Investigating Digitally Inflected Intercity Cycle Commuting

Matthew Cook, Corresponding author
matthew.cook@open.ac.uk
Orcid 0000-0003-2373-2127
School of Engineering and Innovation, Faculty of Science, Technology, Engineering and Mathematics, The Open University, Walton Hall, Milton Keynes, MK7 6AA, United Kingdom

Abstract
Multiple smart city cycle technologies have been developed to support cycle commuting and create lower carbon cities. Such technologies hold significant potential to reshape how cycle commuting is experienced, understood and governed. To investigate such phenomena, this paper provides a rich account of digitally inflected inter-city cycle commuting. It shows how technologies including gamification elements script cycle commuting and consequently reshape cycling practices and infrastructures. As such digitally inflected cycle commuting is revealed as a complex multifaceted process of selfhood, reflexivity, embodiment and social interaction which challenges imaginaries of mobile subjects underpinning standardised smart city transport policy prescriptions.

Key words
Infrastructuring, technological scripts, digital artefacts, smart cities, autoethnography
### Introduction

Carbon emissions from transport remain at high levels and are somewhat stubborn to change (Rosenbloom et al., 2019). As part of efforts to address this issue, transport planners promote cycle commuting in various locales to achieve a modal shift: to get people out of polluting motorised vehicles and onto more or less emission free bicycles (DfT, 2020). Although such initiatives have historically focused on the development of dedicated cycle infrastructure (Aldred and Jungnickel, 2014), more recently so called smart digital cycling technologies have also been promoted to stimulate cycle commuting, including digitally connected helmets and bicycles, smart cycling glasses and smart phone apps which ease access to bicycle sharing services and help riders navigate cities (Nikolaeva et al., 2019). Perhaps most influential of these so-called smart technologies has been the handlebar mounted GPS enabled cycle computer. Such cycle computers record various aspects of cycle rides such as speed, duration and distance as well as details of various bodily functions such as pulse rate which can be subsequently uploaded to social platforms known as ride loggers, e.g. Strava. By uploading to ‘the cloud’ such data form the basis of digital artefacts which endure beyond the ride and can be viewed by others (Barratt, 2017). This is important as before GPS enabled cycle computers and ride logging apps only those who kept a paper training diary or formally raced could record their rides and gauge their performance by comparison to others *ibid*. In this way, ride logging enables the social camaraderie of a team to be experienced while riding alone.

Data uploaded to online platforms such as ride loggers often have significant commercial and managerial value and are made available to other actors and agencies (Rettberg, 2014; Lupton, 2016). This matters as to date cycling has been a largely unsurveilled mobility mode and cycle computers and ride loggers may therefore change this and potentially alter how cycling is experienced, understood and governed (Nikolaeva et al., 2019). Indeed, how mobile cycling subjects are imagined is crucial in understanding the politics of mobile futures as these imaginaries may subsequently become normalised as narratives, knowledges and interventions that reshape conditions of everyday life for citizens *ibid*. And as initiatives to promote cycle commuting both within cities and between them gain momentum there is clearly a need to take seriously the complex interplay between movement, its representation and the embodied experience of digitally inflected cycle commuting practices and its changing demands on infrastructures, developed specifically for cycling and/ or other purposes. Focused on a 50 to 70km intercity cycle commute, this paper begins to address this issue. It investigates how the scripts (e.g. of gamification elements) of these smart cycling technologies are profoundly changing the practices of the pursuit and their relation with infrastructures. Portraying a complex nuanced view of digitally inflected intercity cycle commuting, this paper challenges smart city singular solution narratives (Joss et al., 2017; Aurigi and Odendaal, 2021) and provides a better foundation of knowledge for measures to promote cycle commuting.

### Inscriptions and infrastructuring

Drawing on the precepts of Actor Network Theory, Barratt (2017) appositely argues that the creation of digital artefacts via ride logging apps can be productively viewed as one of inscription: “all types of transformations through which an entry becomes materialised into a sign…” (Latour, 1999: 306 cited in Barratt, 2017). Building on this insight, the underlying argument of this paper is that the creation of digital artefacts, inscriptions and signs such as of a ‘fit competitive cyclist’ generated through ride logging have considerable agency in cycling practices and more broadly, in infrastructuring.
The infrastructuring perspective is founded on ideas about the co-construction between social and material order (Callon, 1986; Latour, 1996) from Science and Technology Studies (STS). It draws attention to the notion that infrastructures are far from obvious complete wholes lying ‘out there’ in a positivist sense waiting to be discovered but are provisional socio-technical achievements which are maintained and (re)created through practices (Rutherford, 2020) such as cycle commuting. Seen in this way, infrastructuring is often used to denote constantly emerging assemblages of heterogeneous entities and agencies rather than a fixed object or relation *ibid*. Infrastructuring brings into view “the allusiveness, uncertainty and multidimensional nature of infrastructures and ‘the proliferation of discourses and material realisations’ (Chaztis, 2017 p22), through which it is provisionally achieved” (Rutherford 2020 p9)

