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Computing and Social Welfare

Minimizing societal harm from digital transformation while preserving the benefits of innovation in online businesses

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Abstract

Social Welfare Computing is an emerging discipline that seeks to direct technology to cause minimum societal disruption, and in particular seeks to minimize the harm caused directly by technology itself. This is markedly different from the better-understood uses of technology to create value or to address existing social needs. Innovative technologies that are widely adopted created significant value for their users; otherwise, they would not be widely adopted. Often the companies that create them obtain new sources of wealth and power, which inevitably lead to new forms of abuse of power and new forms of societal disruption. Societal disruption in turn requires social adaptation, including new regulations to influence the behavior of firms and to define and to protect the rights of individuals in the changed society. The governance of online business models is complex because regulators must meet the conflicting objectives of different segments of society, and because regulators must avoid imposing restrictions that stifle innovation. Social Welfare Computing seeks to guide social adaptation, combining insights from disciplines as varied as anthropology, business strategy, economics, strategic planning, and law.

Keywords Social Welfare Computing · Dark side of computing · Fake news · Platform envelopment · Life control interfaces · Regulation of Big Tech

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This article is part of the Topical Collection on Social Welfare Computing: understanding the complex societal impacts of online platforms, minimizing harm, maximizing benefits, and continuing innovation

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Introduction

Our intent with this paper is to increase interest in Social Welfare Computing among members of the information systems strategy and information systems economics communities, so that their expertise can have greater impact on solving, and even avoiding, some of the most severe unintended consequences of Digital Transformation. We define Social Welfare Computing as *a discipline that seeks to enable the contributions from Big Tech firms while minimizing societal harm*.

Every revolutionary technology produces winners and losers. Every revolutionary technology produces unintended consequences, which must be managed. Sometimes these consequences may become existential threats to civilization, as global warming and climate change appear to be today. These threats are rarely visible early; two centuries passed between Watt's improvements to the steam engine ushered in the Industrial Revolution and the recognition of climate change as a possible consequence of fossil fuel consumption. Digital Transformation and the emergence of innovative online business models are truly transformative. Their benefits are undeniable. But they too will inevitably have unintended consequences, and these consequences may likewise emerge as existential threats. Given the speed with which Digital Transformation is progressing, we feel that it is essential to understand these emerging threats as quickly as possible.

We hear repeated claims that Big Tech has gotten too big and too powerful, and that it needs to be regulated and restrained (Kelly, 2019; Nadler & Cicilline, 2020). Amazon is accused of exercising monopoly power over publishers and crushing small retailers that partner with it (Nadler & Cicilline, 2020). Facebook is accused of collaborating with foreign actors who seek to undermine Western democracy, facilitating manipulation of elections in the US, manipulation of the Brexit Referendum in the UK (Allcott & Gentzkow, 2017; Cadwalladr, 2017; Cadwalladr & Graham-Harrison, 2018), spreading conspiracy theories such those related to QAnon (Frenkel et al., 2020), and recruiting for extremist groups ranging from ISIS (Ibrahim et al., 2017) to White Supremacists in the US (Shuster & Perrigo, 2021). Google has been accused of monopoly power over search and over Android (Allyn et al., 2020; Nadler & Cicilline, 2020), and has been accused of a wide range of privacy violations. Airbnb is accused of destroying entire neighborhoods (Nieuwland & van Melik, 2020) and Uber is accused of everything from ignoring local ordinances to creating traffic congestion or destroying other more fuel-efficient forms of transportation (Bowers, 2020).

We have reviewed several hundred articles describing these claims in order to formulate a comprehensive list of problem areas. These claims are most frequently directed against Facebook, Amazon, Apple, and Google, and the most commonly proposed regulatory fix is the traditional sanction applied to monopolies, breaking the companies up into smaller companies that compete with each other. However, many of the problems that have been created by Big Tech are not caused by the companies' size or monopoly status, and applying traditional antimonopoly sanctions may be both unnecessary and ineffective.

The four largest online companies have enormous power, have transformed traditional consumer services, and have disrupted society in ways we are just beginning to understand. Although the largest tech companies receive the most coverage, and the harm they can potentially cause receives the most media attention, we will also address other technology firms, especially in the sharing economy, and explore the unanticipated effects that they have created.

Our research deals with maximizing the social welfare produced by Big Tech firms and their innovations, while minimizing the harm caused by rapid disruption of society (Clemons et al., 2017; Clemons et al., 2019; Clemons et al., 2021; Clemons & Wilson, 2018). *Social Welfare Computing* has received almost no academic study in the MIS community, and until recently was considered quite reactionary by MIS faculty, and even a bit anti-progress and tainted as Luddite. Many of our MIS colleagues have studied the benefits and the value created by large-scale technological innovation (Benlian et al., 2018; Constantinides et al., 2018). Some colleagues have studied the use of this technology to address existing problems, like improving rural health care (e.g., Venkatesh et al., 2016), improving traffic flow (e.g., Abramowicz et al., 2020), improving online government services (e.g., Bélanger & Carter, 2012; Nishant et al., 2019), or providing more universal access to education (e.g., Sims et al., 2008). Papers address the possibility that Big Tech is creating and abusing monopoly power (e.g., Clemons & Madhani, 2010), or that large technology firms violate consumer privacy (e.g., Zuboff, 2015), or that Big Tech firms manipulate public opinion (e.g., Ross et al., 2019). Additionally, the ethical implications of AI have received recent attention (e.g., Teodorescu et al., 2021; Thiebes et al., 2021). But very few research efforts within the academic information systems community have addressed the downside of progress and innovation in technology and technology-based business models, and very few directly studied reducing the harm created by Big Tech. As noted by Rowe and Markus (2022) in this special issue, the academic information systems community is far more likely to praise Big Tech for

their competitive domination and new sources of power than they are to examine the new forms of abuse created by that new source of power.

That is not to say that the academic community has ignored ways that regulation has been rendered inadequate or even obsolete by advances in technology and changes in online business models. Again, in this special issue, Trzaskowski, a law professor, examines how modern platforms have exacerbated the information-asymmetry between consumer and sellers, placing consumers at increased information-disadvantage (Trzaskowski, 2022). He argues that this requires fundamental changes to consumer protection law. Likewise, two law professors, Bracha and Pasquale, argue that the power of search engines is so great, and its implications are so pervasive, that search requires its own novel form of regulation (Bracha & Pasquale, 2007). They propose a new agency, a federal agency, the Federal Search Commission. Professor Teilmann-Lock, and her Copenhagen colleagues in Design and in Law are exploring how technology has changed the balance between protecting consumers by increasing designers' *incentives to create* innovations and protecting consumers by *increasing consumers' access* to innovation (Kohli & Teilmann-Lock, 2019). These are important studies, but they were not conducted by our MIS colleagues or our academic colleagues in the study of online platforms and their strategies and their sources of power. This paper, and the companion paper by Rowe and Markus (2022), illustrate ways that the academic MIS community can contribute to this work.

The most serious indictments of Big Tech have come from technology insiders, rather than from the academic MIS community. Jaron Lanier, virtual reality pioneer and Silicon Valley icon, has provided the harshest indictments of Big Tech (Lanier, 2010, 2014, 2018). Chris Hughes, cofounder of Facebook, now advocates the company's breakup, in part because of its behavior when used to promote violence (Feloni & Richards, 2018; Gabbatt & Paul, 2019). Chris Wylie, the Cambridge Analytica whistleblower, describes how he built the tools that helped manipulate the 2016 US elections and the UK's Brexit Referendum (Cadwalladr, 2019; Gross, 2019). The best-known studies of the wealth inequality exacerbated by online business models has not been written by MIS faculty (Cassidy, 2014). It is clear that COVID has exacerbated the wealth differences and the quality of life differences between skilled online workers and less-skilled frontline workers, but again these studies are generally not written by MIS faculty.

