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DISCUSSION PAPER

The Cooperation Paradox

Forming a single coalition in order to increase, rather than decrease, the number of economically viable alternatives

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Abstract
Dominant American online platforms like Amazon Alexa or Google Assistant have become *Life Control Interfaces (LCIs)*, which facilitate consumers' online interactions and influence what consumers do and do not see and buy. These platforms operate outside of EU regulation, and create significant costs for traditional European firms in a wide range of industries. These platforms can reduce firms' access to customers, can charge for enabling access to customers, or can charge for access to essential data on firms' customers. Since these platforms enjoy monopoly power there is little restraint on their charges, which indirectly increase consumers' prices. We propose that regulators encourage the formation of a consortium to offer a single integrated EU-based Life Control Interface (EuLCI). This consortium would increase the number of EuLCIs from zero to one, and thus would actually increase consumer choice. We call cooperation that enhances rather than limits choice *The Cooperation Paradox*.

Keywords Life control interfaces · Online competition · Online cooperation and consortia · Online gateways · Online monopoly regulation · Online platform regulation

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Introduction

U.S. firms dominate all aspects of the emerging consumer-facing online platforms in the Western world.[1] The most prominent examples are Google (which dominates the search market), Amazon (which dominates e-commerce), and Facebook, WhatsApp and Twitter (which dominate online social networks and messaging apps).

At the same time, Amazon Alexa and Google Assistant have positioned themselves as active agents further expanding the dominance of the underlying platforms: Users consider relying on them to control more and more of their lives (Kreps et al., 2020), online as well as offline, making them Life Control Interfaces (LCIs) (Schreieck et al., 2019). These agents serve as convenient gateways, providing its users access to goods and services, again

[1] Different dominant online platforms have emerged in Asian countries. Tencent has established WeChat as a dominant messaging platform that offers an increasingly broad portfolio of services. Alibaba is a dominant player in e-commerce. First platforms such as ByteDance's social media platform TikTok have made inroads in Western markets.

online and offline. Some users may be aware that they are being subtly influenced, directed, and redirected (Kreps et al., 2020). However, as users become more familiar with these LCIs, the combination of experience and convenience allows users to become reliant upon these LCIs to an ever-increasing degree. As a result, the LCIs have the ability to direct the users' traffic, for instance, determining which vendors users do and do not see, and thus the LCIs control where users shop and which sellers are effectively eliminated even before the users begin consideration of their possible choices (European Commission, 2021). This is not merely a hypothetical future concern. LCIs are a form of online gateway, and since users generally deploy only one, these LCIs become mandatory participation third-party payer markets (MP3PPs) (Clemons, 2019b). These MP3PPs are outside the boundaries of traditional antimonopoly laws and regulation, and can and do deny competitors access to consumers, while charging other firms almost whatever they wish to allow those firms essential access to their customers. These MP3PPs' pricing is not subject to traditional market forces (Clemons, 2019d), and as American firms they have often operated outside of EU control.

We believe that LCIs and the control they exert will become economically more and more significant, as the number of people using LCIs rises (European Commission, 2021). Since none of these LCIs is EU-based, and since none of the firms that own them have been willing to operate with EU legal frameworks, their control over which sellers are eliminated from consideration allows them to threaten almost any firm with economic disaster. This will indeed become a significant competitive challenge to EU firms, since the LCI can promote its own competitor to a firm that needs access to consumers, or can charge a firm almost the full marginal value of a customer interaction simply for not blocking it. The dominance of US Internet firms has only recently emerged as a topic of debate in literature on information systems and electronic markets (e.g., Aalst et al., 2019; Ciriani & Lebourges, 2018; Korreck, 2021; Moore & Tambini, 2018; Petropoulos, 2021). Scholars have acknowledged that the market power of the dominant firms jeopardizes competition in Europe (Aalst et al., 2019; Ciriani & Lebourges, 2018) and call for increased regulatory scrutiny (e.g., Bourreau et al., 2018; Collin & Colin, 2013; Soriano, 2019). Suggestions on how to enable companies in the EU to establish viable alternatives to the online platforms provided by US firms remain scarce.