Importantly, infrastructure becomes a tool for action when connected to a particular purpose (Rutherford, 2020), which in this paper is inter-city cycle commuting. Although many northern European countries have well developed dedicated cycle infrastructures (Larsen, 2018), other countries such as the UK have less developed cycle infrastructures and cycle commuting proceeds at least in part on infrastructures designed and primarily for and colonised by motorised vehicles. This brings into sharp relief the notion that by uploading data of cycle commutes through shared infrastructures to ride loggers commuter routes are in effect created. On one hand there is a profoundly ‘hard’ materiality (stone, tarmac and concrete) which constitute roads principally used by motorised vehicles. On the other, ride logging cyclists collectively and successively negotiate these via cycling practices which leave little trace on the ground but over time sediment into commuter routes in online environments such as Strava. Such routes are inscribed through collective action in response to technological scripts (Akrich, 1992) such as gamification elements of ride loggers and formed and maintained through the interface of human, digital and material worlds.

The remainder of this paper investigates such hybrid mobilities arising from the interface of material and online digital environments, i.e. a process of infrastructuring. It explicates the hidden, contingent and mutable infrastructures which are taken for granted yet support everyday urban life. Aspects of ride loggers such as achievements, social endorsement and gamification are far from neutral in infrastructuring but play a ‘key’ role in such processes. Gamification elements of ride loggers allocate virtual awards for completing timed segments of routes typically covering popular sprints, climbs or frequently cycled longer sections of routes which can be covered at speed. For example, Strava gives points for overall effort, badges such as Local Legend for frequent riding over segments, cups for places on segment s, opportunities to complete challenges such as the Festive 500. As such routes between places are likely to develop which include segments on which certain performances and placings on segment leader boards may be achieved. Whether such routes are efficient ways of travelling between work and home is likely to be only one of many considerations. Indeed, for many cycle commuters uploading from cycle computers to ride loggers, certain effects and consequently affects are likely to be purposively sought from routes in addition to the pursuit of an efficient route between home and work. Since performances recorded on ride loggers such as Strava arise from cycle fitness training, bodily effects are often foregrounded. For example, the affordances of material infrastructures to provide certain bodily effects such as those arising from long inclines which offer considerable training benefits are frequently sought.
Equally, online affects such as camaraderie and the friendly competitive atmospheres among riders’ communities of followers on ride loggers such as Strava matter (Barratt, 2017) as well as the atmospheres of place on route. Atmospheres are conceptualised here as a place-specific configurations of sensation, temporalities, movements, memories and materialities that give rise to particular affective qualities or ‘moods’ (Abusaada, 2020; Sumartojo and Pink, 2019). Atmospheres are specific to places and times, arising relationally from the interplay of contingency (e.g. a rainy morning, a traffic jam) and the cumulative, and thus historical, interactions between places, materialities, imaginaries and publics (Edensor & Sumartojo, 2015). Atmospheres and the affects that arise in them are inherently relational because the qualities disclosed by entities are not fixed but inflected by contexts, contingencies and encounters. For instance, a circuitous country road will disclose different qualities to a leisure rider and to an efficiency-driven commuter. Likewise, a steep incline will give rise to different affective responses when experienced by a commuter, by a lone athlete or by an athlete who is physically or digitally in the presence of other cyclists. Consequently, these spatial relations appear to change as atmospheres do not permeate some form of homogeneous space. Rather, various atmospheres may coexist and comingle in the same time and space, overlapping without necessarily coming in contact (Ash, 2019).

Thus both effects and affects are potentially foregrounded through cycle computers and ride logging, which digitally reconfigure how a rider may relate to a route, as even an empty road may be digitally connected to constellations of camaraderies and competitions. This potentially stands against the assumptions of transport infrastructure planning which focus on utility maximising discrete individual choices of efficient transport options. Indeed, it is this paper’s working assumption that digitally inflected cycling practices are likely to be complex, multifaceted and give rise to all manner of infrastructures. In the following sections an autoethnography is presented in order to begin to explicate such issues.

