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Reversing the order: Towards a philosophically informed debate on ICT for transport

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Abstract

ICTs are increasingly used in transport contexts for reasons of efficiency, cost-effectiveness and convenience. At the same time, such technologies enable increasingly comprehensive surveillance from the data gathered via devices and infrastructure. Marketing discourses around these applications highlight the benefits that such technologies have for the user and avoid mention of potential risks. This leaves the user under- (and in some cases mis-) informed concerning the use of his/her data by third parties which raises a number of ethical, social and legal concerns such as privacy and social profiling. Thus this chapter, drawing mainly upon medium theory, philosophy of technology, critical theory and surveillance studies, aims to contribute on a theoretical level to the debate concerning the balance between the positive contributions ICTs can make in the transport sector and the risks arising from the gathering of increasing amounts of personal data. It foregrounds the dual use of ICTs in transport contexts using up to date cases of applications and offers policy-relevant recommendations to inform the inclusion of ethical, social and legal issues in the design stage of ICTs for transport.

Highlights

- The inclusion of ethical, social and legal concerns in the design stage of ICT for transport may introduce tangible benefits for users and policy makers.
- Despite the increasing use of ICT for transport applications, ethical, social and legal issues have not yet received sufficient attention by users and policy makers.
- Defining and communicating issues around user personal information can increase acceptability of ICT for transport applications, opening up new opportunities.

1. Introduction

Any microprocessor-based activity utilises data which can be saved and increasingly correlated. This trend which took off during the first decade of the 21st century gave birth to the notion of Big Data. The immense number of applications of Big Data are still to be fully realised, but the enhanced precision of location-based data and access by third parties - i.e. parties other than the mobile telecommunication network operators and the mobile device user - may raise concerns over the use of such data. Driven by growing global concerns for legitimising innovations prior to their diffusion, this chapter aims at minimising the unintended social and technological consequences of ICT development without any prior assessment of the potential impacts (Owen et al., 2009). Big Data

has the potential to unlock promising opportunities, but at the same time it introduces new challenges for the fields of spatial economics and transport (Dekkers and Rietveld, 2009). ICTs are increasingly used in transport contexts to make travel more efficient, cost-effective and also convenient and entertaining through gamification. At the same time, such technologies enable increasingly comprehensive surveillance from the data gathered via devices and infrastructure. Thus, this chapter is a theoretical contribution to the debate concerning the balance between the positive contributions ICTs can make in the transport sector and the risks arising from the gathering of increasing amounts of personal data. In order to address the interdisciplinary nature of this debate, this chapter draws on the following theoretical approaches: medium theory[1], philosophy of technology, critical theory and surveillance studies. It foregrounds the dual use of ICTs in transport contexts offering policy-relevant recommendations to inform the inclusion of ethical concerns in the design stage of ICTs for transport.

The chapter begins by emphasising the ways in which transport is becoming increasingly reliant on ICT applications as part of the growing dependence of modern life on digital technologies more generally. We then examine the benefits arising from an increased use of ICTs for transport in response to the challenges posed by the need for greater mobility and flexibility that defines contemporary life and work patterns. We draw attention to the discourses emphasising these positive contributions such as convenience, cost-effectiveness, reduction of environmental pollution and healthier lifestyles. The Oyster card and the Chromaroma game are discussed as examples illustrating our core argument that presenting these applications purely in terms of their potential to improve individual and collective mobility misses some of the more problematic aspects arising from location-based services (LBS) and their modes of data collection (Bagchi and White, 2005). Big Data are not discussed in detail, but are referred to as another upcoming challenge in the last section. We then map what we consider to be the key ethical, social and legal implications, arguing that ICTs for transport need to be considered within the wider context of surveillance and the exploitation of digital labour (Andrejevic 2011, Fuchs 2011). The chapter concludes by suggesting not to adopt a technophobic approach, but instead that philosophy of technology could be valuable in informing an ex-ante framework for policy-makers, software-developers and researchers. Such a framework would be useful in shaping the development of ICT for transport in advance of any legislative measures which merely mitigate risks and limit potential misuse ex-post.

[1] Medium theory is distinguishable from media & communications theory more generally by its emphasis on the impact of particular media & communications technologies, rather than on the content they communicate (Meyrowitz 2008).