We are not suggesting that there has been no study of the new forms of harm caused by Big Tech, or that there has been no academic study of the harm. We merely note that, in contrast, more of our MIS colleagues have studied mechanisms for increasing the power of these firms by improving

their ability to profile users and offer them what they want, or to manipulate users and charge for enhancing firms' ability to manipulate. Studying the capabilities that result from combining technology and big data fits more easily into traditional information systems research portfolios than trying to analyze the societal implications. As a result, there has been very little study of the downside of computing, the problems caused directly by technological progress, or the reduction and mitigation of those problems. In the next section we review the numerous contributions that other disciplines have made to our understanding the consequences of innovative business models and Big Tech platforms, in the hope that this will help focus the research of our MIS colleagues.

As a modern society we have not yet adequately addressed the problems created by the internet revolution, and indeed, we do not yet agree on what these problems are. We have not clearly articulated the benefits we expected to get or the benefits we have actually obtained, and we have not yet addressed issues created by the enormous disparity between winners and losers. We have not yet addressed the fact that the internet revolution and its digital transformation may have increased the gap between winners and losers and between haves and have nots in our society. As a result, we do not yet have an agreed regulatory philosophy. And we have not yet figured out how to revise the social contract to address the problems created by Big Tech.

Literature review — technology and society

Technology and social structure

Technologies always change societies. Often these changes are quite profound and result in changes in societies' rules. The most profound technological innovations have resulted in changes in legal codes as regulation for individuals, changes in the commercial codes, and even changes in the implicit social contract. This section is provided to place the current revolution, Digital Transformation, into perspective. We show that this is not the first era in which technological progress has transformed society and required changes in law, social policy, and the implicit social contract; there is nothing inherently anti-business in noting the need for regulatory attention focused on Big Tech, as discussed in sections 'Problems created by the internet/Digital revolution for which regulators have solutions' and 'Problems created by the internet/Digital revolution for which regulators do not yet have solutions'. Additionally, we use historical insights to inform our suggestions for regulatory change, discussed in section 'What responses are appropriate to the problems of Digital Transformation of business and society?'.

Perhaps the first technology revolution was the development of agriculture, with cultivated crops and animal husbandry. This almost immediately led to population increases, the first stable population centers, and the creation of the first cities and city-states. The rise of the earliest civilizations in Mesopotamia, Egypt, and China were all characterized by sufficient food surplus to allow some individuals to work in areas other than obtaining and producing food. This led to division of labor and specialists (Pringle, 1998; Wikipedia), with all early civilizations characterized by a nobility or royalty, a priesthood, and an army, supported by taxes (Mark, 2017; Rank, 2021; Rector, 2016). That required administrators, tax collectors, record keepers, and scribes, all in turn supported by the efforts of the food producers at or near the bottom of the social pyramid. Governing societies with large numbers of people required rules, including the Code of Ur-Nammu and the better-known code of Hammurabi. This combination of professional specification, agricultural surplus, and formal codes of behavior is widely considered the start of civilization.

The agricultural revolution is widely equated with the dawn of civilization and with progress, but it entailed very real costs. Overall health declined.

“When populations around the globe started turning to agriculture around 10,000 years ago, regardless of their locations and type of crops, a similar trend occurred: the height and health of the people declined. The pattern holds up across standardized studies of whole skeletons in populations, say researchers in the first comprehensive, global review of the literature regarding stature and health during the agriculture transition (Emory University, 2011).”

Other studies document the increase in diseases as a result of the agricultural revolution (Latham, 2013). Still others make the obvious connection between civilization and inequality and between civilization and organized warfare (Suzman, 2017). There are numerous other examples of technological progress transforming society, from the development of craft guilds in the middle ages and the rise of the bourgeoisie to the Italian Renaissance. The invention of movable type likewise transformed society.

We focus next on the Industrial Revolution, because the social changes, regulatory and legal changes, and changes to the social contract more closely inform our work on the transformational impacts of the internet and online activities. The early stages of the Industrial Revolution enabled mechanically powered factories. Later technologies for transportation, coordination, and communication enabled the creation of large industrial companies and the entrepreneurial and managerial elites that ran them (Clemons et al., 2020). New elites emerged, especially wealthy industrialists

whose power and influence rivaled or even exceeded those of traditional aristocrats. There were also unlucky losers, with no assets and no skills. These were the exploited slumdweller described by Dickens (Orwell, 2012) and who became the proletariat courted by Marx and Engels (Bussard, 1987; Marx & Engels, 2015). The massive industrial companies had new sources of power, like economies of scale, which led to the emergence of near monopolies, trusts, and cartels. This in turn led to new forms of abuse of power, which in turn led to the emergence of industrial regulation (Knight, 2008).

Technology, regulation, and the law — lessons from the Industrial Revolution

The Industrial Revolution created adverse and unintended consequences with significant social costs. These include negative externalities, when the user obtains value from a product, but its creation causes significant harm to others. This is enabled in part by lack of transparency, when the user doesn't perceive the harm caused to others and by lack of altruism, and where the user doesn't care about harm caused to others. The best-known examples include industrial pollution, with its impact on human health, and increasingly on the planet's ecosystem.

The Industrial Revolution increased the importance of economies of scale as a source of monopoly power. Increasingly, the combination of economies of scale and of coordination technologies created a professional management class that supported emerging monopolies, replacing the “invisible hand” of the market with the visible hands of monopolists and interlocking trusts.

Network effects became a new source of monopoly power. The difficulties of calling one phone system from another with the technology available at the time meant that telephony was a natural monopoly. The Kingsbury Commitment of 1913 recognized AT&T's unique status as a natural monopoly, albeit one requiring specific new forms of regulation.

The “essential facilities doctrine” emerged at roughly the same time. The US Supreme Court in 1912 ruled against a group of companies that controlled rail access into St. Louis and refused entry to competing railway companies. The doctrine sets a high bar, only applicable when access to a facility is essential for a competitor's operation, and when its duplication represents a significant waste of society's resources (Pitofsky et al., 2002).

Even in cases where a company performs its core business very well it can be overwhelmed by a platform envelopment strategy. Platform envelopment occurs when a core system, the platform, is augmented by the addition of new applications. The combination has value that is significantly greater than the sum of the value of its individual parts, called super-additive value creation. When the owner of the core can deny

access to competitors, it denies their applications the ability to create super-additive value for their users (Clemons et al., 2017; Clemons et al., 2019). After the Kingsbury Commitment AT&T had a monopoly over long distance communications in the US. When AT&T combined its successful New York radio station with its Boston radio station via its Long Lines monopoly, it created the first and potentially the only commercially viable radio network in the US.

The greater separation between producers and consumers of goods increased the prevalence of lack of transparency and deceptive business practices, advertising, and labeling. This precipitated the creation of the Federal Trade Commission (FTC) in 1914. The manufacture and promotion of potentially harmful ingredients, impure or ineffective drugs, and harmful and addictive products similarly culminated in requiring the oversight of the Food and Drug Administration (FDA) in 1906.