Method
Although symbolic and instrumental elements of mobilities such as cycling can be investigated through reflexive interviews, affective and sensual experiences associated with them which need to be investigated in this paper often “exceed our capacities to ... think about and represent them” (Adey 2010, 142) are less easy to research. Notable methodological responses to such challenges include Laurier (2004) who recorded car driving commuters on video and Simpson (2014) who utilised video elicitation. However, such techniques cannot record the sensations of moving through spaces. Following Cook and Edensor (2017) this paper draws directly upon my autoethnographic cycling diaries to express the immersive “fleeting, multi-sensory, distributed, mobile and multiple, yet local, practical and ordered making of social and material realities” (Büscher and Urry 2009: 102) of digitally augmented inter-city cycle commuting.

Anderson states the “most obvious feature of autoethnography is that the researcher is a complete member in the social world under study” (2006: 379). As such I have been riding and racing bicycles both on and off road since 1982 and have well developed cycle competencies and practical know-how. I have kept a cycling diary for approximately thirty years. Entries are written after completing rides to capture different aspects of performance and subjective experiences. In compiling diary entries, reflexivity developed as I became attuned to the somatic and mental experiences of riding on the open road as well as through towns and cities. Such sensations are difficult to access and articulate, and in this way the reflexive autoethnography is key to obtaining empirical data honed through practice and
consistent reflection via my diary. While such recording is messy (Denzin 2006) and cannot aim for exact expression (Merriman 2014), I identify consistencies from the diary which were reflected upon to compile an evocative ‘thick’ description of successive experiences of intercity cycle commuting over several years and how handlebar mounted cycle computers and ride logging have inflected these. The intention here is to produce convincing and coherent points that enable readers “to enter the subjective world of the teller – to see the world from her or his point of view” (Plummer 2001: 401).

**Digitally Inflected Cycle Commuting**

Now in my early fifties I ride about 8000 to 12000 kilometres per year. A significant portion of this distance is made up of a cycle commute between my home in Bedford and the Open University’s main campus, Walton Hall, Milton Keynes, which are located in the south east of the UK. Depending on the route taken, the commute typically ranges from a 50 to 70 kilometre round trip, which prior to March 2019 I undertook between one and three days per week. My routes are typically through rolling countryside and when coupled with strong winds are both interesting and challenging.

While in terms of territorial units the commute is between two urban conurbations, I experience the routes as profoundly urban. Indeed, my routes pass through rolling countryside but the surfaces are hard and mainly populated by motorised vehicles and there is little sense of the bucolic. This chimes with the view that urban regions are constructed and shaped through connections (Massey, 2005), travel and even infrastructure which is often seen as “the very parameters of global urbanism” (Easterling 2014, P12). In the morning, my commute begins at about 08:00 and I am normally sitting at my desk by 09:15 having parked my bike, showered and changed into work clothes. In the evening I set off between 17:00 and 19:00 and arrive home anytime between 17:45 and 20:00. I typically follow the fastest route into work and lengthen the return journey for training purposes.

In somewhat instrumental terms, I cycle commute for two over-arching reasons. First, much of my work is about trying to move society toward more sustainable futures and I want to reflect these aims in my everyday life by trying to live a lower carbon lifestyle. Since emissions (carbon and particulate matter) from transport are proving challenging to reduce, a low carbon cycle commute therefore makes sense to me. Second, I cycle commute for training purposes. I started riding bicycles seriously in 1982 mainly because I lived in a rural area and needed to travel to school and subsequently work. Much to my surprise, on joining a local cycling club, I discovered I had a little talent for cycling and embarked upon amateur racing. Today, cycling is a key part of my life which I never think of it as a chore, rather it a part of what I do and who I am. As such, I typically follow a shorter route into work and lengthen it for the return journey for training purposes in response to fine weather or I have experienced a hard day in the office and need a little break before returning home to my family.

The following takes this practice and personal motivation as an object of self-reflexive study which is set out below in light of the conceptual approach detailed in Section 2. It should be noted that while the conceptual approach frames the study analytical categories were not generated in order to avoid presenting ‘findings’ which merely confirm the validity of the conceptual approach in a positivistic sense and to allow the data generated by the reflexive diary ‘to speak’. In the final section of the paper themes from the following section are explicated, conclusions drawn and implications for cycle commuting policy considered.
**Racing Bike and Cycle Computer**

The material and technological augmentation of my commute between home and work is not only understood through the use of a smart application but begins pre-digital, i.e., with cycling equipment. I ride a 22 speed racing bike with a carbon fibre frame and carbon fibre wheels. I wear specific tight (to reduce drag) lightweight cycle clothing which includes a lightweight cycle helmet and carbon fibre stiff soled cycling shoes that fit clipless pedals (See Figure 2).

