Article

Eyes on the Road: Surveillance Logics in the Autonomous Vehicle Economy

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Abstract

As emblematic products of a previous industrial era, cars are often tied to a sphere outside the digital economy and its ruling logics and are, therefore, governed by different ideas of privacy, agency, and sovereignty. However, as self-driving cars gain momentum, computerization, and automation, their platformization contributes to transforming the automobile as technology, industry, and cultural artifact. This creates new spaces of consumption within cars, around them, and between them—all of which are premised on highly detailed contextual information that is collected, processed, and transmitted in the process of navigation. Thus, the ads and entertainment delivered to passengers, the landscapes surrounding the vehicles, and the proprietary data networks that link self-driving car fleets are all redefined as revenue streams in the new auto economy. This paper explores the transformation of the existing auto economy in the context of the emergence of self-driving cars by following the transposition of surveillance logics that are central to the digital economy and by considering the implications of their adaptation to the arena of automated mobility.

Computerizing the Car

For decades, cars have been undergoing a gradual transformation through the incorporation of electronic and computerized components. This process has endowed cars with a wealth of functions that go far beyond enabling the movement of people and goods across space. With the help of electronic components, such as car stereos, onboard navigation units, cruise control, automatic parking assistance, satellite radio, lane detection, smartphone integration, and even audiovisual dashboards, cars have become mobile spatial media environments whose operations are coordinated by increasingly sophisticated computers that are often connected into digital networks of various types.

In this article, I argue that this car computerization has been the catalyst for an even more substantial transformation that is beginning to take place: as cars are on the verge of the autonomous driving revolution, they are becoming substantively embedded into the platform economy. As a result, many of the surveillance logics central to platforms, and to the digital economy more broadly (such as harvesting personal data, location tracking, and targeted advertising), are readily integrated into cars and their electronic components in order to buttress the business models of the new autonomous-navigation economy.

In what follows I establish how the computerization of cars has provided the technological basis for these developments by turning automobiles into hardware and software that is amenable to being incorporated into the digital economy through an array of electronic components with growing capabilities for data

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collection and integration into surveillance and monetization platforms. The next section shows how this process has entailed the development of a range of services through cars as a way of leveraging their technological capabilities and creating new revenue streams in the context of the digital economy. The third section argues that the automation of cars creates the conditions required for the next stage in this transformation. In this new stage, cars cease to be primarily viewed as products to be bought, sold, or owned, and become the basis for new business models within the platform economy, all of which fundamentally relies on the broad data-harvesting capabilities of the next generation of automobiles.

Underlying this transition is the automobile industry's thorough adoption of surveillance logics that are fundamental to business models at the core of the digital and platform economies, such as social media (Facebook), search engines (Google), video streaming (Netflix), digital services and online retail (Amazon), and ride hailing (Uber). The fourth section explores the surveillance implications of the emerging platform-centric model in the automotive industry. The article concludes with an outline of the main issues in the emerging autonomous-navigation economy and a call for research to deepen our understanding of the socioeconomic impacts that may follow such a fundamental transformation of automobiles—one of the most instrumental technologies around which human societies have been reorganized in the past century.

From Product to a Bundle of Services

Due to the vast size of the automobile market and the increased infrastructural dependence on this technology in many parts of the world, car ownership comes with enormous social, political, and environmental impacts. Whether it is as a status symbol, a means of transportation, or a signal of environmental politics, owning a car (whether a hybrid or an SUV) is bound up with notions of autonomy, mobility, (national, class, group, and gender, etc.), and identity, among other things. These varied ways in which we relate to cars are not only tied to the products themselves but are also enmeshed in a web of exchanges, relations, and experiences that include the many services associated with cars.

The automobile business requires building a consistent but adaptable socioeconomic infrastructure around cars that includes providing an expanding array of options to access and own these products. At least since the mass commercialization pioneered by Henry Ford, automobile manufacturers have relied on expanding their market through the sale or lease of vehicles to individual owners. In this process, automobile manufacturers have diversified their products through a range of ancillary services in order to maintain a foothold in the market.

A key example of this branching-out process that has helped automobile manufacturers survive is the development of the financial services that are routinely offered to prospective buyers as a way to lease or purchase a vehicle. Consequently, it is no accident that many of the leading automakers now conduct a significant portion of their business through their financial arms and draw growing revenue from them. For instance, in 2015, the total auto loans outstanding in the US surpassed \$1 trillion for the first time, with \$119 billion generated only in the second quarter of that year (Zumbrun 2015).