The late nineteenth and early twentieth century saw increasingly unsafe working conditions. These were then addressed by strengthened labor unions and government regulation leading to the creation of the Occupational Safety and Health Administration (OSHA) in the US in 1971. The dehumanization of work in the modern factory and the alienation of the worker were perhaps best captured through humor, in the iconic scene by Charlie Chaplin in the 1936 movie *Modern Times* (Chaplin, 2019), or the 1952 candy factory episode in the *I Love Lucy* TV series (Wells, 2010). Jaron Lanier, internet pioneer, has led the more recent discussion of the dehumanizing impact of modern technology; see *You are Not a Gadget* (Lanier, 2010) and *Who Owns the Future* (Lanier, 2014).

Technology and the social contract

Social contract theory describes the implicit pact among people in a society through which they give up certain freedoms to the state in return for security. This compact establishes the moral and political rules that regulate behavior, protect rights, enforce obligations, and safeguard the collective. The earliest ideas of this theory in the West go back to Plato (Wikipedia), and in the East to Confucius and Ashoka the Great (Cartwright, 2012; Mark, 2020). However, it was during the Age of Enlightenment that philosophers like Thomas Hobbes, John Locke and Jean-Jacques Rousseau developed and refined distinctive theories of social contract. Hobbes famously said that in the natural state without the safeguards such a contract made possible, a man's life would be "solitary, poor, nasty, brutish, and short" (Davies, 2012).

The social contract continued to evolve after the Industrial Revolution. The beginnings of a social safety net emerged with its roots in the Enlightenment, which in itself was a rejection of prior regimes. The French and the American Revolutions each brought major changes to the status quo and

addressed the worst imbalances of power between rulers and the governed, influenced by the ideas of Rousseau, Descartes, Montesquieu, Locke, Hume, Kant, Franklin, Thoreau and others. These changes continued after the first and second World Wars and laid the groundwork for a social safety net, from health care and pension security in the UK to the Nordic model of a welfare state, and from the Square Deal, the New Deal, and the Fair Deal to Obamacare in the US.

Changes in the social contract entail more profound changes than individual changes in forms of industrial regulation, and generally lag changes in regulation. Interested readers can find more complete treatment in the team's earlier publications (Clemons et al., 2017; Clemons et al., 2019; Clemons et al., 2021).

Study of Social Welfare Computing in other disciplines

We are not the first MIS researchers to suggest that our field needs to adapt and change our research paradigms. McFarlan at the Harvard Business School was one of the first to note that information systems innovation could provide more than breakthroughs in efficiency, and that we needed to understand its impact on competitive strategy (McFarlane, 1984). Bakos and Treacy built upon this insight and called for greater economic and mathematical formalism in our research on IT's impact on corporate strategy (Bakos & Treacy, 1986). Fifteen years later, Orlikowski and Iacono call on us to remember that we are not strategy professors or economics professors, and call on us to remember that the IT artifact — the implemented manifestation of technology — is also core to what we do (Orlikowski & Iacono, 2001).

We are not claiming that Social Welfare Computing had received no attention before our studies from information systems colleagues. There are indeed many areas in which information systems faculty have made significant contributions, and even have taken the lead in studying problems caused by strategic use of information technology or by innovative online business models. Deng et al. (2016); Masiero (2021); Wiener et al. (2021) have all studied how large platforms tend to decrease the power of already powerless gig workers. Malhotra and Van Alstyne (2014), ardent supporters of platform-based business models, have studied the "dark side of the sharing economy". Alan Dennis and his colleagues have recently edited a special issue of the *Journal of Management Information Systems* (Dennis et al., 2021), and several of the papers written by information systems faculty members investigate the harm caused by fake news, the factors that contribute to its effectiveness, and mechanisms for mitigation of this harm (George et al., 2021; Ng et al., 2021; Turel & Osatuyi, 2021). This research continues to

explore ways to reduce the impact of fake news (Moravec et al., 2020).

In other areas faculty from information systems have participated in the studies of the unanticipated harm created by large platforms, but there are other disciplines with an equally valid claim to expertise. In those areas we find that both information systems faculty and faculty from related disciplines contribute. The first studies of racial bias among Airbnb users were done by Ben Edelman, who at the time was an information systems faculty member at the Harvard Business School, with training in both law and economics (Edelman et al., 2017).

Additional studies were performed by faculty members in economics, applied psychology (Jaeger & Slegers, 2020), and travel and tourism (Farmaki & Kladou, 2020). The harmful impacts of Airbnb on residential communities are well-documented in the popular press (e.g., Guttentag, 2018), with regulation being demanded, voted upon, and implemented in a number of cities around the world. We have been able to find studies by faculty in travel and tourism (Caldicott et al., 2020), and by the author of the BBC study mentioned previously (Guttentag, 2018).

Economics and information systems faculty have both studied abuse of power by large online platforms. Zhu and Liu, technology and economics faculty respectively, have studied how Amazon observes the success of individual participants in the Amazon Marketplace, determines which products are likely to be more profitable for Amazon if Amazon vertically integrates and sells them directly, and then uses its scale to offer products to consumers at lower prices (Zhu & Liu, 2018). Ben Shiller, an economics faculty member, describes the complementary phenomenon of Amazon increasing its prices when major competitors have been eliminated (He et al., 2021). Possibly because the training of lawyers is more focused on abuse of power, while the training of business school faculty is more focused on gaining and exploiting power, it's easier to find papers on the abuse of power written by lawyers. Edelman and Garadin combine both schools of thought in their examination of Android's abuse of market power (Edelman & Geradin, 2016) as part of their platform envelopment strategy.

When the study of abuse of new sources of power transitions into examination of regulation of these new sources of power, it is not surprising that much of the research is conducted by lawyers. Gasser (2005) and Grimmelmann (2007) both study the regulation of search. Bracha and Pasquale (2007) actually propose a new federal agency, the Federal Search Commission, charged with enforcing fairness in search, much as the Federal Communications Commission once imposed fairness in broadcast media and the Federal Trade Commission ensures "fairness" across a broad spectrum of business practices including advertising. Likewise, law faculty and

economists have undertaken major studies of the need for new approaches to antitrust, to deal with new sources of power in online business models. The following can safely be considered classics on the power of two-sides markets and two-sided platforms, by Evans (2003), Evans and Schmalensee (2013), and Katz and Sallet (2017). Given the volume of material information systems faculty members have produced extolling the strategic benefits to be gained by exploiting the power of these two-sided markets (e.g., Parker et al., 2016), platform envelopment and the use of self-preferencing in gateways and cross-subsidies from platforms as new sources of monopoly power (e.g., Condorelli & Padilla, 2020; Padilla et al., 2020), it's surprising how little material MIS faculty have produced systematically examining the new sources of power, the new abuses of power, and the need for new forms of regulation (e.g., Clemons, 2018b).

Not surprisingly, there are areas where economists have their own expertise and their own approach to the problems engendered by new business models. Allcott et al. (2020) examine the social costs imposed by social media by studying the welfare improvements that are associated with temporarily "deactivating" some users' access to Facebook. Shiller studies how information mined through a range of sources, including search and text, allow sellers to infer the buyer's reservation prices and increase the accuracy of their price discrimination (Shiller, 2020). As sellers approach perfect price discrimination consumer surplus is inevitably decreased.