A cycle computer equipped with Global Positioning System (GPS) technology is mounted slightly in front of the handlebars, which allows me to ride on the drop handlebars and observe digital readings and look at the road in front. There are also sensors that collect data on pedal cadence and speed, which are placed on the cranks and rear hub respectively. A strap to measure my heart rate is placed around my chest. All smart devices switch on when I mount the bike. Rather than simply ride away, I wait while the cycle computer connects to the GPS system and my mobile phone. This and the connection with other devices are signified by various beeping sounds. I have set up the cycle computer to show time (duration of ride), current speed and average speed in kilometres per hour, metres of ascent and heart rate. I ride in certain heart rate zones and aim to achieve various average speeds. I generally ride with my hands on the drop handlebars. The cycle computer is mounted in front of the handlebar stem so I can look down at it and maintain an aerodynamic position on the bike.

Data from my cycle computer are synced via Bluetooth technology to the mobile phone which subsequently uploads data to the online Wahoo platform which in turn uploads data to the ride logger Strava. Strava is cycling platform and app, where self-tracked data from multiple compatible devices can be uploaded. I record distance travelled, duration of ride, average speed, heartrate. Most of these metrics can be observed in real time on the cycle computer. When uploaded to Strava my cycle route is portrayed as a red line on a digital map other data such as average speed are captured in a read out.

On arrival at work and return home, data are automatically uploaded from cycle computer to Strava. In the evening, after cycle commuting, I review my performances on Strava. Some of my followers will use Strava’s social endorsement function and give me Kudos. If the conditions are favourable, if the roads are dry, the air is warm and light and there is a tail wind, then I might have improved my placing on a segment leader board or even be top of the leader board, i.e., what Strava calls King of the Mountain (KoM). I may also have achieved a high average speed, such as 40kph which my followers would consider fast and would offer another opportunity to gauge my performance and gain social endorsement.

**Constructing and choosing routes**
There is little dedicated infrastructure for cyclists between my home in Bedford and workplace in Milton Keynes. Thus the route is not obviously physically 'out there' waiting to be ridden but must be constructed through infrastructures shared with among others motorised vehicles (see Figure 2 below). Over time, I have built a repertoire of routes between Bedford and Milton Keynes on Strava which variously offer the potential of an efficient safe commute and at the same time effective cycle training and the possibility of achievements in Strava.

Figure 2 Shared infrastructures

As my commute proceeds at peak times, I tend to follow commuter routes which minimise encounters with motorised vehicles, i.e. traffic. Before setting out I might access Google Maps to identify congested areas and choose a route which avoids them. Weather also impacts route selection. I check the weather forecast for the route on my smart phone - for Bedford and Milton Keynes as well as places on route such as Cranfield. Three aspects of the weather forecast matter. First, wind speed, including gust, and direction. Windspeeds below 20 mph have minimal effect on my ride, but over 20 mph starts to really impact riding. If the forecast is for winds of over 20 mph, I look at my Strava and construct a route that avoids what cyclists call a strong headwind. Here even though I think I know the orientation of certain roads, it is useful to see on Strava the different routes I have made between Bedford and Milton Keynes set out on a Euclidean plane to inform this decision. Second, the chance of precipitation and how this varies throughout the day. The weather forecast on my smart phone, which is updated throughout the day, enables me to choose suitable clothing to keep dry. Third, temperature and thus the likelihood of slippery surfaces due to snow and ice. I look at the local authority website to determine which roads have been salted and use this information to select a route. Further, lower temperatures mean higher air density at ground level, which increases drag and slows cyclists down. Thus I record air temperature and how dense air feels in my training diary. Most cyclists will observe reductions in average speeds throughout winter and an increase in average speeds in summer due to changes in air density.