2. Contemporary applications of ICT for transport

A wide variety of ICTs are being used in contemporary transport infrastructure and a lot of these aim at promoting better use of economic, social and environmental resources. For example the Oyster card constitutes an integrated ICT for transport scheme which can be used on all public transport modes across London e.g. underground, buses, Docklands Light Railway, river boats. From an operator's point of view this is a hugely beneficial development since it allows the analysis of travel behaviour data and management of transport demand in ways that were not possible in the 20th century. The increased use of Variable Message Signs (VMS) on motorways or public transport interchanges is another example of positive applications of ICT for transport informing travellers whilst allowing transport operators to direct traffic according to network capacity. The latter has noteworthy implications both for research and policy, particularly in the light of contemporary efforts to increase public transport demand and lower carbon emissions in densely populated urban areas (Nakamura and Hayashi, 2012; TfL, 2012). In conjunction with other transport measures facilitated through ICT, such as congestion charging schemes using Automatic Number Plate Recognition (ANPR), these developments contribute to sustainable urban transport at various degrees (Givoni, 2012). At the same time, the introduction of wi-fi and other ICT infrastructure in public transport has ameliorated passengers' experience and the use of travel time as highlighted in the literature (Lyons and Urry, 2005; Mokhtarian and Salomon, 2001; Mott MacDonald, 2009).

In addition, a plethora of transport-related smartphone apps have been developed during the last decade[2], all of which demand access to a range of user information in exchange for certain benefits such as convenience, safety, eco-friendliness or travel cost reduction. Although it is not among the aims of this chapter to offer a comprehensive overview of such applications a brief overview of applications for different transport modes is offered to illustrate user benefits.

The partnership between Pleasecycle[3] and Cyclescheme in the UK is a contemporary example of the potential benefits of ICTs for transport for cyclists through gamification, whilst addressing congestion and emissions reduction. Cyclists only need to register their bicycle trips in order to gain access to the scheme rewards. In this case employees can benefit through retail outlet vouchers, employers can benefit by demonstrating that they reduce their carbon footprint and urban areas can benefit through reduced car traffic and lower emissions in the local atmosphere. Similarly, users are

[2] Ideas in Transit offer a snapshot of such applications until 2012 (Ideas in Transit, 2012).

[3] Pleasecycle: http://www.pleasecycle.com The use of brand names and trademarks in this chapter aims only at illustrating the arguments made by the authors. No copyright or ownership claims are implied through the use of these brand names and trademarks, which belong to their respective registered license holders.

able to meet individual targets e.g. to walk more and improve their personal health and well-being while receiving rewards. SMART[4] is an application offering an additional feature, i.e. a heatmap based on crowdsourced information so that users in The Netherlands can avoid congested routes. Another application which utilises crowdsourced information to offer real time traffic updates reducing travel time and fuel costs is Waze[5] which is an application widely used across the US due to the high car use by commuters. Such applications may be enhanced in the future through vehicle-to-vehicle (V2V) communication offering real time traffic updates as discussed in chapter 6. Along the same lines, Taxibeat[6] is an application automatically detecting a user's location which can call a taxi via a single tap on one's smartphone. The added value in this case is that this application allows the selection of a taxi (e.g. vehicle, driver) based on previous evaluations, which can enhance the user's experience. Moreover, new opportunities appear for the vehicle insurance sector since mobility tracking allows charging insurance premiums based on the actual distance travelled. Users may also benefit from the increased application of ICTs through services such as Friendsurance[7], which aims at lowering the insurance cost for each individual user. Moreover, safety concerns over vulnerable social groups, namely children, disabled or the elderly may also be addressed through ICTs for transport by enabling carers to monitor their trips and locations in time.

