace of movement; secondly because it is quite likely the individual was already undertaking the activity (e.g getting to work) and therefore there is no perceptible increase in the amount of 'work' being done; and thirdly the data 'mined' from mobility is stored 'somewhere in the cloud'; invisibly out of sight and reach. Susan Leigh Star (1991) asks a pertinent question with regard to how to make the invisible, visible in social enquiry? In line with Zuboff she argues that forms of social control are tied to the erasure of practical activities

that stabilise them. ==The process of ensuring behavioural surplus derived from PBSS usage remains intangible (e.g not overtly displaying the raw material or product to the user) exemplifies such a form of social control precisely because it suggests that there has been no change in the social relations of production==: no labour is being done and no product produced.

Compounding this, as Mavroudeas & Ioannides (2011) point out, there is a significant gap between when the commuter performs the work of mobility, and when surplus value from it may be realised: "…there is usually a considerable time-lag before workers actually comprehend that their work has been intensified, because a change of the technical conditions of production involves, to a greater or lesser extent, a change in what a worker actually does during his work. These changes inhibit him from grasping immediately whether his work has been intensified" (431). The workings of surveillance capitalism are such that it is rarely clear that everyday social reproductive activities are now sources of value because there is little change in what the worker actually does (e.g. they are still getting to work, even if the mode of transport has changed), and the sale of any product arising from it will be distant from the event both temporally and geographically.

When taken together, these techniques intersect to render it extremely unlikely that the user has any idea about the relationship they are about to enter into, and what may be done with the products of their labour, or indeed that they are even labouring: as far as they concerned they are still working (an activity with use value) rather than labouring. As such the contract and intangibility of the data generated represent a process of misalignment which render it much more likely that the user will surrender data at zero or low cost. Thus, by effectively obscuring the second text from view, it is that much harder for any user to claim that the work of mobility being undertaken is a form of labour that should be monetarily remunerated.

Section 5 - Conclusions: Valorisation and mobility fixing
This paper has sought to outline some of the ways in which the socio-technical apparatus of PBSS2.0 acts to valorise the work of cycle commuting with dual purposes of positioning it as worthy (and hence providing a framework for the activity to be interpreted as affective remuneration), but also separate the activity from any surplus value generated (and hence not require a wage to be paid to the labourer). Here we want to draw together and reflect on

the wider significance of this process for understanding the political-economy of mobility, and the ways in which PBSS2.0 functions as a form of mobility fix.

Firstly, PBSS2.0 represents an incursion into an established social reproductive activity – cycle commuting. Our analysis of PBSS2.0 clearly positions it as a privatised investment and means of wealth extraction that relies on the valorisation and commodification of unpaid 'volunteer' labour (Dowling, 2016:460). Just as fitness trackers represent an incursion into leisure mobilities (c.f Gidaris 2019; Millington 2014), as an example of platform urbanism (Stehlin et al 2020) the socio-technical apparatus of PBSS2.0 represents an orchestrated incursion into more instrumental mobilities. Accordingly we need to maintain a critical perspective on cycling: we have illustrated that PBSS2.0 companies generally escape a critical gaze because of cycling's largely unchallenged privilege within debates on sustainability, health and urbanism. However, the development of PBSS2.0 gives a clear example of how cycling is utilised within existing circuits of accumulation, representing a mode of fixing operating through the extraction of surplus value from mobility. This represents a doubling down on the exclusion of the commute from the wage economy, despite its centrality to its reproduction.

Having demonstrated that PBSS2.0 as an extraction architecture is geared toward the scraping of behavioural surplus, we argue that this positions PBSS2.0 as another kind of 'mobility fix': one geared toward harnessing the labour of the cyclist to produce raw materials that can be manufactured into predictive products. We emphasise the idea that fixes are increasingly produced outside of the traditional terrains of labour geography (e.g sites of paid work) (strauss 2020:154) in the realm of social reproductive flows - through the conjoining of virtual and physical to create hybrid mobiles that enable the economisation of social practice. In its conjoining of virtual and physical mobility, PBSS 2.0 represents a new frontier in the drive to economise and commodify the work of previously 'unproductive mobility'. Once again, rather than being materialised as a force enabling us to question logics of unrestrained growth, cycling is being brought into circuits of capital in a way that reproduces or accelerates accumulation in unsustainable ways.

As such, the paper makes the argument that the mobilities and flows that constitute many social reproductive activities - and PBSS specifically in this case – must be seen as a new terrain

of economic fixing. Whilst such fixing can have a spatial element (for example the re-engineering of movement spaces to favour cycling, c.f Spinney 2016; 2020); or a digital element (Stehlin et al 2020), our argument here is that what we see in PBSS2.0 is a form of fixing that is enabled by technology and works by valorising the work of everyday mobility so that surplus value can potentially be extracted from it when it is manufactured into predictive products. As such, it is a form of fixing that works through the intersection of physical and virtual mobility enabled by digital environmentalities.

Narrowing of cycling as a practice

The discussion also highlights the ways in which cycling as a meaningful cultural practice may become narrowed in the process of incorporating it into circuits of surveillance capitalism. As we have shown, participants and municipal administrations alike are taught to value cycling for its time efficiency in congested areas, health benefits and environmental benefits. As Dowling argues in the case of volunteering, this re-directs the practice toward a "…logic of individual utility maximisation…thereby transforming the affective structures in which it occurs" (Dowling, 2016:458). The digital pedagogy of the smartphone App interface is a particularly important actor in this process of teaching the user which qualities of the practice they should value.

