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Service design and the emergence of a second economy

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15.1 Introduction

Services enabled by digital technologies are promoting the expansion of the service economy, the diversity and variety of services, and the nearly ubiquitous access to services. Services delivered through digital platforms and accessed via digital devices create dependencies on technology and change divisions of labour among service providers and recipients and among the human and non-human actors involved in the service exchange. Contributing to the growth in new services is the arrival of the 'Internet of Things' where sensors send and receive information connecting people, places and things to the internet and to each other. Every day we learn of new apps that analyse data to report on such things as buying habits, blood sugar levels, traffic congestion, voting patterns, driving habits, available parking spaces, cheap airline tickets, and the list goes on. Often unbeknown to service recipients, these digitized processes execute functions such as calculating, processing, sorting and routing that trigger further actions.

Many of these 'smart' functions until recently were performed by a skilled human workforce – but efficiencies in cost and improvements in quality and reliability have meant that data-driven algorithms are displacing people at an ever-growing rate. Worker dislocation as the result of automation and advances in technology is not new, but service designers now must address the fact that the recent rise in services involves the emergence of new divisions of labour among humans and machines facilitated by a 'hidden', digital algorithmic workforce (Arthur 2011; Zysman 2006).

This chapter explores new opportunities for service design to guide this transformation by helping to define the components and interconnections of these digitally enabled services and the new economic, political and social relationships they afford.

The chapter proceeds as follows. The first section, 'The digital workforce', places the digital workforce in the context of the long-standing human experience with technology and automation. The second section, 'The autonomous car', provides an example of a site for the design of digitally enabled services. The third section, 'Knowablity, visibility and materiality of the second economy', brings into play three general criteria for service design to consider as it ventures purposefully into the digital economy, and the final section, 'Designing digitally enabled services', reflects on implications of these transformations for service design.

15.2 The digital workforce

> The choices we make, or fail to make, about which tasks we hand off to machines shapes our lives and the place we make for ourselves in the world. (Carr 2013)

Ever since humans created the first tools for hunting and gathering, technology has been enlisted to assist in the performance of the work people do to make a living and create a meaningful life. Bows and arrows and spears made hunting more efficient, and baskets and grinding tools were the labour-saving devices of their time. However, today many of our assistive technologies are out of view, operating behind the scene, and their inscrutability only adds to their invisibility. The more sophisticated these digital technologies become, the more difficult it is to understand the complex algorithms that manipulate and analyse data in order to help guide human actions, whether this involves where to stay for a night's lodging, what medications to take, or how to park your car.

Digital technologies do not just provide a substitute for work once done by people – they refigure the division of labour between humans and machines. For example, technologies that assist in parking a car require that drivers develop new skills in reading onboard monitors, ready to take over as needed. Over time some drivers will lose the skill of unassisted parking, leaving them 'helpless' if in the future they are obliged to drive an older model vehicle, as happened when automatic transmissions were introduced and standard-shift cars became increasingly un-drivable by those who had never learned to drive one. Many have written about the psychological perils of turning over such tasks as flying airplanes or operating high-risk facilities to digital technologies, noting how people can become complacent or put too much trust in information produced by digital sensors and complex algorithms, doubting their own experience and expertise (Woods 1996; Parasuraman et al. 2008). As we continue to embed digital technologies in an ever-increasing range of tasks and activities, we run the risk of not only deskilling, but of relying on algorithms that we have little involvement in designing and no ability to scrutinize, critique, or change.

Involving service design in more aspects of this very large, but unseen, digital workforce will require that service designers understand more, possibly much more, about software (not to mention hardware and data analytics) than is typically now the

case. To quote Marc Andreessen, 'Software is eating the world' (2011) and service design must take notice. Our capacity to shape new service worlds (Bryson et al. 2004) requires that we develop more nuanced and informed understandings of how algorithms work and the data transformations they are based upon.

15.3 The autonomous car

The emergence of what variously is called the automated car, the driverless car, the self-driving car, or the robotic car provides an opportunity to explore issues and concerns brought about by the growth in the digital workforce. The 'autonomous car' (including cars not yet fully autonomous) already is becoming an area for service innovation where automobiles sold today offer self-parking services, collision avoidance services, and the long-standing 'time for service' alerts. But going forward, the services that might be added or replaced with advances in car technology or, more radically, 'automated travel' open up significant areas where service design can have an impact. A wide array of companies is investing in autonomous car design beyond automotive companies, including technology companies such as Alibaba, Baidu, Google, Apple and Tata Consultancy. The involvement of technology companies is hastening the expansion of the automobile's digital workforce with the ability of these companies to act with immediacy, potentially putting humans and the autonomous car on a collision course, both figuratively and literally. As declared in a recent article in the *New York Times* titled 'Google's Driverless Cars Run Into Problem: Cars With Drivers' 'Researchers in the fledgling field of autonomous vehicles say that one of the biggest challenges facing automated cars is blending them into a world in which humans don't behave by the book' (Richtel and Dougherty 2015). As with other digitally enabled services, integration between the things humans do and those performed by machines will be critical to the success of these new services.