Finally, long before Christopher Wylie's *Mindf*ck* (Wylie, 2019) highlighted Facebook's complicity in the "plot to break America," psychologist Robert Epstein had conducted experiments on the ability to influence voter behavior by the manipulation of search results. Epstein's research received significant press coverage at the time (e.g., Epstein, 2014; Timberg, 2014) but has largely lost visibility. More recent research on election manipulation, and the need to monitor and regulate attempts to manipulate voter opinions through personalized messaging is continuing, both by psychology, media, and philosophy faculty (Burkell & Regan, 2019) and by information systems faculty (Clemons, 2018a, 2018c).

We do believe that there have been substantial research efforts throughout the academic community to identify, to understand, and to solve the numerous unintended impacts and unanticipated sources of harm from large technology platforms. We believe that the area of Social Welfare Computing has not yet received the attention it deserves from information systems faculty, who continue to focus more how firms can better use these platforms for strategic advantage in their interactions both with competitors and with their own customers. And we believe that information

systems faculty have unique contributions to make, and to make early, because we understand the new capabilities of innovative online business models and the new sources of power that they represent. We sense power shifts before they occur, because we understand both the capabilities of the new technologies and the strategies that they enable. The earliest paper that we have been able to locate that addresses the power of online search as a gateway with the ability to charge for access to customers was written by IS faculty in 1992, long before the emergence of Google (Clemons & Kleindorfer, 1992). The earliest paper we have found calling for regulation of “free” third-party payer gateway systems that do not users but charge sellers for access to users, was written by IS faculty in 2011 (Clemons & Madhani, 2010).

There are few works by information systems faculty that attempt to be as comprehensive as we have been in this paper, reasoning from historical analogs and attempting to develop a theory to determine where existing regulations are adequate, where history can guide us in the development of appropriate regulations for new business models, and where we need something quite different from historical approaches. Information systems faculty have a lot to contribute. We need to be more engaged.

Problems created by the internet / digital revolution for which regulators have solutions

There is a great deal of material presented in the sections on ‘Problems created by the internet/Digital revolution for which regulators have solutions’, ‘Problems created by the internet/Digital revolution for which regulators do not yet have solutions’, and ‘What responses are appropriate to the problems of Digital Transformation of business and society?’. This is summarized in Tables 1, 2, and 3 at the end of section ‘Problems created by the internet/Digital revolution for which regulators do not yet have solutions’, which

also show the relationships between each of the subsections below.

Economies of scale as a source of power in online platforms

Virtually all software exhibits extreme economies of scale. Development costs are high, as in many forms of innovation, but with online digital downloads the cost of producing and distributing additional copies has dropped to zero. Virtually all software, like MS Windows and MS Office, enjoys enormous competitive advantage in part because its *average* per-copy cost, as well its *marginal* per-copy cost, are lower than any smaller competitor could match. Google Search involved massive investments, and it is difficult for a smaller search engine to afford comparable development. Bing lost more than \$5.5 billion between 2009 and 2011 (Goldman, 2011), and while it appears to have stopped losing money, very few startups could afford losses of that magnitude with such limited long-term payoffs (Ovide, 2019). Additionally, larger search engines see more usage and adapt more quickly to changes and breaking news stories.

Regulators have several options. One is to treat platforms as essential facilities, and require that Google provides services to competitors at prices the courts deem to be fair. A second is to consider them as natural monopolies and regulate them the way networks have been regulated in the past. A third is to realize that economies of scale do peak before 100% and that monopolies like Google can be broken up, the way AT&T and Standard Oil were broken up in the past.

Traditional network effects

Communications networks, from traditional telephony to social media networks like Facebook and Twitter, gain their value in large measure from the number of users they have. The value increases faster than the number of network users. With limited interconnectivity and dedicated hardware, early

Table 1 Problems that emerged in the Industrial Revolution for which we have regulatory solutions under Digital Transformation

Problems that we encountered in the Industrial Revolution for which we do have effective solutions	Current problems and sources of abuse of power for which we do have current solutions for Social Welfare Computing
Economies of Scale and Monopoly Power — best early examples were coal, steel, and oil — and these served as the basis for the development of monopoly law	Economies of Scale and Monopoly Power — best current examples are in software, where virtually costs are development and marginal costs approach zero — traditional monopoly law can be applied when needed
Network Effects and Monopoly Power — best early examples were in telephony, where the more users a system had the more attractive it was to additional users	Network Effects and Monopoly Power — best current examples are Microsoft Office and Google Search — traditional monopoly law can be applied when needed
Positive Externalities and Network Effects — the best early examples are network effectiveness associated with emerging telephone networks	Positive Externalities and Network Effects — the larger the installed base the more companies provide software for the platform. Microsoft DOS and Windows provide the best early examples — and again, traditional monopoly law can be applied

Table 2 Problems that emerged in the Industrial Revolution for which we do not have regulatory solutions under Digital Transformation

Current problems and sources of abuse of power where solutions generated during the Industrial Revolution are inadequate for Big Tech and Digital Transformation	Current problems and sources of abuse of power where markets do not provide solutions and for which we have not yet developed effective remedies
Negative Externalities — best early examples are those related to pollution	Negative Externalities — the best current examples are related to the Sharing Economy. Users of these systems obtain significant benefits and are motivated to preserve them, while those who are harmed are not easily identified and may not have standing to litigate
Deceptive Dangerous and Addictive Products and the Lack of Transparency — lack of sanitation in food processing and the addictive nature of tobacco required both transparency and regulation	Deceptive Dangerous and Addictive Products and the Lack of Transparency — Facebook and other social media are in some ways addictive, and we are just beginning to learn how harmful fake news and manipulation can be — Big Tech firms have various forms of protection here, from freedom of speech to Section 230

Table 3 Problems that did not emerge in the Industrial Revolution, for which we do not have regulatory solutions under Digital Transformation

Current problems and sources of abuse of power that we did not encounter in the Industrial Revolution (problems that have recently emerged)	Current problems and sources of abuse of power where markets do not provide solutions and for which we have not yet developed effective remedies (problems that have recently emerged)
Platform Envelopment, Super-additive Value Creation, and Deliberately Limited Interoperability — systems where each additional application increases the value of the platform, which is good for consumers, but where the resulting value is so great that the platform achieves some degree of monopoly power and can reduce or eliminate competition.	Platform Envelopment, Super-additive Value Creation, and Deliberately Limited Interoperability — the ability to exclude competitors from the core platform provides a novel form of monopoly power. Microsoft Windows was an early litigated example, and Android is the best known example at present — “rehabilitation” of the Essential Facilities Doctrine would provide a solution. The EU is beginning to take effective action.
Online Gateways and Mandatory Participation Third Party Payer Systems — systems where corporations are forced to pay for access to consumers and where competition does not limit prices that gateways can charge.	Online Gateways and Mandatory Participation Third Party Payer Systems — Google Search is the best known example — we developed remedies for abusive airline reservations systems, but the power of current online gateways makes them difficult to control. The EU is beginning to take effective action.
Life Control Interfaces — systems where the convenience of an online interface gives it de facto control over consumer’s commercial behavior, including where they shop.	Life Control Interfaces — Alexa, Google Assistant represent an extension to online gateways, where power is augmented by unique and protected access to essential data — this has not yet been widely recognized as a new problem.
Fake News, Manipulation of Public Opinion, and Creation of Internal Societal Discord — systems that profit from manipulation of public opinion, especially those that are exploited by foreign actors.	Fake News, Manipulation of Public Opinion, and Creation of Internal Societal Discord — this is a new problem related to the addicting and harmful nature of social media — Big Tech firms are aware of the problem but we do not yet have a solution.

networks emerged as natural monopolies. Today, limited interconnectivity is often artificially imposed as a means of achieving monopoly power or extending it into new domains (Clemons, 2018b, 2018c).