What should be evident through the aforementioned is that personalised travel planning, rewards, real time updates about traffic, public transport or parking availability, e-tolls, lower vehicle insurance premiums and increased safety are all benefits realised through ICT for transport applications. It is thus apparent that various benefits for users, manufacturers, local authorities and traffic managers derive from such use of ICTs within the transport sector (Bekhor et al, 2013; Rose, 2006; Steenbruggen et al, 2013; Thakuriah and Geers, 2013). On the other hand these applications require direct and constant access to a user's:

- current location
- home address
- transport mode
- mobile device details
- software details
- payment details
- hobbies and interests

[4] SMART: https://play.google.com/store/apps/details?id=nl.enschede.smart&hl=en
[5] Waze: http://www.waze.com
[6] Taxibeat: http://www.taxibeat.com
[7] Friendsurance: http://www.friendsurance.com

The argument in this chapter is that despite the apparent benefits for research and policy making there are important issues surrounding such user data and the awareness of users about this data collection (FTC, 2012). This may raise concerns for children (UN, 1989) or other vulnerable social groups as their privacy is important. A debate about safety or privacy priority (Eriksson and Bjornskau, 2012) arises then which is further discussed in this chapter. Additionally, there are wider implications of this issue for any mobile tracking device user since smartphone apps such as Pleasecycle may foster employer surveillance over their employees in certain industries e.g. logistics (Kanngieser, 2013).

A common criticism against such privacy concerns has been the inability of individuals to make rational decisions in certain ICT scenarios due to bounded rationality (Acquisti and Grossklag, 2005). Yet, Potoglou et al (2013) have addressed the latter issue through a stated preference survey which corresponds with common practice in the transport sector. They conducted three stated choice experiments which confirmed the privacy paradox (Barnes, 2006), namely that individuals state that they are concerned about their privacy but they are not willing to pay to protect their personal data. Consequently, it remains to be seen how these technological transformations including the highly anticipated benefits of the Galileo positioning service to be launched in Europe (Chapter 3) will be managed in practice by users, corporations and policy makers to address these issues.

3. ICTs and the discourses surrounding transport applications

In this section the focus moves from the benefits of the increased application of ICTs for transport to the implications of how these benefits are marketed to consumers. The emphasis on usability in marketing communications (e.g. convenience, ease of use) and the fact that these ICT applications seemingly emanate from self-contained gadgets (e.g. smart phones, tablets) encourage the user to focus only on their immediate benefits, disregarding any risk that ensues from these applications.

In the context of the move towards ever greater mobility, the application of ICTs in the transport sector for instance promises to make planning and booking transactions and travel itself safer, as well as more cost- and time-efficient (Dijst, 2009). The ‘Oyster’ smartcard in London, for example, has replaced older paper-based tickets as well as the need for individual ticket systems for different kinds of public transport (underground, bus, light rail), making travel ‘cheaper’ and more ‘flexible’ (Transport for London n.d., a). Such integrated ticketing systems are often called ‘smart’ because they allow users to travel on different modes of transport or on modes provided by different

transport operators (HMC, 2013). How ICTS are making travel 'smarter' is also the argument used in the marketing communication of smartphone applications such as the Dutch SMART app and the US traffic and navigation app Waze: the latter especially emphasize the benefits of cost- and time-reduction ("saving everyone time and gas money") (Waze 2013). Marketing communications foreground these positive uses because, as Murakami-Wood and Ball (2013) point out, any association with problematic practices such as the collection of personal data would have undesirable results for the market as consumers would not align their interests with those of the cooperation. Thus discourses such as 'convenience' and 'time-effectiveness' serve to maintain the alignment between the interests of the company and the consumers, preventing an alternative consideration of the consumer's technological activity or device.

The crucial question is how precisely this alignment takes place. We suggest that marketing discourses conceptually 'package' digital developments in a way that produce specific attitudes or beliefs amongst users, a process which can be understood from the perspective of Althusser's theory of interpellation. According to Althusser (1970), individuals are constructed as subjects by responding to and thus perpetuating the ruling ideology. Althusser uses the example of a policeman who shouts out to a member of the public, producing an instantaneous reaction in this person insofar as he or she turns around to await the officer's further instructions. This process of 'hailing', according to Althusser, is how ideology is maintained – through language. Or, as Fairclough has argued more recently: "Ideologies are closely linked to language, because using language is the commonest form of social behaviour" (2001:2). The individual's response reproduces the ideology, and thereby the power of the "Ideological State Apparatuses" (ISA's) from which it originates – in this case the law, but the media, or the market, as Andrejevic (2013) argues, equally function as ISA's that determine our beliefs, actions and decisions.