This focuses our attention on the relations between physical movement between places, and a reduced, attenuated and modified user based upon that movement. Through this process, particular aspects of the labour power of daily mobility are foregrounded as profitable, representing a shift in the ontological status of cycling as particular aspects (that can be measured, analysed and monetised) become more important. Hence, what is potentially lost in the drive to represent cycling within the framing of a supposedly pragmatic, neutral and common-sense urbanism (Kitchin et al 2018:22), are the "…social, cultural, historical, institutional and political complexities…" (ibid) of daily mobility that give it its unique character".

Cycling is a plural and sensory practice that overflows narrow bounds set by current matters of concern, yet these aspects of it are rendered invisible and marginalised in the processes of valorisation we have described here. Not only does this potentially foreclose cycling's role in

truly changing what we value in mobility and urban life, it can also exclude participants who do not or cannot value the elements promoted as important, such as children who generally value the playfulness of cycling over any functional or health benefits. In the rush to get cycling recognised as a valid mode of transport, those who promote cycling are doing so in such a way that it risks, as Dowling (2016) has argued, paving the way for, "…new rounds of capitalist valorisation or otherwise assist[ing] the stabilisation of this exploitative system" (460-1). This echoes the words of Weeks (20133:3) who has argued from a feminist perspective that selective affirmations of social reproductive activities focusing on the augmentation of human capital can "re-inscribe the very discourses that affirm a capitalist work ethic" (Weeks in Dowling, 2016:460). As a result, a politics that affirms cycling as legitimate only with regard to the valorisation of behavioural surplus in urban and financial economies risks, "…reinvigorating or stabilising capitalist accumulation rather than transforming it." (Dowling, 2016:460). As Zuboff has argued, "technology in modern times comes already patterned with an economic orientation" (Weber in Zuboff 2019:16) thus we should question the potential of such technologies to transcend their origins.

Accordingly, the sustainability of PBSS2.0 as a contemporary manifestation of cycling must be questioned. If the constant search for new markets and maximising economic growth is the key challenge to be overcome in the Anthropocene as Jackson (2009) has argued, then utilising cycling as a vehicle to extract surplus to sustain growth positions it as central to accumulation, rather than as a vehicle through which such logics could be questioned. Yet it is clear that the technologies that comprise PBSS2.0 could be configured in very different ways if underpinned by different logics. In line with this, PBSS 2.0 represents the expression of a specific logic of accumulation, though clearly one that is contingent, not fully strategized, and open to change.

From valorisation to valuation

Thus at the heart of this paper is the issue of who gets to ascribe worth (and therefore meaning) to cycling as a practice, and the politics that ensues from this. To value cycling as a plural social reproductive activity (rather than valorise it narrowly as a form of commuting from which profit can be extracted to address specific matters of concern) entails an open and transparent process where all aspects of cycling as a practice are considered in order to

make it as inclusive as possible. As Dowling argues, it is "...to recognise social reproduction...as the terrain that constitutes the very conditions for life, thus necessitating unconditional access to its means. Such modes of valuing social reproduction are antagonistic to capital, rejecting the subordination of social reproduction to its demands" (Dowling, 2016:461). And here we come to the crux: if the recognition of cycling is dependent on its ability to reduce CO2 emissions, reduce the cost of congestion delays, to reduce the cost of the public health burden, and to provide data for predictive products, can the relations of power that underpin capital's rule be shifted? As Dowling asks, can we imagine social practices through registers and measures that don't "simply prepare the ground for capital to marketise the demand for recognition?" (Dowling, 2016:462).

Leading on from this, we need to ask who should be driving processes of valuation? In PBSS2.0 we see this process of valorisation being left to surveillance and venture capitalists, but do they really have the best interests of citizens and urbanism at the core of their missions? As this suggests, the emergence of PBSS, and by extension all forms of Mobility as a Service (MaaS) and platform urbanism have implications for urban governance as it relates to transport. As Stehlin et al (2020:1262) argue, "...if the data needed to govern urban mobility is increasingly accumulated, processed, and packaged by private entities...then democratic governance of infrastructure planning is likely to be eroded." This is in spite of the fact that that same data utilised to predict and accommodate movement can be, and has been, generated, by applying a set of technologies to a freely available public resource (the street) and the unwaged labour of mobility. Indeed, the increasing importance of private data sources and operators call into question the notion of the planned city, as the fulfilment of mobility needs (eg the last mile) becomes both liable to failure and subordinate to whether a surplus can be generated from that mobility.

The absence of sustainability and justice in current iterations of cycling such as PBSS2.0 is not just related to a logic of continued growth, rather it is also related to a lack of transparency, citizen participation, and uneven governance in defining what data is gathered, where it goes and how it is used. The mode of operation of PBSS2.0 has profound implications for citizens given the opacity of mobile data harvesting infrastructures (Rodriguez et al 2016). As Birchall (2016) has argued, the fact that citizens only count in terms of their role as flat data affects

the scope of political agency (Birchall, 2016:7). The point we draw out here, is that much like imagining the utility of cycling narrowly in forms such as commuting marginalises alternative forms of agency, seeing PBSS users as sources of behavioural surplus further flattens political agency because the harvesting and use of it is opaque and exclusive to users. Dowling suggests that we need to liberate our affective investments in social reproduction from their ties to capital in order to facilitate a socially just and sustainable transformation. This she argues, requires critical attention to 'the social organisation of production', as well as 'the psychic and affective dimensions of contemporary capitalism'. (Dowling, 2016:463). What might that mean for cycling and PBSS? We are not yet sure ourselves and it is clearly a subject worthy of further investigation. However, two possibilities occur to us immediately: the first relates to understanding a broader range of affects (such as relaxation, excitement and flow) that are generated through cycling, and promoting those that enhance individual and community wellbeing and sustainability rather than economic growth. The second relates to the governance of PBSS, and particularly the range of actors who decide what PBSS should like, who it should serve, where it should be located, what matters of concern it should address, what data could be collected, and greater transparency relating to these processes.

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