Regulators face the interesting dilemma of wanting consumers to benefit from a single entity with the largest possible participation externalities and wanting consumers to benefit from competition in the market place. However, with modern technology, participation externalities can be maximized by permitting platforms to interconnect, or rather, by prohibiting platform operators from implementing measures to limit interconnectivity. Today, regulators can simply block artificial limits on interconnectivity. Once again, this

would involve treating large platforms as essential facilities, and requiring that they provide service to all firms, including competitors, at prices that the courts determine to be fair.

Economies of scope and positive externalities on the supply side

Users gain value from increasing the number of participants on the other side of the market. When Microsoft’s DOS became the most widely used operating system it attracted more software developers, which attracted more users, eventually reaching a tipping point and virtually

eliminating all domestic competitors other than Apple's. Numerous other examples have been studied (Rochet & Tirole, 2004).

When competing platforms have sufficient market share, developers provide apps for both. Many apps available on the App Store have equivalent offerings on Google Play, and vice versa (Chen et al., 2022). While this does not ensure that all would-be platform developers have access to the market, it does ensure that users have a choice of viable platform alternatives.

Problems created by the internet / digital revolution for which regulators do not yet have solutions

The externality problems caused by online platforms

Modern platforms create novel problems related to externalities. Modern software platforms have impacts beyond their users, and these are very different from traditional externalities like congestion or pollution. Negative externalities occur when users of a product or service gain value themselves, but cause harm to others. Markets rarely solve problems with externalities because the individuals who cause harm do not suffer harm themselves, and may even be unaware of the harm they cause. Users love Uber because of its convenience, speed, and low cost, but Uber may increase urban pollution and traffic congestion by shifting users away from more efficient mass transit (Bowers, 2020). Airbnb provides users the ability to live in historical neighborhoods on vacation but this displaces long-term residents, who have come to despise Airbnb (Nieuwland & van Melik, 2020).

Deceptive, dangerous, and addictive social media products

Modern platforms replicate some of the problems faced by dangerous and addictive food products at the beginning of the industrial revolution, although in forms that are even more difficult to recognize. Facebook's role in the crafting and dissemination of fake news has been widely reported (Naughton, 2018; Wylie, 2019). Facebook's role in radicalization and recruiting for extremist organizations has been widely reported (Alarid, 2016). Facebook played a role spreading rumors during periods of unrest and dangerous medical misinformation, as they are doing during the current pandemic (Frenkel et al., 2020).

Search can be dangerously and deliberately inaccurate, as with Google's support of illegal smuggling of counterfeit pharmaceuticals through dummy websites established

to look as if they were Canadian (United States Department of Justice, 2011).

Users are enticed to use more and more applications on a single platform, and the more they use, the more the platform learns about them. The more that platform learns about them the better the platform's services become. The dark side of this capture and integration of information is better manipulation of the users, better targeted marketing, and better precision pricing. As firms learn to price products and services to match each individual's willingness to pay markets do become more efficient, but consumer surplus is also reduced; that is, more and more of the value of technology is appropriated by the provider, not by the user.

The easiest approach to limiting the harm from deceptive, harmful, and addictive products would be labeling, and this would work if users care enough to act differently if they did know. However, there is evidence that by itself labeling to increase transparency may not be effective. This has been observed in products as diverse as cigarettes and fake news (Schwartz, 2017).

Legal mechanisms for limiting abusive practices are always problematic. Freedom of speech makes it difficult to prohibit all but the most abusive material. Moreover, Facebook argues that its use of personal information to target fake news to the most responsive readers is part of its core strategy of ensuring that users see the content that is most interesting to them, which is protected even within the EU's GDPR. Perhaps the most promising avenue is to extend consumer protection law, as suggested by Jan Trzaskowski in his paper in this special issue (Trzaskowski, 2022).

New problems — platform envelopment

Platform envelopment is emerging as perhaps the most complex form of abusive monopoly power. A platform is a core system that can readily be extended. Platform envelopment involves the combination of the following three characteristics: (1) Monopoly control over the core system, (2) Super-additive value creation as each additional application added to the core creates more value for users, including increasing the value of the core and some or all of the applications already added, and (3) the ability to deliberately reduce access to the core or to deny access to the core entirely, to cripple potential competitors (Clemons, 2018b, 2018c).

Platform envelopment strategies have existed for decades, although they have not always been as powerful or as prevalent. The Radio Commission, the precursor of the Federal Communications Commission, was created to address the first occurrence of platform envelopment, when AT&T leveraged its control over long distance telephony to create a monopoly in radio networks (Clemons, 2018b,

2018c). Platform envelopment has become much more prevalent with the increased importance of software platforms (Clemons et al., 2019). The best-known examples involve Microsoft (Clemons, 2018b, 2018c; Clemons & Wilson, 2015a) and Google (Clemons, 2018b, 2018c; Volpicelli, 2019).

It is easy to view platform envelopment as an opportunity for all businesses to develop their own platform strategies (Parker et al., 2016). This is probably dangerously misguided. Dominant platforms are already well-established. Android is already free both to users and to hardware vendors, and it enjoys enormous network benefits from millions of apps available. Rather than offering opportunities for all companies, platform envelopment creates an ever-increasing sequence of opportunities for abusive monopoly platforms.

There are few remedies available. The Essential Facilities Doctrine would limit the abuse of platforms like Android. It might be argued that Android is now an essential facility for app developers who wish to sell to users of non-Apple devices. *Duty to Deal* argues that a firm cannot refuse to work with a competitor it has worked with previously, solely for commercial reasons (Federal Trade Commission). Neither of these is universally accepted legal doctrine, and the EU is currently treating platform envelopment as a novel abuse of monopoly power.

New problems — gateways and third-party payer systems

Google and Amazon control critical online gateways (Clemons, 2018b, 2018c). Amazon, and its Alexa, and Google, and its online assistant, are becoming dominant forces in post-pandemic retailing, with power and reach well beyond that of any traditional retailers.

Perhaps the most interesting business model of the internet is the combination of an online gateway with a third-party payer system (Clemons, 2018b, 2018c). Google is essential for users who want to find sellers, and sellers know this; hence sellers are willing to pay to be found, and willing to pay to avoid being hidden from buyers. Over time search platforms have become essential, and have mastered the art of charging sellers to be found, and of transferring part of the payments they receive to buyers to maintain their loyalty. This is an interesting aspect of gateways combined with third-party payer models. If their market share of shoppers is large enough and loyal enough, their platforms become essential to sellers, and sellers must participate in all of them to avoid losing buyers who are loyal to only one platform. Providing high payments to buyers is more important to their competitive strategy than having low costs for sellers. When search engines compete they actually increase

rather than decrease the prices they charge sellers to be found and then increase their payments to users to buy more loyalty. These mandatory-participation third-party payer systems are perhaps unique; they appear to be the only businesses where competition causes the competitors to increase the prices they charge their customers, and then use the revenues to buy loyalty. These *reverse price wars* (Clemons, 2018b, 2018c) are successful because party-1, the users, do not know about or care about the prices charged to party-3, the sellers, and because party-3 has no choice. If users use only one search platform, which is true of most users, then party-3 has to participate in all platforms, and cannot reject a platform simply because it has become more expensive. There may not be a market solution that can eliminate reverse price wars. These are still serious problems today, four decades after the first legal judgments against them (Clemons, 2018b, 2018c).