Turning to effective training through my cycle commute, the demands of cycle training vary according to the time of year. When not racing in the winter months, I aim to build physical strength through ‘hard mileage’ on the cycle commute. In the Summer racing season, I build form by increasing speeds and reduce commuting times. In practice this means that in addition to conditions such as weather and traffic, like many amateur athletes I construct routes via infrastructures which offer suitable affordances for training (Latham and Layton, 2020). Here the configuration of the natural and artificial features of the route as well as specific properties and qualities of materials matter because they facilitate and create the affordances for training *ibid*. For example, in winter I might modify a route to include a long hill of reasonable gradient with a ‘gnarly’ road surface which takes between 3 to 4 minutes to climb, where I can change up a gear or two and build leg strength. In summer I might follow a route with a shorter steeper hill which builds peak power over a short duration and includes a long flat section on smooth tarmac which allows me to let my heart rate climb to higher fitness building zones for several minutes. Speeds attained can be high, giving a sense of euphoria as I travel through space among cars and obstacles.
Road cyclists often talk of the metronomic nature of cycling and indeed, for me cycling is a rhythmic practice, which I find simultaneously relaxing, challenging and beguiling. For effective progress at higher speeds, smooth rhythms are necessary for efficient manoeuvres such as cornering (Spinney 2006). Brown talks of “rolling continuity” through which “cycling is a fluid and often fragile accomplishment in which body, bike and the frictions of ground and air are actively enfolded in a dynamic assemblage that requires, for all but the most skilled riders, forward rolling motion” (2012: 807). Indeed, there is much talk of a ‘golden thread’ followed by professional cyclists which is the most efficient and effective route through a difficult descent over a high mountain pass. Thus to achieve Strava goals which inevitably are gained by achieving high speeds on the bike I construct routes that ‘flow’ through infrastructures, follow a golden thread particularly in summer when speeds are higher due to better levels of fitness and less dense air. In part this is achieved through experience and a sense of what feels right and by considering pedal cadence (measured in revolutions per minute (rpm) taken from a sensor on the left crank arm and displayed on the cycle computer. Here I look to maintain a cadence of about 80 to 100, even when travelling uphill or into the wind. If cadence drops below 80rpm then I am ‘mashing’, or forcing the bike through anaerobic strength which I will not be able to maintain for any great distance. Similarly, if my pedal cadence is above 100rpm then I am spinning out, drawing on my aerobic strength and I should change up a gear.

**Sensing and Editing Performances**

Elementary physics shows that whether pedalling at higher or lower cadence the riders power output is the same – 80 to 100rpm is generally thought to be the ‘sweet spot’ where power can be maintained for a significant period. Many competitive cyclists install power meters on their bicycles. These sensors are strain gauges which can be installed on crank arms, pedals, bottom brackets, chain rings or rear hubs. Data are sent from the sensor to the cycle computer for riders to observe their power output expressed in watts. Such data can also be uploaded to Strava and there is now discussion not only of personal best times (PBs) for particular routes but also of power PBs. Power meters provide an objective view of a cyclist’s ability by allowing a calculation of number of watts per kilo a rider can produce. Indeed, for many racing cyclists, power data (expressed in watts) are the ultimate objective data by which to gauge performances, fitness and thus diagnose problems and prescribe fitness routines such as interval training to resolve them.

I have resisted installing a power meter on my bike. While such sensors would provide an objective measure of my power, there are limits to what data I wish to collect about myself and share with others. In more abstract terms, I have resisted attempts to further quantify my physical performance and fitness. In part, I am frightened of what the numbers might tell me. I have cycled for so long that I am indeed, a cyclist. I never think about training as a chore, it is a practice that I perform partly in order to maintain my identity which is a complex interplay of a view of myself and how others view me. And even though a power meter may enable me to train more efficiently, I am concerned that with the passage of time, my numbers will decline meaning I simply don’t add up anymore.

I wear a heart rate monitor while commuting, which sends data expressed in beats per minute to the cycle computer which I can review in real time. In contrast to data from a power meter, heart rate data are difficult to interpret. A low heart rate could either indicate I am tired or I am very fit because I have pushed the lactate threshold away. Thus while I consider heart rate data while I am riding and upload it to Strava as a proxy for fitness, it is only a
fuzzy indicator of performance and exerts a limited effect on my commuting practices. Instead, in most of my cycle commutes I aim to produce certain overall average speeds at different times of the year. So, these data discipline my commutes and rides in general, and are an immense source of satisfaction as well as frustration. Over the years, I have developed 
*rules of thumb* for average speeds. In winter, I aim to ride into work at an average speed of between 18 and 19mph and ride home from work at an average speed of 20 to 22mph. In summer, I aim to ride into work at 20 to 21mph and home from work at an average speed of 22 to 26mph. These times and speeds have served me well over the years, to prepare my body for racing and for general fitness. Throughout my commute I continually look down at the cycle computer and pace myself carefully to achieve these times. If by the middle of the commute I am well below the average speed I want to achieve, then I push harder in the latter part of the ride. I take chances as I travel through junctions and will fight hard to achieve the target average speed. If I don’t achieve the average speed then I am bitterly disappointed and what I deem to be failure affects my overall mood and creates a desire for more training and activity to redress the poor performance.