In addition to shaping our everyday experience of driving, the autonomous car is also having an impact on jobs as automated vehicles deliver services once performed by people. As happened with airline pilots and train engineers previously, fewer drivers will be needed in industries such as trucking, taxi and bus services, and including the 'independent' drivers for Uber, Lyft and the like. The autonomous car also is highly disruptive for the services provided by the insurance industry and public policy and regulatory agencies. In part because of the prevalence of cars in everyday life, the autonomous car provides a novel space that is attracting much commentary, but more importantly is providing ample opportunity for service design to claim its seat at the table of the digital economy. That said, design challenges abound, including ethical ones, that must be addressed and that we explore in the sections that follow.

15.4 Knowability, visibility and materiality of the second economy

As noted in the introduction, digitally enabled services involve 'hidden' machine-to-machine interactions that aggregate and analyse data from diverse sources; they connect frequency data with geospatial displays, route users through task flows, and perform behind-the-scene calculations. These digitized processes make possible such things as the optimal routing of package delivery, real time notification of power outages, flight reservation confirmation and seat assignments, notification of vehicles approaching from the rear, and more. Service recipients have gotten used to incorporating the outcomes of these digital processes into the things they do, even if they are unaware of how the service experience is being shaped by what is happening behind the scene.

The challenges of making 'hidden' digital services visible and knowable manifest with growing frequency these days. Recently, for example, citizens in the USA were warned that Google's algorithms could shift voting preferences of undecided voters (Epstein 2015).

> Our new research leaves little doubt about whether Google has the ability to control voters. In laboratory and online experiments conducted in the United States, we were able to boost the proportion of people who favored any candidate by between 37 and 63 percent after just one search session. The impact of viewing biased rankings repeatedly over a period of weeks or months would undoubtedly be larger.

Influencing voter preferences for candidates may not be the intended use of Google search, but this study suggests that service designers need to consider how service outcomes can reach far beyond the immediate service on offer, with the possibility of intentional (or unintentional) manipulation of invisible algorithms designed to produce specific outcomes. This brings to the fore the spectre of the inscrutability of digital manipulations that produce specific outcomes. In many cases this may not pose a problem, but in others knowledge of how behind-the-scene choices are made becomes an imperative for service designers.

Finally, while it is easy to think of the digital domain as immaterial, digital services, like other services, are materially constituted through the interactions among service entities whether they are bodies, artefacts or algorithms. This necessitates opening the aperture of observation beyond digital and non-digital dichotomy to consider how service designers scope their investigations to include the work and outputs of the digital workforce. The space of possibilities is dauntingly large and accordingly, we suggest three general areas to consider in the design of digitally enabled services: their knowability, visibility, and materiality. These three dimensions intersect with ongoing concerns within service design of agency, service ecosystems, innovation, and relations among service entities – which we comment upon as appropriate.

15.4.1 Knowability

The argument often is made that people don't really want to know the details of the calculations that go on out of their view. They are only concerned with the quality of the recommendations they receive for films, books or dating partners, or the timeliness of airline seat assignments, theatre tickets, or even crash avoidance manoeuvres. Service designers too, in focusing on the service experience, often only interact with the digital workforce through the user interface, for example, focusing on designing the 'driving' experience for occupants of autonomous vehicles or considering such things as how the service experience is affected by the time needed to come up with a movie recommendation.

However, the emergence of a digital workforce raises questions about digital agency that go beyond how changes to divisions of labour between human and non-human actors are having an impact on the service experience. When should our algorithms be given the authority to act on our behalf and when should they be able to do so autonomously? What aspects of these digitally enabled services do people need or want to know? And when and how should people become knowledgeable about the 'hidden' services performed by a digital workforce? Answers to these questions implicate public policies, regulations and laws that grant agency to people and organizations.

These questions are not new with the advent of these digitally enabled services. They are asked in the non-digital realm all the time. For example, in the USA, HIPPA regulations (the Health Insurance Portability and Accountability Act of 1996) require that patients know what happens with their medical data – who can see it, who can access it, and what can be done with it. Patients sign a document on each medical visit in effect authorizing the collection of their data, with the understanding that its use is constrained in various ways. Consider another example, the use of Microsoft's Word where the technology acts on our behalf to keep formatting consistent or offer spelling corrections. In this sense, it is acting autonomously although human users retain the authority (if not always the competence) to override the system. In a somewhat different way, the publishers of this book authorize a certain format for our text, which is then enforced through digital templates. The source of authorization is the human actors responsible for the look of the publication, but the digital template autonomously enforces the formatting rules. These are relatively easy cases, where we can sort out who or what is acting on our behalf and how to appeal the outcomes if they are in dispute. But this is not always the case.