The financial arm of the auto industry relies on a well-developed architecture for the information gathering, verification, and approval of credit subjects, who then are permitted to buy or lease vehicles. While currently this part of the business model has the objective of securing customers in good financial standing, its information infrastructure may prove increasingly valuable as the industry's business model pivots toward a more data-centric and automated future. This potential has led some of the largest car manufacturers to rethink their business strategies in order to monetize the vast reservoirs of financial and personal customer data they have collected through their financing operations. Ford's CEO, Jim Hackett explained this move in a recent radio interview cited by the *Detroit Free Press*:

The issue in the vehicle, see, is: We already know and have data on our customers. By the way, we protect this securely; they trust us... We know what people make. How do we know that? It's because they borrow money from us. And when you ask somebody what

they make, we know where they work, you know. We know if they're married. We know how long they've lived in their house because these are all on the credit applications. We've never ever been challenged on how we use that. And that's the leverage we got here with the data. (Wall Howard 2018)

The diversification of automakers and their monetization strategies, along with the continuous technological transformation of cars themselves, underpin the new automated vehicle economy by progressively transforming the car into a bundle of services rather than just a product. A central part of this turn in the auto industry is the increased specialization required to service cars that have complex digital components, which opens new revenue streams beyond the one-time purchase of the vehicle. For example, even though services like repair and maintenance have always been part of the car economy, the computerization of vehicles has brought greater need for electronic skills, advanced technologies, manufacturer authorized certification processes, as well as new frameworks to regulate how these services are provided. A consequence of this trend has been to push out independent repair shops and aftermarket providers through technical and legal barriers in information sharing, thereby centralizing the provision of car repair services to dealerships that are licensed and overseen by automobile manufacturers (Kessler 2017).

At a more systemic level, as cars continue to be defined by incremental computational and multimedia capabilities, they are brought further into the digital economy and influenced by its ruling logics of information harvesting, monetization, personalization, and surveillance. Following the trajectory of some of the electronic components that have brought the car into the digital economy provides a window into the potential developments that await in the face of autonomous driving. The case of onboard navigation technologies is illustrative of this trend, since it is also deeply involved in the development of self-driving capabilities.

Although car navigation is nearly as old as cars themselves—and some versions of this technology even precede automobiles (French 1995)—it was only in the 1990s and 2000s that the technology underwent substantial development and massive commercialization. Building on pioneering innovations from previous decades, such as third-party manufactured ETAK, or Honda's Electro Gyrocomp (Arai, Nakamura, and Shirakawa 2015; Edwards 2015), car-navigation technologies in the US greatly benefitted from the Clinton administration's decision to unscramble GPS signals on May 1, 2000 (Reuters 2000). Allowing civilian use of high-precision geolocation, which had previously been reserved for the military, fed the growth of a navigation industry that featured rising third-party manufacturers such as Garmin and TomTom but also auto companies that devoted more attention to the provision of services via built-in devices such as Oldsmobile's Guidestar, GM's Onstar, and Ford's SYNC. While the inclusion of GPS capability within smartphones eventually led most users to favor this option for navigation, onboard navigation systems that are pre-installed by automotive manufacturers are now forming the basis for developments in self-driving car technologies and, thus, the automotive industry may be primed for a return to competitiveness (Taub 2018).

The prevalence in use of GPS for the purposes of car navigation proved instrumental in bringing the car into new networks of information while also opening the door to new possibilities for real-time locational surveillance. The US Supreme Court addressed this issue, in 2012, in *United States v. Jones*, where the majority decision established that the police's placement of a GPS tracker on a suspect's vehicle constituted a search (and trespass) under the Fourth Amendment and thus required a warrant. According to some commentators, however, this ruling left the substance of the matter unsettled, since by focusing on the narrower issue of trespass it failed to adequately address the increasingly ubiquitous surveillance capabilities of GPS-enabled geolocation and its incorporation in all manner of electronic devices (Epps 2012; Morrison 2012). In fact, even though she issued a concurring opinion with the ruling, Justice Sonia Sotomayor forcefully expressed her concern with the core issue of access to GPS-enabled geolocation data:

Only Justice Sotomayor addressed the fact that the sheer quantity of information the government was able to collect on Jones was what was troubling about the case. Sotomayor

noted that “GPS monitoring generates a precise, comprehensive record of a person’s public movements that reflects a wealth of detail about her familial, political, professional, religious, and sexual associations.’ Faced with all the ways in which technology has eroded the private sphere, ‘it may be necessary to reconsider the premise that an individual has no reasonable expectation of privacy in information voluntarily disclosed to third parties.” (Morrison 2012:124)