Based on Althusser's model of the dissemination of ideology through language it becomes possible to understand how marketing discourses shape our beliefs and attitudes regarding the use of ICT applications. The location-based app Google Maps for instance markets its service via the invitation to "explore new" and "share favourite places with friends", emphasizing the positive attributes of 'shared experiences' (Google Inc.). Surrounded by discourses of "sharing" and "exploring", the marketing of the applications seems to suggest to the user that they merely facilitate a variety of desirable experiences. Figure 1 builds on Althusser's theory of interpellation in an attempt to model the effects of the marketing discourses on consumer attitudes and actions. At the centre of the model is the ICT application, where the surrounding bubbles contain some of the most common marketing rhetoric in the transport context, such as time-effectiveness, convenience

or eco-friendliness. Similar to the hailed subject in Althusser's example, the user of ICT applications is hailed as an uncritical and enthusiastic consumer by marketing discourses. The desirable experiences he is promised act as a deflective layer that distract attention away from the technologies themselves and any potential risks, towards their prospective benefits.

Figure 1: Discourses surrounding ICT applications

4. Digital convergence and emerging risks

Sections 2 and 3 explored how the discourses surrounding the implementation of ICT in transport contexts are successful in creating positive connotations of these technologies amongst users (Figure 1). Oyster smart card users for instance with a monthly travel card subscription are often not aware of the nature and extent of information held about them, but even for a visitor who purchases an Oyster card by debit or credit card this includes not only their full name, address, telephone number, e-mail address and password but also encrypted bank details. Crucially, this information is then supplemented by records of locations, dates and times of journeys made on transport systems where Oyster is in use. Each time the card is swiped, its user adds another piece of information to a user's digital profile, or data double (Haggerty & Ericson 2000): the digital 'footprint' that each individual is leaving behind through his use of ICTs. For the user, however, travel constitutes a socio-cultural practice and as a result of how ICTs in the transport sector are marketed he sees these as a continuous improvement of this practice. Thus the question of risks emerging from the use of ICT for

transport – e.g. what happens to the data accumulated via the use of the Oyster smart card – is not immediately relevant for the user.

In the Oyster card example, its use results in millions of new data additions daily (TfL, 2013) which contributes to what is now called Big Data and consists of several databases. The principle of purpose limitation – the idea that data may only be used for the purposes for which it was originally collected – becomes meaningless as soon as attention is paid to the small print of the Oyster terms and conditions: Transport for London (TfL) has the right to *"share Oyster information with their subsidiaries and service providers"* which also is comparable with other services used also for marketing purposes (Transport for London n.d., b). Chromaroma (2013) may be such an example, since it offers an overview of all the trips of an Oyster user in an attempt to introduce gamification to the everyday life of Londoners[8]. Similar data-sharing practices take place for smartphone applications such as Pleasecycle, Taxibeat and Waze. Further to this, following the 1998 Data Protection Act TfL is obliged to comply with requests made by the police and other law enforcement bodies for disclosure of personal data. In 2006, *The Guardian* reported 243 requests by the Metropolitan Police for release of personal information of Oyster card holders, by 2010 this figure had risen to 6576 requests, with only 810 requests denied (Xynou, 2012). This means in over 85% of all cases the information asked for was released. In addition it should be noted that a range of other bodies have also made requests to TfL for disclosure of information held on Oyster card users, amongst others solicitors, the UK Border Agency and city councils (Xynou, 2012).

What the above example makes clear is that data collected via a transport 'smart application' are easily merged with data collected from other applications or sources in an attempt to create Big Data-bases. In this case information from an Oyster smart card or Chromaroma are combined with data from the individual's credit or debit card. The merging of data from two seemingly self-contained units is enabled by the basic operating principle of digital information and communication technology, the processing of binary code (a sequence of 0s and 1s). Government agencies and private businesses alike are harnessing the benefits of this simple principle: The foundation of Big Data, the Open Data initiative in the UK and the National Data Warehouse for Traffic Information in The Netherlands are developing databases and combining them in ways not previously possible which has expanded the range of their field of action. What presents itself to the user on the other

[8] Chromaroma is an entertaining game based on the data created by users and left behind unnoticed. Mudlark, the Oyster based travel game developer, aims to help users make "smarter" decisions about their lives based on their own travel data overview through this game. This is anticipated to be achieved by building communities of users whilst overcoming the fear of creating a dystopian database society (Chromaroma, 2013).