A recent example makes this point. The *Financial Times* (3 April 2015) published a story of a woman who had been in a car accident in which the airbags deployed. Moments later she received a call from her insurer. 'It was surreal,' she says. 'I was all shaken up, had just been hit in the face and could not understand how on earth my insurer knew what was going on' (Sharman 2015). It is fair to conclude that the service experience provided to the driver of the car was not wholly expected, nor

completely embraced. In the end, it turned out there was the proverbial black box placed inside her car that detected the strength of the accident, and autonomously sent the location and the force of the impact to the insurer who called an ambulance. In the future the ambulance may be called autonomously as well, without the need for the insurer to place a call. The driver in this case had little ability to know who defined the technical specifications that resulted in a message sent to her insurer or for that matter who designed the algorithms and implemented them and who had the authority or expertise to inspect and modify them. It is hard to say what considerations were given to the design of the driver experience, but this example highlights the importance of addressing how the actions of the digital workforce impinge upon the service experience.

Additionally, there are moral and philosophical implications to how we understand digital agency as it relates, for example, to the simple act of driving a car. Human drivers are given the authority to drive a car by taking written and behind-the-wheel driving tests. In return they receive a driving licence issued by an authorized agency. Beginning not so many years ago, driver autonomy began to be shared with the car's technology, starting with systems that automatically adjusted the car's braking and steering, and more recently providing assistance in parking. The algorithms that enable the car to act autonomously are being incorporated into the design of automobiles at an ever-increasing rate and they are for the most part inscrutable to anyone but those who invented and/or programmed them. The design of the autonomous car is outpacing policies and laws that regulate what actions cars can take on our behalf. Carmakers are beginning to ask questions about whether autonomous vehicles should use algorithms to make ethical decisions that human drivers make today (Lin 2013). In theory, algorithms could review alternative crash outcomes and then rank them, for example, to avoid hitting a bus full of school children above a man driving alone. Hodder (2009: 1) notes:

> The ethical issue with algorithms and information systems generally is that they make choices about what information to use, or display or hide, and this makes them very powerful. These choices are never made in a vacuum and reflect both the conscious and subconscious assumptions and ideas of their creators.

Realizing the centrality of agency – what is authorized and by whom and how that turns into autonomous action on the part of the digital workforce – can begin to guide service designers to ask questions about what should be knowable to service recipients and the wider service ecosystem and how to make the information accessible. Furthermore, the prospect of unintended outcomes brought about by the actions of an invisible digital workforce brings to the fore the possibility that service recipients, designers and engineers will not be fully able to understand and anticipate the impact of algorithmic outcomes.

This raises a number of questions for service design regarding where and when in the service design process should considerations of agency, authorization and

autonomy enter the picture and who needs to participate in these design choices. While there is not space in this chapter to consider the possibilities, much has already been written about the importance of 'stakeholder' participation in design decisions and about strategies for directly involving 'users' and others affected by design choices (c.f. Simonsen and Robertson 2012). It is not possible to program-matically advice how best ensure that individual, societal and business concerns are addressed in the design of algorithmic agents and their inclusion in the delivery of services. Instead our intent is to raise ethical and customer experience issues associated with making 'hidden' digital services knowable and understandable to a range of stakeholders.

15.4.2 Visibility

As noted earlier, while the workings of the digital workforce are largely invisible, service design arguably has a responsibility to make visible certain aspects of those workings to service recipients and to consider alternatives for how to make them visible. For example, in the realm of the financial services industry, algorithms churn out credit scores autonomously that are used in the process of offering or denying credit to consumers. However, many people did not understand what was behind the decision to offer or deny them credit. This led to greater scrutiny in the USA of the credit score algorithms. Credit agencies were ruling on the credit-worthiness of consumers based on these `invisible' analyses without sufficient authority or transparency. As the matter came to the attention of the regulators, legislation was enacted to give consumers the right to see their credit score free of charge and to question the data upon which it was calculated. These new regulations increased visibility into the activities of the Financial Industry Regulatory Authority (FINRA), the authorizing authority, as well as other parties who used this information to determine a consumer's access to credit. Visibility meant, in this case, allowing individuals free access to their credit score once a year so they had the opportunity to question the assessments.