**Shaping the Rider’s Gaze and Kinaesthetic Skill**

The focus on the cycle computer to achieve certain performances such as the attainment of a particular average speed by drawing on real time data means I cycle in a ‘tunnel’ looking down to the meter, road surface and traffic with little apprehension of my surroundings beyond those entities. Space ‘undergoes continuous formation’ as we move through it (Ingold, 2011) but here cycling does not afford distanced observation of a romantic gaze (Urry, 2002), instead cyclists continuously confront emerging urbanscapes and must attend to the near-at-hand to ensure safe progress, paying particular attention to changes in road surface and obstacles, which may be irrelevant for car drivers, as they arise (Aldred, 2013). Thus cycle computers and associated ride logging has disciplined my gaze and in order to ensure safe progress at high speeds, effectively forced me to ride in response to other sensations from different parts of my body:

“The body senses as it moves, through kinaesthetic skill, merging sensory experience that informs one what the body is doing in space through the sensations of movement registered in joints, muscles, tendons and so on with intention and bodily memory ... It combines with touch... sight, hearing, smell and other sensory impressions to perform the body’s motion, as well as intense emotions.” (Büscher and Urry 2009, 6)

Drawing on a repertoire of routes means that over time I have developed a good understanding of road conditions. Even though my vision is narrow my body ‘knows’ where most potholes are on these routes and it almost automatically rides round them, or makes me stand on the pedals to absorb the shock of an obstacle or causes me to ‘bunny hop’ over an obstacle – the bump of tarmac on the A507 south of Malden, Bedfordshire, the fissure in the road near Bedford golf course, the invisible bump in the road between Astwood and Newton Blossomville. I respond to these obstacles but never consciously apprehend and respond to them. In this way, I remain focused on the cycle and negotiate safe passage but with heightened sensations and pleasures. Indeed, such purposeful activity done with skill is intense and enjoyable experiences and even yields kinaesthetic pleasure (Spinney 2006)

**From Self to Social: Anticipation, experience and memory**

Through Strava, distant others are made ever present, which inflects cycle commuting practice. In my paper cycling diary, which I have kept for many years, I create a thick description or story of myself. By using Strava, aspects of my story, the story I want to tell
myself of cycle fitness and performance, are made available to others and actively created in their presence. In this way, my smart cycle commute is more than a red line portrayed on a Euclidean surface in Strava, it is a digital artefact or inscription which forms a sign partly emblematic of my cycling abilities and identities. Thus I am aware that such digital artefacts must be carefully crafted to reflect myself, who I think I am and who I want to be. However, once these are available to others and hard, objective quantitative data revealed, pressures to make claims about cycle performance and where one might stand in a cycling group are brought to bear. Consequently, there is little doubt that since joining Strava I favour commuter routes which are well tuned to producing fast average speeds and if there is a backing wind, the opportunity to gain placings on segments leader boards. I also begin recording my commute from the edge of town because I don’t want the slow speeds in conurbations to reduce my average speeds, or to have to resist the pressure to ride fast and in a potentially dangerous way in these. In combination the digital artefacts I create through ride logging are a representation laden with signs of myself, that at over 50 years of age I can still produce a fast time even though I have retired from road racing. I can still hold a position in a cycling team, I can perform well for my age.

While opening my cycling diary to the scrutiny of others, there are benefits of socialising these accounts of myself through ride logging. Like many amateur sports cycling is intensely social (Latham and Layton, 2020). Some of my happiest memories and most enjoyable experiences have been on fast paced group rides. It is through this sociality of cycling that to some extent the meanings of certain cycling performances are made. It was only when I rode with a cycling club in the 1980s that I realised I could cycle faster over a long period than most. Or in other words, it was when I contextualised my performance in relation to other cyclists. Thus for me an important feature of Strava is it provides an opportunity to compare my cycling performances with others, which in effect socialises my cycle commute even when other riders are not present. Opening one’s cycling diary to others can be uncomfortable but the benefits of the sense of camaraderie seem at times to outweigh the costs of being known.