hand is an interface that promises precisely the positive experiences listed in Figure 1 – convenience, flexibility, time-effectiveness. User control over his data is replaced with usability – as evidenced by Potoglou et al (2013). Or, as the medium theorist Friedrich Kittler argues:

> *"[t]he general digitization of channels and information erases the differences between the individual media. Sound and image, voice and text are reduced to surface effects, known to consumers as interface. Inside the computers themselves everything becomes a number... With numbers, everything goes. Modulation, transformation, synchronization; delay, storage, transposition; scrambling, scanning, mapping—a total media link on a digital base..." (Kittler 1999:1)*

The digitization of information processing allows for contact-less transfer of information between any number of devices and databases without the explicit consent, or in some cases even knowledge of the user. Using smartphones introduces further risks since location data and photos can be easily stored and transmitted from mobile devices without a user's explicit consent. What emerges from these considerations is that ICTs for transport which include location, distance, duration, frequency and mode data, form part of and should be considered from the perspective of, a single informational system. Within this system the user's personal information circulates increasingly seamlessly as part of a great "amorphous flow" of data that to the user is "unknown and seemingly uncontrollable" (Zurawski 2011:510). The revelations of the scope of the surveillance programmes run by the American National Security Agency ("PRISM") and its British counterpart ("Mastering the Internet") in the summer of 2013 have shown in unprecedented clarity the extent to which the flow of data is beyond the control of the user as well as the increasing cooperation between states and commercial entities.

The 'total media link on a digital base' mentioned by Kittler has so far been seen from a largely celebratory 'digital convergence' perspective which allows the end user to traverse multiple media platforms in search of the total information and entertainment experience (Jenkins 2006). But as the example of the Oyster card shows, with convergence there comes what Boyd (2008) refers to as the "collapse of contexts": the user of an Oyster card originally provided his personal data in the context of transportation in the London area. The contextual boundaries that originally separated the spheres within which data was gathered or made available and assigned specific purposes to the data collected, are thus becoming increasingly porous. As Boyd points out, the "collapse of contexts" that results from digital convergence has significant implications for the individual, it results in a lack

of control over his or her data, but even more significantly, it results in a need to renegotiate the terms of privacy.

Whenever surveillance has come under scrutiny, privacy has been one of the main concerns. Yet, as David Lyon argues, we are far from having reached an agreement on how to define privacy, even in the West where one might assume a certain homogeneity of opinion exists about personal, physical privacy for instance. In the West bathroom activities for instance are largely considered private, whereas Indian households lack such a concept (Lyon 2007). Helen Nissenbaum's argument that privacy is "contextual" (i.e. what is private in one context might not be in the other) has been highly influential as it appears to solve issues of cultural difference. We would agree with Boyd, however, that *"information is not private because no one knows it; it is private because the knowing is limited and controlled"* (Boyd 2008:18).

5. Ethical, Social and Legal Considerations of ICTs for Transport

Urban, geography and transport studies have emphasised the benefits of the growing application of ICTs in smart cities in general and in the transport sector in particular (Bagchi and White, 2005; Bannister, 2012; Cottrill et al, 2013; Midgley, 2009; Shaffer et al, 2012; Tyrinopoulos, 2011; Xiao et al, 2012), both in terms of personal user experience through reducing journey times, improving cost-effectiveness as well as offering wider social, economic and environmental benefits i.e. de-congestion, reduction in air pollution, healthier lifestyles leading to an overall healthier society and reduced healthcare costs. However, we argue that this emphasis needs to be supplemented with a more critical analysis of the surveillance capacities of these digital technologies. Where in a pre-digital era informational flows were controlled by decisions that were determined by context (Boyd, 2008), the contactless flow of data in times of digital convergence relegates the idea of context to a pure simulation. The example of the Oyster smart card has shown that the data collected in the transport context are readily available for marketing purposes. However, because the user situates both his travel activities and associated products such as the Oyster smart card within the framework of a socio-cultural activity (largely thanks to the marketing discourses surrounding ICTs for transport discussed above), the economic and social value of the data collected via these activities is obscured. Thus he is not aware of the ways in which this data can then be "processed, manipulated, traded and used to influence us and to affect our life chances" (Lyon 2001: 108). However, it is precisely our inability to determine exactly how data provided in one context might be used in another, and/or by a different agency and with what consequences, that requires ICTs to be

seen as means of surveillance. Thus, the main social, ethical and legal challenges emerging from the use of ICT applications in transport contexts are identified as:

- mission creep
- profiling
- privacy
- corporate exploitation of digital labour

What follows is a more detailed discussion of these issues, at the end of which we offer a summative, indicative table of the issues that need to be taken into account by stakeholders, giving examples and suggesting potential solutions.