New problems — emergence of powerful life control interfaces

Smartphones and at-home digital assistants have become far more than phones, and indeed far more than devices for communicating with other people. They have become our *life control interfaces* (LCIs) (Schrieck et al., 2019). They contain our schedules, our plans, our to-do-lists, our contacts, our photographs. They are our indispensable cybernetically enhanced memories. They are our access points to the net, including our access to search and to shopping, and to services ranging from restaurant delivery to taxis and other forms of local transportation. We use them to manage our schedules, order our groceries, control our music and our television and even the lighting in our homes. They provide real-time directions, and even when we do not let them actually control our movements we let them influence or decide our movements for us.

Life control interfaces influence, and even determine, what we buy and where and when we buy it. As the emerging internet of things enhances the power of smart appliances and autonomous vehicles, life control interfaces will become increasingly important, and their American owners will gain even greater power over the behavior of all European consumers. We believe that this will be dangerous to many firms in the EU, in many industries.

Platforms are increasingly not neutral agents that we control. Increasingly, these life control interfaces have their own agendas, and subtly control our lives while we believe we are controlling ourselves (Zuboff, 2020). If we ask Alexa to get us six cans of lentil soup, we know where she is going to shop. She will direct the order to one of Amazon's own operations, but at least she will probably order our favorite brand. If we ask Google to get us the same thing, both the brand and the price are certain to be acceptable, but both the brand and the

store will be determined by algorithms like those used for sponsored search. With Alexa many retailers are squeezed out of the distribution channel, and with Google retailers and manufacturers once again are forced to pay to participate.

Life control interfaces can provide access to consumers for some firms while blocking access for others, which indicates that the power they demonstrate is related to the power from control of online gateways for shopping. But LCIs are more complex and more powerful than online shopping gateways. LCIs are the natural extension of online shopping gateways into the future of the online Internet of Things. They are related to online gateways, but are even more powerful and it is even harder for companies to compete with them. Well-known companies like Walmart and eBay have not needed to pay for their own names as search terms because they are so easily found online. But when consumers start using life control interfaces to shop for them, Walmart may increasingly find itself bypassed. Walmart can compete online with Amazon since its website can be designed as well and its prices can be as competitive; Walmart cannot compete with Alexa, because users will not want and indeed will not accept a second in-home life control interface. New BMWs will have an interface controlled by Google. If the owner instructs the car to pick up family members and bring them to the restaurant for dinner, obtaining the full functionality of future autonomous vehicles will require Google to share data with BMW to direct the actions of the car. This makes control over smartphone data a critical resource in the operations of LCIs, and dramatically restricts the set of companies capable of participating in any future consumer-focused internet of things. The data needed to support an LCI, and even the LCI itself, can be seen as cospecialized assets (Clemons & Row, 1991; Teece, 1986) which make it difficult or impossible for most companies to compete effectively against the owners of LCIs.

Consumers are not harmed in any obvious way, and will increasingly become dependent upon their life control interfaces. But competition is harmed, and retailers will increasingly be harmed by this new form of anticompetitive behavior. Likewise, consumers will not be able to obtain the full range of value from their smart cars without a relationship between the car manufacturer and the owner of the interface, Android or iOS. Likewise, manufacturers will not be able to achieve the full range of value from their smart home appliances without a relationship between the car manufacturer and the owner of the interface, Android or iOS.

New problems — fake news and the use of online media to manipulate public opinion and to destroy social cohesion

Fake news and the harm it creates have been studied previously. Alan Dennis and his colleagues have explored numerous aspects of the issues involved in a special issue of the *Journal of Management Information Systems* [in press]. The authors of this paper have the problems created by highly targeted and well crafted fake news stories, individualized and ideal suited to manipulate the opinions of specific groups. Individualized fake news stories are the most effective, and well-targeted stories are not often read by unsympathetic individuals, limiting public opinion backlash (Clemons, 2018a, 2018b, 2018c).

Fake news is newly emerging as a form of cyber warfare. “*War is too important to be left to the generals*” (Malinson, 2016), and increasingly conflict in war is too important to be fought entirely by armies.

- *Deception and elaborate plans of disinformation* are not new in international conflict. It was a fundamental principle advanced by Sun Tzu in the sixth century BC to end wars quickly (Tzu et al., 1971). Operation Bodyguard (Smith, 2014) before D-Day was an elaborate deception to convince the Germans that the real invasion was going to be led by Patton, attacking Pas-de-Calais. More recently, deception played a role in Desert Storm (Wright, 2019).
- International conflict has often involved *non-traditional mechanisms*. At the start of World War I Britain engineered an effortless blockade of Germany by canceling all funding for maritime shipping to Germany and canceling all maritime insurance of cargoes going to the Continent (Lambert, 2012). At the start of World War II Germany printed £134 million in counterfeit British currency and planned to drop them over London to destabilize the British economy (Blakemore, 2016). The plan was never implemented, in part because of how easy it would have been for Britain to respond with similar counterfeit German currency.
- *Revolutionary progress in media* has often transformed society. The relationships among moveable type, the publication of the Gutenberg Bible, and the Protestant Reformation are probably the most striking (Roos, 2019). The internet, and online social media in particular, have affected how we get news, and has affected the balance between traditional journalism, sensationalism, and outright manipulation (Bradshaw & Howard, 2017). It is not surprising that social media platforms are being deployed as non-traditional forms of international aggression.

- Some media companies have always relied on *sensationalism*. Consider the role of yellow journalism to increase the circulation of papers owned by Hearst and Pulitzer. And the impact on occasion was dramatic. The Spanish American War was perhaps the first war driven largely by print media ([United States Department of State](#)).
- Finally, *targeted marketing and microtargeting* have emerged as significant factors in modern political campaigns (Fowler, 2020).

But actions by Russian Trolls, and secondarily by Chinese and Iranian actors, are the first to combine all five of these factors. The principal actors are not engaging in media campaigns to advance a legitimate minority points of view, or to sell media products. Their actions represent a novel and effective form of international aggression, and this is emerging as a significant factor in international conflict short of military action. As such, it is fundamentally different from other forms of fake news, and requires extreme and novel responses.

Social media would not produce societal discord, distrust, and tribalization if they did not appeal to inherent and fundamental human tendencies that limit the effectiveness of large groups (Shermer, 2012). Anthropologists have documented some of the societal implications of human evolution and early prehistory. Humans evolved in small bands, little different from troops of great apes. We evolved with social structures ranging from a few dozen to perhaps as large as a few hundred individuals. Small groups, like rural villages, view the group as *same*, and view outsiders as *others*. As societies increase in size, *other* takes on connotations of *like me*, and societies naturally begin to fragment. The centrifugal forces driving societies apart have historically been countered by the clear benefits of the larger group, allowing societies to gain economic, political, and military stability. But large groups of humans are inherently unstable, and can be manipulated to loathe and take violent action against *others*; for example, see Appadurai's Fear of Small Numbers (Appadurai, 2006). Modern ethicists have recently commented on the use of social media to increase fear and loathing directed at others as an act of aggression to destabilize the societies of nations viewed as economic or potential military competitors (Tierney, 2018).