I have a premium Strava account which is private and allows me to restrict access to it by vetting each follower request. I often turn down requests, especially from riders I don’t know. At the time of writing, I had 50 followers and followed 50 other riders – Strava etiquette almost demands you follow your followers. While some of my followers are friends who cycle occasionally, the majority of my followers are amateur racers and those who cycle for the race team of which I am currently a member. I receive feedback from my followers in two ways. First, by posting a comment on the activity such as ‘great speed’, ‘you’re going well mate’. Second, by using Strava’s social endorsement function followers can give Kudos which is simply expressed as a thumb up. For most rides I receive between ten and twenty thumbs up - kudos. Comments are few and far between and seem to be given when exceptional performances are achieved. And for performance/ target focused cyclist this works well, as it offers quite intoxicating forms of encouragement. The social interactions of the cycle club and team are not replaced for they still proceed in other forums such as club rides but are partly taken online. I reciprocate by following all of my followers on Strava. In this way, I monitor my performances and aim to contextualise them by comparisons with other rides of a good standard.

Strava segments are one of the main ways I contextualise my cycle fitness and performances in the presence of others. For example, my commute between Bedford and Milton Keynes includes a number of segments of various lengths, elevation and thus difficulty, e.g. Cranfield...
Hill Climb 1.63 m with an elevation of 53m, A422 Main to Hay 2.83km with elevation of 26m, Astwood North Down and Up 3.61km with an elevation difference of 38m. Times and therefore speeds are recorded for these segments. There are leader boards for each of these segments, which include some of my followers as well as other riders that use Strava. If one is competitive, placings on leader boards are highly prized and somewhat addictive. Top placings on leader boards such as King of the Mountain (KoM) are even kept in your own virtual trophy case and a sense of ownership can arise over certain segments. For example, I live on top of a steep hill and I am KoM on the steepest section running over the top. There is a sense in which I own the KoM or rather my local hill. Unsurprisingly, segments can be a source of conflict. When one loses a KoM you may be notified that you have been dethroned, detailing who the new KoM is and how much time they beat you by. As with any sport this can be difficult. Strava etiquette suggests you should go onto the new KoM’s Strava account and give them kudos for their achievement. However, some riders write challenging and even threatening comments. Recently Strava introduced ‘Local Legend’ which can be attained simply if riders consistently follow a route. I have gained the impression that this aims to broaden its appeal and encompass riders who prize activity as well as speeds and times as expressed in segments.

Various cycling practices follow diverse aims, are undertaken for certain durations, exhibit different rhythms, express particular styles and fashions, use certain bikes and associated technologies and pass through quite different kinds of space. Accordingly, spatial and embodied experiences are very different for different groups of cyclists such as climbers (Spinney 2006), rural and urban leisure riders (Jones 2005), and commuters (Aldred 2013). Specifically, commuter cyclists are thought to “seek continuous rhythm and efficient movement when assembling trajectories but chosen routes also involve conscious experience of surroundings” (Duppen and Spierings, 2013 p242) and moreover, “cycle commuting is often founded on often highly personal preferences, biographies and memories” Ibid.

Although I have constructed and built a repertoire of routes over many years to commuting and training purposes, the routes I follow are about much more than the instrumental purposes they embody, such as for efficient commuting or even cycle training. More reflexively, they potentially offer opportunities to experience certain affects, atmospheres and emotions.

Many generations of my family have lived in North Bedfordshire and as such this area invokes a strong sense of home and belonging in me. Often the commuter routes I follow offer a multitude of memories of cycling with my late father in the quiet country lanes, cycling through urban streets and villages where members of my family live. As I pass through familiar places I experience infrastructures which produce memories, with the past, present and future brought together almost instantaneously (Pile, 2002). Although many of my commutes are spent staring down at the cycle computer, looking in front at the road and traffic they are far from a one dimension activity only undertaken in pursuit of greater fitness and in a field of competitive relations, instead they are imbued with memories and familial atmospheres and part of a constant search for connection and belonging.

Thus I pursue cycle commuting for instrumental purposes such as travelling between home and work but also and importantly in pursuit of affects associated with atmospheres and feelings which arise from the places I travel through. Digitally inflected cycle commuting does not necessarily produce a disinterested instrumentalist gaze on a landscape but a journey through the place I call home. In this way, I experience precognitive intense feelings that move and pull people together (Thrift and Dewsbury, 2000) reinforced through cycle
commuting practices. And as I review my cycle commutes posted on Strava these evoke strong memories, of fabulous rides where high speeds were attained with my team mates, where difficulties such as tyre punctures were overcome, of incidents such as when I slid off on a patch of diesel or of comments made by my followers. In this way, the line on the Euclidean surface produced on Strava is a way of making sense of aspects of my life journey and the feelings it creates. Digitally inflected cycle commuting is far from a linear temporal narrative, it is a journey through places and atmospheres that collectively form an appreciation of home, belonging and exhilarating performances, which are simply good fun!