As argued earlier, the collapse of contexts has severe implications on the ability to maintain privacy as it has eliminated the right to draw the boundaries within which one's personal information would remain. This however would appear to nullify the principle of 'purpose limitation' which was meant to uphold the very contexts within which the data are collected and for which the user has given his consent. As stated in Section I, Article 6 of the EU Data Protection Directive 95/46/EC, *"personal data must be collected for specified, explicit and legitimate purposes … and not be further processed in a way incompatible with those purposes".* Returning to the example of the Oyster card, the fact that a user's personal data can be made available to both commercial parties and law enforcement agencies disrespects the principle of purpose limitation. This is what Lodge also refers to as "mission creep". As she argues, *"mission creep is unethical because it can be insidiously introduced: if a technological application functions in one context, extending its application to another one – as a 'tool' – is tempting, especially if this can be achieved without further reference to public [or] parliamentary scrutiny"* (2010:12). In this context it is also important to refer to the debate around what has come to be known within the European Union as "the right to be forgotten", because the effects of mission creep are exacerbated by the fact that data is often held for unspecified lengths of time. No final resolution has been made within the European Union about this issue until 2013. However, Viktor Mayer-Schoenberger, one of its strongest proponents, has argued for the introduction of a sell-by date for data, which would mean the deletion of data once it has been used for its primary purpose (The Guardian 2013).

Helen Nissenbaum's argument in the previous section that privacy is contextual becomes thus problematic insofar as mission creep eliminates the boundaries that previously defined what should remain private. Debates around privacy issues are of long standing both in academia and in policy circles with regard to ICTs and surveillance (Bennett 2011). Corporations in turn have responded more quickly by adapting both their products and communication strategies to this increased

sensitivity towards privacy. The CEO of the company 'Renew' for instance that in August 2013 faced severe criticism for placing data-gathering recycling bins around the Cheapside area of London that captured the MAC codes (Migration Authorisation Code) from the smart phones of passers-by, made it clear his company was taking advantage of a loophole in the law by not adding name or home address to the collected data (Quartz 2013). However, the name and home address of a person are no longer necessary in order to compile a digital footprint that is information-rich enough to be commercially exploited. Consequently, the notion of privacy itself needs to be redefined. Privacy, as a consequence, is no longer tied to 'individual' variables such as name or home address, but needs to include other variables that are necessarily shared with other members of the population. In this context, to paraphrase Lyon, data is used in ways in which they can "influence and affect ... [the] life chances" of entire groups of the population. Hence, the privacy debate needs to move on from the level of the individual to that of the social in order to explore the implications of the widespread use of ICTs - for transport in this case – for social groups.

While the profiling of groups can be directed towards positive ends such as the identification of disadvantages based on disability, for instance, in the context of neo-liberal market capitalism, social profiling becomes a tool of market segmentation. The data collected from ICTs used in transport contexts becomes part of what Pridmore refers to as a "personal information economy", an economy that *"depends upon the gathering of data through surveillance systems and then analyses this data for patterns and associations deemed to be "of value," continually re-evaluating corporate practices and products based on these analyses"* (Pidmore, 2012:321). Where individuals embed ICTs for transport, such as the Oyster card or the Pleasecycle portal and app, within the socio-cultural practice of travel, at the same time they produce monetary value through these practices (Potoglou et al, 2013), thus becoming digital labourers. As Zurawski and Andrejevic have argued, "it should be noted that watching, monitoring, or profiling actually involve work, constituted of acts and place where surveillance is performed or practiced" (Andrejevic 2005 and Zurawski 2011, cited in Zurawski 2013:514). Critical scholars of the media and ICTs are increasingly focusing on the exploitation of digital labour through companies such as Facebook, who utilise user data in order to sell advertising space (Fuchs 2011). The above considerations show that this is an issue that should become increasingly relevant for transport studies also as digital technologies are used more and more in this context. For example when applications to calculate the carbon footprints are designed, potential risks need to be taken into account. What the preceding argument highlighted, is that aside from issues around the privacy of persons who submit their personal data in order to benefit from the advantages coming with the increased use of ICTs in transport systems, a range of other ethical,