Beyond navigation capabilities, the use of geolocation in cars represents a new frontier for auto manufacturers to bring new services into cars and create revenue streams that tap into the valuable information provided by having access to customers’ data and driving trajectories. A recent example of this growing trend is General Motors Marketplace, which allows customers to access third-party services from vendors, such as stores and restaurants, through their car dashboards (White 2017). General Motors frames this service as a way for bringing vendors and other third parties into the car space; in other words, intermediating access to a captive customer base—much like a digital platform would do. Indeed, in advertising this service to vendors, GM frames the car as a transformed space that consists of a bundle of services that are increasingly mediated by digital platforms:

With a first-of-its-kind branded ecosystem, Marketplace enables businesses to seamlessly integrate into drivers’ daily lives. General Motors (GM) is leveraging decades of personal mobility leadership to support the Marketplace experience no matter where consumers find themselves.

Be the first to remedy an empty tank. Marketplace allows fuel merchants to be the initial choice following a low-fuel event trigger that generates convenience store and fuel offers based on proximity. (General Motors n.d.)

The business model behind this development relies on the use of personal information and the targeted display of sponsored information in the car’s “infotainment” systems. This service is part of a larger turn of leveraging navigation devices and car media screens into advertisement hubs (Telenav 2018; Vaas 2018). In addition to the safety hazards that might come from distracted driving, these services translate into the car space the constant potential for privacy infringement and surveillance that routinely affects users of other digital platforms.

In essence, as the above examples suggest, cars are turning into bundles of services that are, in turn, becoming increasingly dependent on the monetization of customers’ attention and personal information. This pivot redefines the core business strategies of the auto industry by bringing the industry into the orbit of digital platforms such as Google, Facebook, and Amazon. Subsequently, as cars begin to give way to autonomous vehicles, the thorough computerization, networking, automated data collection, and unlocked passenger attention of these vehicles are set to create favorable conditions for a thorough platformization of the auto industry. These conditions are discussed below.

Autonomous Driving and the Platform Economy

Just as gradual computerization created new revenue streams, the rise of autonomous vehicles is tied to new spaces of consumption and new avenues for monetization. For example, by freeing up driving time, autonomous vehicles turn drivers into passengers, thereby enabling them to repurpose travel time for work, rest, or entertainment. This newly available attention is unlikely to go unnoticed by firms wishing to capitalize on it. In fact, non-autonomous cars are already fully integrated multimedia environments that allow passengers (and to a lesser extent, drivers) to consume all types of audiovisual media. Added to this, their constant location awareness through GPS-enabled navigation makes cars potential providers of highly valuable personal and spatial data. Thus, with the advent of self-driving technologies, the multimedia spaces that already exist in cars can be enhanced to multiply the provision of products and services to passengers, vendors, and other third parties, thereby bringing these vehicles more fully into the platform economy.

The fundamental characteristic of platforms, which has made them key sites for economic transactions, is their ability to bring different actors together to facilitate transactions between them, such as buyers, sellers, and advertisers. According to Srnicek (2017), the advantage of a platform over traditional business models is bolstered because it is positioned: “(1) between users, and (2) as the ground upon which their activities occur, which gives it privileged access to record them” (44). As enclosed and mobile spaces equipped with myriad sensors and sophisticated computers with access to users’ routines, personal data, behaviors, preferences, and movements in physical space, automated cars represent an enhanced version of digital platforms with economic potential that is as significant as their latent threats to privacy, security, and autonomy (Glancy 2012; LaFrance 2016; McBride 2018).

While the auto industry is not (yet) platform centric in its business model, cars already play a pivotal role in the business models of some of the most prominent digital platforms, such as ride-hailing giant Uber and its many competitors. However, in these cases, cars serve as vessels through which humans provide services (from rides to food delivery) that are contracted via a platform. Once they acquire automated-driving capabilities, cars will be in a position to destabilize this business model by merging the roles of the vessel and the human who provides the service. This has the potential to both expand the platform economy and upend its existing structure.

The widespread use of automated cars can conceivably generate substantial impacts across a continuum of domains, which Milakis et al. (2017: 325) have classified in three stages: first order (traffic, travel cost, and travel choices); second order (vehicle ownership and sharing, location choices and land use, and transport infrastructure); and third order (energy consumption, air pollution, safety, social equity, economy, and public health). While the extent and exact nature of these changes are yet to unfold, it is clear that they will create new conditions that will require economic actors to adapt, particularly those in the business of making, selling, buying, or providing services through cars.