There are many other examples of systems making recommendations that have an impact on the conduct of human affairs. For example, some companies are consid-ering the use of LinkedIn postings (Boyd et al. 2014) or Twitter data (Badenes et al. 2014; Gou et al. 2014) to decide whom to hire. Hiring managers and job candidates alike are likely unable to decipher precisely what data are being used and how they are being analysed to suggest a good fit between job and applicant. Similarly, insurance companies are using driving patterns based on the numerous sensors found in today's cars to determine the rates to charge customers and, in the future, law enforcement might assess responsibility for automobile accidents based on car sensor data. These digital assistants are changing the work of insurance agents and police alike and raise questions for designers about the options that are available for making drivers aware that their cars are communicating with insurance agencies or police departments. At what points might drivers be made aware of this service – when the car is purchased,

when the insurance is renewed, or when an actual interaction between the car and insurance company occurs?

The growing connectedness among service entities that in part is enabled by digital technologies compounds the difficulty of understanding what is taking place out of our view and out of our control. The autonomous car exchanges data and relays information through its sensors and embedded software, providing access to the latest traffic reports to suggest alternative routes, sensing the distance to nearby cars to avoid collisions, or recording road conditions to adjust the braking system. The autonomous car is envisioned to stop on its own, determine its own speed, pass other cars, take an alternative route if traffic has slowed, turn on the windscreen wipers, and even wake its passengers in time to prepare for arrival. For the car to provide the service of driving from point A to point B carrying people and goods, a vast number of entities will be called upon to engage with each other and the world around. As Arthur (2011: 2) notes, the growth in these technology-enabled services means that processes that were once visible and enacted by people are now 'being executed electronically … in an unseen domain that is strictly digital'.

The practices of participatory design can aid in making design decisions about how the workings of the digital workforce might be made more visible. However, as we have noted, gaining visibility into the workings of the digital workforce is not altogether straightforward. A recent example (Romain and Griffin 2015) provides a first-hand account of how the detailed understanding of the technical system (in their case a computer vision tool to assess the layout of shelves in retail stores) was needed by the design researchers to participate fully in the design of this shelf-stocking service for retail clerks and store managers. Without this detailed technical knowledge their ability to participate in the design of the 'system throughout the pipeline' (ibid.: 43) would have been limited. Ultimately service designers must consider how much they need to understand about the work being done by the digital workforce to have a voice in design choices that ultimately impact the service experience.

15.4.3 Materiality

Digitally enabled services are materially constituted through interactions among service entities whether they are bodies, artefacts or algorithms. The performativity of services means that these entities together conspire to deliver service outcomes (Orlikowski and Scott 2015). Recognizing the materiality of everyday experiences is not new, as Barad (1998), Latour (2005), Mackenzie (2006) and Suchman (2007) have pointed out. However, as argued by Orlikowski and Scott (ibid.: 205), 'Effective understanding of digital services and their consequences will require conceptual tools that take materiality seriously in studies of service innovation.'

While the algorithms that constitute digital services are often invisible to service recipients, the data they manipulate is produced through the materially constituted actions of people and things, whether that is the force applied to an automobile's

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brakes, the flow of vehicles on a motorway, or the keystrokes used to compose this chapter. That said, the way data are aggregated and analysed creates levels of abstraction sometimes far removed from the actions that produced the data (Striphas 2010). Sometimes a false sense of objectivity is suggested in how rankings and recommendations are presented without clear views onto the transformations that take place between data and outcomes. The materiality of the interactions among service entities necessitates opening the aperture of observation to include the production of these digital traces and how they are manipulated to produce outcomes.

15.5 Designing digitally enabled services

There are several challenges for service designers as they establish their role in defining the digital workforce and its relation to new service offerings. Service designers must recognize that part of the story of the recent rise in services involves the emergence of new divisions of labour between humans and an emerging digital workforce, some of which dislocate workers and redefine human relations. Service design must actively participate in designing new business models and the socio-material assemblages that enable them – claiming its place in shaping this redistribution of labour, assets and value. In participating in designing new business models, service design must concern itself with where technology fits into new divisions of labour among actors, including the algorithms that work behind the scene.

There are many opportunities for service design to contribute to innovation in digitized services and to define the new relationships they afford – including the design of data producing activities, algorithms and analytics that create new information, techniques to visualize data and make them actionable, 'thin client' user interfaces that expose the work of the machine-to-machine interactions, and even the digital devices that provide ubiquitous access to services. An understanding of technology is critical to designers' ability to grasp the social, legal and economic implications of technology-enabled services (van Dijck 2010). Service design must expand its focus beyond the 'service experience' to include these technology-connected design activities. Becoming engaged in these less familiar areas will provide opportunities for innovation beyond those currently available to service design. But in so doing service designers must address when and how to make the actions of the digital workforce knowable and visible, while at the same time acknowledging the materiality of these out-of-sight and often inscrutable algorithmic activities. This raises the questions of how and how far should service design go into the workings and outputs of the digital workforce? Finally, service design must move quickly and decisively into these new terrains or risk being overshadowed and dislocated by those with business or engineering expertise who are delivering on the service design promise.

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