social and legal implications arise that currently receive only limited attention in transport studies. Within the scope of this chapter it was not possible to undertake a full analysis of these implications, yet we suggest that their consideration in the transport studies context would amount to a healthy expansion and redefinition of the field. As with ICTs more generally, debate needs to be fostered with a number of other disciplines, such as law. Depending on whether a given smartphone application makes use of location data services, widely used platforms such as OpenStreetMap or GoogleMaps for instance, may significantly affect data-protection policies that need to be adhered to. Equally, significant differences between countries may be experienced. For example, despite the existence of a common EU policy framework, the national legal frameworks and the implementation of this common EU Directive vary in technologically advanced countries such as the UK and The Netherlands (Chapter 11). The complexity of the legal and policy framework results in part from the fact that data are collected locally but flow globally. These challenges call for an urgent debate across disciplinary boundaries to enable law and policy responses to new technological developments to more effectively limit the risks involved.

Table 1 gives an indicative list of ethical, social and legal issues arising from the increased application of ICTs in the transport context, and offers suggestions about how these issues could be addressed by technology manufacturers and policy-makers. It is not an exhaustive list of issues or possible solutions, but should be understood as an indication of the types of action necessary for a socially acceptable future of transport technology:

Table 1: Illustration of some key ethical, social, legal issues to be taken into account by stakeholders

Issue	Example	Desirable action	Timeline
Purpose limitation / mission creep	Chromaroma: a smartphone app offering discounts for activities conducted by users in their real life e.g. travel by bus	Increase of user awareness about the ways in which one's data, e.g. collected through gamification (Pleasecycle), can be used for other than the originally specified purpose (e.g. when data is made available to third parties for law enforcement or commercial entities)	Issue should be considered during the ICT design process and options offered to users prior to registration
Definition of "personal information"	The data-gathering bins around London were argued to be "legal" as the data collected was not deemed "personal information" as long as it excluded names and addresses	Review of what is considered as "personal information" taking into account implications of datasets such as time of day not just individually, but also the sensitivities arising for users from potential combination or correlation of individual datasets (e.g. location, time, frequency) which is intertwined with Big Data	Issue should be addressed through appropriate legal frameworks and codes of practice both in advance and during registration to use ICTs
Wider definitional issues	Perception and definition of privacy in ICT initiatives with a community objective e.g.	Privacy, if understood from an ICT or legal perspective, is largely equated with data protection. In philosophy, however, the history and implications of this concept are far more complex, where it is part of what it means to be	Such issues are of wider relevance and should be reviewed both by policy makers and by users to aid manufacturers/developers

	Pleasecycle	human. Decision- and policy-making processes would therefore benefit from more frequent round-table discussions where these conceptual issues can be addressed, as they have significant impact on technology development and implementation	address them efficiently
Quality assurance	Ensure that any key ethical/social/legal issues have been addressed before an ICT is available for public use	Extensive and regular "ethical reviews" to be conducted in the design and development stages. Stronger cooperation with academic experts or focus groups with potential users could act as independent review processes. Development of a quality standard (e.g. ISO, EMAS) to be adhered is a future alternative	Issue should be addressed at the final stage of ICT development, but should be reviewed throughout the design and development process