Conclusions
The above presents a complex picture of ride logging and how it has inflected the practice of an inter-city commute. It shows that by logging rides on social platforms such as Strava, riders create digital artefacts which embody particular performances and outcomes, such as high average speeds and positions on leader boards. Drawing on Latour such digital artefacts can be thought of as inscriptions which are types of entry which are transformed into various signs, such as in this instance, stories of cycling performance, health and fitness for the rider and others, i.e. principally their followers. Developed in competition with others and socially endorsed by them digital artefacts are playing a major role in reshaping inter-city cycle commuting and ultimately infrastructuring. No longer a pursuit more often than not likely to be undertaken alone and recorded in ‘closed’ cycling diaries, cycle commuting is undertaken not only with others but in competition with others and reflective of social standings in cycling communities, in this case amateur cycle racing. This matters, for cycle commuting is about far more than efficient transport between places. Cyclists are increasingly concerned with the development of routes inscribed in digital environments which have additional attributes - as hard climbs may be embodied in segments for which placings on leader boards are highly prized, while following a ‘golden thread’ through infrastructures may offer the possibility of high average speeds and as a secondary consideration reduced commuting times. Hence, different attributes of cycle routes are sought depending on the time of year, weather and road conditions.

In addition to these effects the digital inflected inter-city cycle commutes are imbued with particular affects which matter in route choice and thus infrastructure. An atmospheric sensitivity was found suitable for analysing such collective, place-based affects because digital artefacts reconfigure places as they become potentially linked to friends, followers and competitors. The presence of others in online communities may be somewhat perilous as one’s cycling diary open to the scrutiny of others. However, team camaraderie and such competitive atmospheres are no longer the preserve of club rides, training sessions and races but ‘spill over’ into online environments and other cycle practices such as commuting. Here one gains the impression of not having to struggle alone against traffic and weather to achieve performances such as high average speeds but of having an enduring digital artefact which lives on beyond the ride and can be shown to others. And further, ride logging through apps such as Strava not only creates signs in discrete fashion but in combination with other stories of self and place such as those invoked by familial memories of place and belonging illustrated above.

Thus digital artefacts created by ride loggers are far more than simply a line representing an efficient commute on a Euclidean surface. Such inscriptions play a powerful role in infrastructuring. Positioned on the interface of digital and material worlds they socially sediment into routes offering among other things potentially safe and efficient passage
between places but crucially of various training benefits and to attain various performances indicative of cycling fitness and group standing. Transport planners should heed this complex picture. Measures to reduce carbon emissions from transport sectors may well focus on cycle commuting greater distances and entail a move from intra to inter-city commuting. Specific cycle infrastructure is welcome but simply designing it for efficient commuting may mean it does not appeal to all groups, particularly fitness orientated cyclists seeking particular effects from commuting and affects from infrastructures to support such endeavours.

Finally, the subject of the empirical aspect of this paper identifies as male. Such masculinity is simultaneously biased and considered a body neutral default (Criado-Perez, 2019), which gives rise to certain limitations of the study. Although the subject has a nuanced view of multiple cycle commuting practices, when creating digital artefacts in ride loggers such as competing for positions on segment leader boards, he performs and reinforces profoundly masculine aspects of competitive cycling such as risk taking noted by Barrie et al. (2019). Ride loggers play into his competitive cycling instincts and as he willingly uploads greater amounts of data to these, he is increasingly aware of the algorithms which form political relations to himself and to others (Amoore, 2020), and enable him to further reinforce his masculinity. While ride logging may be good fun for the subject, equally such pursuits can reinforce the masculinities of competitive cycling and the exclusion of others from cycling practices, infrastructuring and infrastructures. The paper offers no ready answers to such issues save to note further research and interventions are desperately needed to resolve these inequalities.
References


P. Adey, Mobility, (London: Routledge, 2010).


A. Aurigi and N. Odendaal “From “Smart in the Box” to “Smart in the City”: Rethinking the Socially Sustainable Smart City in Context, Journal of Urban Technology 28:1-2 (2021) 55-70.