From ride-sharing platforms to auto manufacturers, freight operators, and even car rental companies, car-reliant businesses will face disruption from automated navigation and this will force them to plan for a variety of possible scenarios. On the one hand, the existence of self-driving cars could make it easier for people to move from place to place, thereby unburdening them from the effort of driving and allowing them to take advantage of the time spent in the car. If this leads to higher levels of car ownership and use (which would benefit incumbent automotive manufacturers), it could erode the customer base of ride-hailing and other car-reliant platforms.

Under a different scenario, the automation of cars represents a business opportunity for firms like Uber because it offers the technological means to continue providing rides without the necessity of relying on human labor pools and paying to provide the actual service of transporting people. In this scenario, automated driving can lead to economies of scale in the ownership and management of vast fleets of robotic cars and this would enable the direct provision of services to consumers, thus turning ride-hailing platforms into transport operators.

By making substantial investments in the development of automated vehicles, leaders in the platform economy (such as Uber and Alphabet’s Waymo) have recognized the potential for monetizing the latter scenario—and, in doing so, have simultaneously increased its feasibility. Recognizing that this may threaten the traditional model of car ownership, incumbents in the automotive industry are explicitly pursuing a platform-centered approach. Ford, for example, has recently created an independent spinoff company, Ford Autonomous Vehicles LLC, which focuses solely on the development of self-driving cars. The subsidiary’s CEO, Sherif Marakby (who was until recently employed by Uber), has been vocal about developing a new business model and pursuing the opportunities provided by the platform economy, stating that the goal is to develop a service where Ford owns and manages fleets of autonomous vehicles to “move people and moving goods in a geofenced area” (O’Kane 2018).

Surveillance Implications

Changes in the car market and the thorough digitization of the economy at large are reinforcing incentives for auto companies to transition toward an information-centric business model. In this process, automakers are able to leverage the massive troves of financial and personal data they have accumulated through their financing arms—which constitute rapidly growing parts of their business. In addition to allowing them to monetize existing customer data, this pivot simultaneously puts automakers in an improved position to take advantage of the possibilities offered by autonomous vehicles.

On a technical front, autonomous vehicles provide the opportunity to open multiple new revenue streams due to their reliance on pervasive multi-modal data collection—via the surveillance of locational data, the capture of the physical environment, linkage through communication networks, and the collection of car and passenger data. All of these data streams¹ can be monetized in a variety of ways, most of which involve the increasingly fine-grained identification, profiling, and targeting of customers. For example, newly opened attentional spaces in cars increase the potential for personalized advertising and multimedia content provision for passengers.

In addition to the data-collection capabilities cited above, autonomous vehicles, through their automated features and interconnection to larger communication networks, provide an infrastructure for the rise of a platform-centric business model for the auto industry. This means that ride-sharing firms, automakers, and others with the intention to operate as autonomous-vehicle fleet operators will be positioned to benefit from increased and widespread surveillance. This will likely include individual customers, but it will also rely on the industry expanding its dragnet toward (among others) assessing demand and supply in transportation services; continuous locational analysis of optimal geofenced areas; and the monitoring of information, communications, and transportation networks at large.

Conclusion

Beginning with the gradual incorporation of computers and other electronic components, cars have been absorbed into the digital economy and transformed into a bundle of services. Autonomous navigation stands to draw them fully into the platform economy and, in doing so, accelerate an ongoing industrial reconfiguration between the automotive and information technology industries. The consequences for significant portions of the world economy are noteworthy as are the implications for transportation systems and car users alike, since the business models underlying this turn rely on their constant surveillance and monetization of ever more (expansive and invasive) personal information, as well as myriad data streams.

Ford AV's business pivot, combined with the investments and alliances made by other incumbents in the automotive industry, signal the recognition that the car is becoming a full-fledged platform in and of itself. While auto manufacturers are moving toward a platform-centric business model and existing car-reliant platforms are investing heavily in the development of autonomous vehicles, it is not clear how this industrial reconfiguration will be settled. However, the contours of this are already apparent in what has been called the "future of transportation stack" (Stewart 2017). This configuration is characterized by the integration of firms across industries such as geospatial, navigation, artificial intelligence, ride hailing, transportation, automobiles, drones, and other associated technologies.

Such integration represents the convergence of two trajectories that, until now, have been running mostly in parallel: the expansion of the platform economy to multiple sectors and the increased computerization of cars. The implications of the comprehensive transformation of automobiles that this will entail are only beginning to come to light. This will require research that addresses the disciplinary confluences and

¹ According to Hitachi's estimates, autonomous vehicles will have the capacity to send 25 gigabytes per hour to the cloud (kdespagniqz 2015).

multifarious impacts that will likely arise from such a fundamental transformation of the automobile, one of the pivotal technologies that has come to structure our current social and spatial order.

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