Why is it so hard to develop appropriate responses to the power of Big Tech?

It has been extremely difficult to develop a strategy for responding to the power of Big Tech companies. Academics, industry experts and regulators remain unable to agree on the questions to ask. We cannot agree on what regulation should look like or on what social policy should look like

until we agree on what problems we are facing and how we would know when we found an appropriate solution.

It's impossible to implement any solution without consensus on what the problem actually is. It's impossible to implement any solution without an understanding of individuals' objectives and without understanding the tradeoffs among them. Without this understanding we would lack public support for any proposed solution. That's why we have conducted extensive survey research, in order to understand consumer behavior. This is described in detail in section 'Why is it so hard to develop appropriate responses to the power of Big Tech?' Similarly, we will need to understand the concerns of executives in industries directly affected by the power of Big Tech, its power over existing gateways to control access to consumers, and the emerging power of *life control interfaces* like Alexa and we will need to understand how to teach people to make decisions in their own long-term best interest, which includes understanding motivation and self-control, and both analytical and intuitive decision-making. This is described in detail in section 'Why is it so hard to develop appropriate responses to the power of Big Tech?'.

This is why we are arguing so insistently for interdisciplinary research. The relevant disciplines obviously include information economics and business strategy, to understand what Big Tech firms want to do, and how different regulatory restraints would affect their ability to act in ways that regulators deem undesirable. They would also include regulatory policy and regulatory economics. We will also need to include anthropology, sociology, and consumer psychology, so that we know what consumers do and do not already understand, what consumers do and do not want, and what consumers will and will not accept both from their services providers and from their governments. Without this it will be impossible to design a regulatory policy that consumers will accept. There are lessons that must be learned from Big Tech's ability to derail both the US Congress and the US Senate's attempts to limit online theft and republication of protected content.

What responses are appropriate to the problems of Digital Transformation of business and society?

The most common recommendation in response to Big Tech is to apply antimonopoly law more strictly (Kendall & McKinnon, 2020). Historically, many problems created by irresponsible corporate behavior have not been solvable through antimonopoly law. The harm from tobacco addiction was not caused by the monopoly power of any individual tobacco company, but by lack of transparency regarding harm, by powerful advertising and lobbying efforts, and by humans' well-known inability to trade off immediate benefits against long-term harm. The solution was a combination of mandatory labeling, increased taxes, and outright ban on sale to minors. The problem of lead in gasoline was

not caused by the monopoly power of gasoline companies around the world, but again by lobbying, misinformation, and lack of transparency concerning future harm. The problem was solved by actions banning leaded gasoline in the entire industrialized world and by requiring automobile companies to produce vehicles that did not require leaded gasoline. The problems of externalities — harm to others caused by our own economic activities — are not caused by monopolies. The most obvious examples, such as air and water pollution, are not caused because coal companies, other extractive industries companies, refineries, and chemical companies are monopolies. They are caused by a lack of transparency: we cannot immediately judge the harm we are causing others. And they are caused by a lack of altruism: we don't care about the harm our activities cause others. The problems of defective, harmful, or addictive products were not caused by monopoly power.

Additionally, some of the problems we face today are without precedent. Monopoly law is not helpful or even relevant or applicable. The power of platform envelopment is not caused directly by the existence of a monopoly, but by the leverage of that monopoly to create additional power in other areas of economic activity.

What solutions are appropriate for externalities?

Uber increases traffic congestion and increases air pollution by reducing reliance on more fuel-efficient public transportation. Airbnb alters neighborhoods, allowing residential housing to be converted to commercial near-hotels and forcing out long-time residents. And yet city-dwellers love Uber, and tourists and many parts of the tourism industry love Airbnb.

There is no universal solution. Solutions need to be negotiated locally among all stakeholders. But who should be consulted? Should hotels be represented, since they are harmed? Should renters be consulted, since some may benefit from renting their own units, while others may be harmed by the renting of units near theirs? Should municipalities be consulted, since their tax revenues may be affected, affecting the delivery of local government services? How can foreign tourists be represented in local analysis of tradeoffs?

Deceptive, dangerous, and addictive social media products

One recommendation is to regulate social networking platforms as harmful and addictive products, much as we regulate tobacco and alcohol, as suggested by Professor Jan Trzaskowski of Copenhagen Business School (Trzaskowski et al., 2018; Trzaskowski & Sørensen, 2019). Alternatively, they could be regulated as unsafe public spaces, as suggested

by Professor Amanda Shanor of The Wharton School. While adults may continue to choose to purchase dangerous, harmful, or addictive products, like tobacco, alcohol, and highly processed fast foods and sweetened soft drinks, we acknowledge society's obligation to protect minors. Even when these regulatory restrictions are not popular with the populations that are being protected.

What solutions are appropriate for platform envelopment?

Platform envelopment is often studied as a source of competitive advantage, and indeed for some firms it has been (Eisenmann et al., 2011; Parker et al., 2016). There has been little academic study of the problems of platform envelopment, even though more firms have been dominated by platform envelopment at Google and Amazon than have benefited by launching their own successful platform envelopment strategies. Regulators are beginning to act. The Department of Justice litigation against Microsoft was at its core about platform envelopment (United States Department of Justice, 1994). The record-setting €4.34 billion judgment of the EU Competition Commission against Google was likewise about platform envelopment and about denying competitors equal access to their Android platform (European Commission, 2018).

Since platform envelopment revolves around denying access to an essential platform, an effective solution would require allowing unrestricted access. This requires that a firm provides services to its competitors. *Duty to deal* in the US is usually applied only when a company that had been providing services ceases to do so solely for anticompetitive reasons (Bouknight Jr, 1985). Likewise, although the *Essential Facilities Doctrine* (Pitofsky et al., 2002) was effectively used in litigation against American Airlines' abuse of Sabre (Locke, 1989) and to compel AT&T to provide MCI access to individual subscribers' phones (Pitofsky et al., 2002), it is now seldom employed either in American or EU litigation. Analysis is complicated in part because consumers do benefit from the super-additive value created by the platform operator (Clemons, 2018b, 2018c). The key decision is determining a fair price that the platform owners charge for access.

What is the appropriate remedy for abuse of control of gateways?

Abuse of gateways is a dominant online business model, especially when combined with third party payer systems and reverse price wars. Consumers rarely see the indirect costs they create for themselves by using free search. Search engines are not required to provide consumers with the best possible search results, and sometimes, when the profits are large enough, they will return search results that are actually

dangerous and harmful (Epstein & Robertson, 2015; European Commission, 2017; Kahn et al., 2013; Lianos & Motchenkova, 2013; Mikians et al., 2012). The most extreme examples involved Google's facilitating illegal drug smuggling into the United States (United States Department of Justice, 2011).

But harmful search results are rare today. Google has learned that allowing inferior suppliers to purchase top spots in search is rarely good business. Consumers would learn to distrust paid search results, which would be catastrophic for Google's business model. And it is more profitable to provide the top spots in sponsored search to suppliers that consumers will actually click on, since that produces revenue. Google uses a combination of the seller's quality score and the seller's bid to determine its location in the search results it shows users. Google reserves the right to adjust quality scores in order to extract as much money as it chooses to extract from winning bidders, but it rarely shows truly inferior sellers to consumers anymore. It uses the threat of not showing a particular seller as a mechanism for extracting high prices even from sellers who should automatically show up at the top of search.