6. Conclusions: The place of critique in policy-making around ICTs

The practical suggestion here is that there is an urgent need to raise normative questions in the lead-up to policy decisions on ICT applications in a wider sense (see Table 1). As already argued, there is a tendency in marketing and policy communications to present ICTs as a neutral means to desirable experiences (Figure 1), which follows from the neo-liberal market imperative to derive value from the data provided in these contexts. The basic operating principle of digital ICTs has two significant implications: firstly, that ICTs for transport need to be considered as part of a larger informational infrastructure, rather than as an isolated case, and secondly, the collapse of the contextual boundaries originally separating the purposes of data collection. This has enabled both commercial entities and law enforcement agencies to benefit from the masses of data gathered through transport applications, often without the explicit consent of the user. Subsequently, a number of ethical, social and legal concerns have been raised, emanating from the increasing violation of the principle of purpose limitation. In this final section, it is argued that critical theories of ICTs and philosophy of technology approaches can inform an interdisciplinary debate on the benefits and risks of ICTs with a two-fold purpose: firstly, to increase the awareness of the public about the risks associated with the use of technologies that collect, process, store and transfer their data in order to be able to make informed decisions. Secondly, stakeholders from the legal and policy making circles will benefit from a more thorough and theoretically informed debate to avoid a lack of clarity in definitions of concepts such as privacy creating loopholes that can then be exploited for commercial gain as seen in the example of the data-collecting bins (section 5).

Drawing on the work of the German philosopher Martin Heidegger, who criticizes what he sees as the dominance of an instrumental understanding of technology that conceptualizes technology as a neutral means to beneficial ends (Heidegger,1977), an understanding can be reached of why users

fail to see ICTs as an interconnected informational system and the risks associated with this interoperability. According to Heidegger, the mode of engaging with everyday objects like technologies as "ready to hand" leads to their usability obscuring their systemic character. From Heidegger's perspective, an ontological analysis of an object like the Oyster smart card would deconstruct it into a complex network of materials, persons and intentionalities or power relationships. Underneath the apparently simple plastic surface of the card such an analysis would reveal how it is tied into the political economy of personal information, and the network of private, commercial and state actors involved as beneficiaries in its usage. As our prior analysis has shown, use of the Oyster card adds a number of benefits to the socio-cultural practice of travel (Figure 1), however the data collected via this practice is of value to commercial entities and law enforcement agencies, a factor that is part of the very design of the object. A philosophy of technology approach can thus replace a focus on pure usability on the part of the user with a more comprehensive view of the technological object that takes into account the risks arising from its usage also.

At the same time, a comprehensive understanding of technology such as that afforded by philosophy and sociology of technology approaches is needed in the policy-making process (Table 2). Currently, a widespread lack of understanding of the technologies themselves, a lack of clarity in the definition of concepts used to regulate their use (privacy being a case in point) and the inadequate consideration of potential risks has led to a situation where the dominant policy strategy is to pass 'corrective legislation'. An example would be the supplementary regulation on bodyscanners at European airports introduced by the European Commission following a series of debates on their impact on health and risks to privacy several years after their original trial at London Heathrow, Amsterdam Schiphol and Helsinki Vantaa Airports. Contemporary regulations in the US offer the option to travellers not to be scanned, although they are advised that this may result in missing their flight departure. Both technology- and policy-driven strategies to safeguard human rights and public health regarding the application of ICTs therefore only contribute to risk minimization. As argued in this chapter, it would be possible to anticipate a large part of the social, ethical and legal implications arising from unchecked informational flows (e.g. section 5) by allowing a philosophically informed debate to take place at an earlier stage in the decision-making process. Thus, it could be ensured that technologies will continue developing *"unchecked by anything other than such policies and regulations that minimize their risks and their misuse"* (Kompridis 2009:21).

To conclude it should be stressed that, like in other consumer contexts, ICTs for transport do not form part of a *"malign plan of a totalitarian corporation or state"* (Zurawski 2011:515) but have evolved in response to the challenges societies face due to growing urban environments and

changing lifestyle patterns. It is in this sense, however, that they need to be considered not in isolation from but from the perspective of the wider information-technological infrastructure of society. Consequently, the ethical, social and legal implications of the application of ICTs to transport contexts are not just relevant to the transport context but form part of the wider challenges technological innovation is posing for society. Thus, while the debates surrounding the controversial data-gathering processes of the Google Street Map View have raised much-needed public awareness in relation to privacy globally, it has been argued that the negative 'hype' created around individual technologies should not distract from the *systemic* nature of the informational infrastructure. It is the purpose of this chapter to highlight some of the ways in which transport studies should expand their field of vision to include some of the more recent debates taking place in critical studies of ICTs such as the exploitation of digital labour. At the same time, these debates should also be enriched by the insights gained from transport research as outlined in the previous chapters.

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