Some of the profits extracted by the search engine are returned directly to consumers through a range of other services, making search engines appear to be more free than free (Clemons & Wilson, 2016). These payments are used to buy loyalty from users and to increase market share. As a result, competition among search engines actually *increases* the price they charge sellers to be found. Breaking up Google would not reduce the cost of keywords, or the costs sellers pay as a result of participating in search, but would actually increase them. Since a significant portion of higher costs are always passed along to consumers, free search may ultimately prove to be the most expensive way of providing search. Since breaking up Google would only increase the cost of keywords, and thus would only increase the indirect costs of free search paid by consumers, we need another mechanism. Both the cost of keywords and preferencing of a search engine's own offerings above those of competitors have led to the imposition of massive fines by the EU's Competition Commissioner.

Bracha and Pasquale (2007) have suggested the creation of a Federal Search Commission. Their intent was to eliminate search bias and ensure that consumers obtain the best possible search results. But the FSC could also address two other problems created by the current market for search. It could set tariffs and limit the costs imposed by any search. It could eliminate abuses such as preferencing the search engine's own offerings ahead of those of other competitors.

Regulation of search will not be easy. Our most recent research suggests that even in 2020 consumers do not approve of Google's behavior but would be reluctant to share data with any Google competitor and would be reluctant to

switch to a paid service even if it preserved their privacy (Hermes et al., 2020).

What solutions are appropriate for abuse of life control interfaces?

Life control interfaces require data to operate, and these are cospecialized assets in the sense described by Teece (Teece, 1986); firms that control cospecialized assets are the firms that profit from innovations. Clemons and Row explain how this is especially true in information-based innovations (Clemons & Row, 1991). A smart car needs data in the user's phone to arrange to pick up guests and drive them to dinner, a smart shopping assistant needs access to other information stored elsewhere in the user's life control interface (Schreieck et al., 2019). No single automobile manufacturer, appliance manufacturer, or retailer can provide a compelling reason for users to reenter their data or for them to adopt a new life control interface. Apple iOS, Google Assistant, and Amazon are here to stay.

Looking at the EU, the most plausible response would be the creation of a single cooperative pan-EU life control interface that is transparent, regulated, and agnostic about where to shop and would have full access to the consumers' data. The GDPR ensures that users own their data and that they have the right to download data to any competing platforms, but most users lack the patience, the skill, and the motivation to do so. A pan-EU life control interface could provide motivation, by offering superior unbiased service, and could provide access to the data necessary for the interface's operation.

Alternatively, Alexa, Android, and iOS could be regulated as essential facilities in the US, the model for regulating airline reservations systems in the 1980s. This would require that the platforms themselves, or at least the data that they possess, would be made available to all competitors that wanted access to customers and to their devices.

What solutions are appropriate for restricting the use of social media for manipulation of public opinion?

Social media are used to manipulate public opinion, both in elections and in marketing. Social media are used to advocate extremist political or religious ideas, and to radicalize and recruit new members for a wide range of dangerous extremist groups. The problem has been called an existential threat to democracy (Naughton, 2018), but Facebook has successfully defended its practices using arguments related to freedom of speech and to its use of data as part of its core marketing strategy.

Jaron Lanier has suggested that we all terminate our accounts and stop our use of social media (Lanier, 2018), but Jaron's readers are not among Facebook's most susceptible

users. Mark Zuckerberg expressed no concern about a boycott by advertisers, since he was certain that they would all come back (Clayton, 2020b).

Recent suggestions have been based on a combination of increased transparency and labeling of social media content, restricting what information social media firms can share with actors intent on manipulation, and restricting the behavior of social media companies by limiting what they can and cannot post. Each has its benefits, and each has its limitations. Labeling has been shown empirically to have limited impact on users (Moravec et al., 2020). Simulation modeling has examined limiting social media companies' legal ability to provide essential information to misinformation campaigns, and has shown that this limits effectiveness of these campaigns (Clemons & Waran, 2019). Unfortunately, this work has also shown easy ways for social media companies to circumvent restrictions. The most effective mechanisms would be encouraging or even requiring social media companies to restrict the publication of the most virulent fake news stories. This comes up against arguments based on freedom of speech and First Amendment Rights. Recently, conservative groups have argued that limiting what can be published unfairly and systematically limits what they and their supporters can publish (Ray, 2020), although evidence suggests that this is not the case (Clayton, 2020a) and that conservatives continue to dominate online (Scott, 2020).

What solutions are appropriate for external actors using fake news to destroy social cohesion

This Project was only recently added to our research program. We understand that it is fundamentally different from fake news campaigns conducted by domestic actors trying to advance their own political views; indeed, often the authors of this form of fake news may actually believe their messages; this is particularly true of groups like passionate anti-vaxxers. While groups like anti-vaxxers are generally protected by freedom of speech and in the US by First Amendment rights, foreign actors writing solely to create social chaos are clearly in a different category, and different interventions would be permitted. Their posts are not protected by freedom of speech, any more than counterfeiters distributing billions of dollars in fake bills would be protected by freedom of the press. However, Section 230 of the Communications Decency Act in the US shields online platforms from liability for the contents of their websites in ways that traditional print and broadcast media would not be protected (American Civil Liberties Union, n.d.). In contrast, in response to horrific events like a mass shooting in a New Zealand mosque in 2019, other nations are beginning to consider criminal penalties for some online

content, including the possibility of both fines and jail time for platform executives personally (Dalzell, 2019).

We are still studying anthropology, and in particularly the emerging discipline of evolutionary anthropology (Kamilar, 2020). We are not yet ready to offer proposed solutions.

Other considerations and conclusions

Technology and online applications do not respect any international borders. Any attempt to regulate Western firms must be approached carefully, or we will cripple our domestic firms and create opportunities for them to be replaced by new entrants with worse behavior (Wang, 2020).

Regulation is only one approach. Market solutions would work if the public's commercial behavior considered the impacts to others and avoided harmful externalities. Unfortunately, the lack of transparency ensures that the public is mostly unaware of the harm that Big Tech causes. And there is little indication that diffuse harm changes individual behavior. Higher prices that result from merchants' key word costs seem an abstract and theoretical danger, and the joys of staying in a perfectly located Airbnb dominate concerns for displaced local residents. Can we implement policy without public support? Should we? Do we have the right to do so?

Other authors have suggested that the moral education of the firm, its executives, and its board of directors, would lead to a new social contract between firms and society. Employees, customers, and society as a whole would be included among the firm's stakeholders, and would reduce the role of shareholders, profits, and market valuation as metrics of a firm's performance (Sorkin, 2019).

We have focused on some of the most pressing problems facing modern society. We addressed a small set of problems that are novel, or newly significant, and that are not yet resolved by current regulation. Moreover, we have explained why these are problems that are unlikely to be solved by transparency, by changes in consumer behavior, by market forces, or even by a combination of all three. These problems require interdisciplinary study. And we have sketched out how some of these problems might be approached and the disciplines that might be applied.

Since we are calling for the larger academic community to work on Social Welfare Computing, many of the suggestions for future research will come from our colleagues. We sincerely hope that additional colleagues in MIS will be inspired by this work and will begin to explore their own research agendas in Social Welfare Computing. The authors intend to continue to work together, along with our colleagues in Denmark, France, and Germany in Europe, China and Japan in Asia,

and the US. Most of the papers in this special issue are based on discussions at our Symposium on Social Welfare Computing, which was part of the (virtual) 2021 Hawaii International Conference on System Sciences. The Symposium is an annual event.

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