As we discuss in this paper, the power of LCIs is a problem that cannot be solved by any single EU firm, nor can any EU industry surmount this problem acting alone. Cooperation, both within industries and across industries, is essential to achieving a solution. Unfortunately, such cooperation, especially cooperation within an industry, often appears to be an anticompetitive, monopoly practice: Coalitions between enterprises are often equated with cartels. A cartel offering a single choice is seen as offering consumers no choice at all. Interestingly, in the absence of a single new choice, consumers already truly do have no choice at all. Thus, paradoxically, allowing this cooperation will enable the formation of a viable European alternative to the existing dominant American platforms, and allowing it will actually increase consumers' choice.

We thus have the *Cooperation Paradox*: Allowing cooperation among firms is the only way to create a viable new alternative to the existing LCIs, which operate largely without oversight from EU regulators. We have addressed the paradoxical role of cooperation previously. An early work explored when self-protection requires cooperation, and when self-protection is justifiable in the presence of overwhelming anticompetitive threats from outside the EU. In those cases, self-protection cannot be labelled as protectionism (Clemons, 2015). Cooperation that creates a viable new alternative is not anticompetitive; it rather allows European firms to compete effectively, on equal footing and allows them to survive. Cooperation that benefits European firms and European consumers should not be perceived as collusion, and it is not restraint of trade. Furthermore, cooperation that allows European firms to survive in a market dominated by American giants is not European protectionism, but European self-protection.

The structure of this paper sets up our argument for cooperation among EU firms. We start by describing the problems associated with American domination of consumer-facing platforms on the net as they evolve into LCIs. We then describe the impossibility of individual firms mounting an effective response to the problems of LCIs. Next, we describe what an effective response would look like and how it could be implemented; again, paradoxically, cooperating to create a single viable EU-based Life Control Interface (EuLCI) would increase, rather than decrease, consumers' choices. The second section reviews the simple fact of American domination of consumer-facing online platforms. The third section reviews forms of monopoly power and domination, and explains the role of essential facilities and platform envelopment strategies to explain the evolving economic significance of American domination of consumer-facing online platforms. The fourth section reviews the emerging roles associated with LCIs, including their future roles in supporting consumer shopping and enabling intelligent homes and autonomous vehicles. The fifth section explores why normal market forces are not effective in reducing the power of essential facilities when those essential facilities' power is defended by platform envelopment strategies. The sixth section describes the combination of actions that would

enable European development of an effective counter to the current set of American platforms dominating LCIs. The ninth section returns to the *Cooperation Paradox*. It defends cooperation, even apparent collaboration, and collusion, to enable the development of a viable European alternative to the dominant and harmful LCIs offered by American platforms. The essence of the paradox is that actions that would normally be illegal because they limit the choices available in the marketplace should in this instance be encouraged because these actions will increase choice and reduce costs both for firms and for consumers. Finally, the eighth section summarizes our work, presents our conclusions, and offers suggestions for future research.

American domination of consumer-facing online applications

Google controls 93% of online search in Europe (Statcounter GlobalStats, 2020), giving Google quasi-monopoly power over pricing. Online search is essential to all businesses today, including those that operate purely online and those that rely principally on their physical presence. If consumers cannot find your firm, your firm essentially no longer exists. Online search can be categorized into organic and paid search. Companies can purchase search ads to be more visible to potential consumers. These search ads are enormously expensive to these firms, and currently represent an estimated wealth transfer of €16 billion annually from EU businesses to Google.[2] Thus, with Search, Google enjoys enormous gateway power, determining which firms can be reached by their consumers and which cannot. This was the basis of the fine of €2.42 billion the EU Competition Commission imposed on Google for preferencing its own comparison shopping service over those of competitors, using the example of Foundem as the basis of their complaint (European Commission, 2017a).

Amazon is by far the largest online retailer in the EU and in the US (Statista, 2020). Complaints against Amazon include that it avoids European taxes (Neate, 2019) and that it threatens the viability of a range of traditional retailers whose existence is essential to local economies (White, 2018). Additionally, it has been claimed that Amazon abuses small vendors that become dependent upon it for their survival (Nadler & Cicilline, 2020). Amazon observes its partners in the Amazon Marketplace and monitors which products do and do not sell well. It then uses this information to determine where to compete with its own products against its existing partners (Zhu, 2019). Knowing what is profitable in specific product categories allows it to compete selectively, and its scale allows it to compete unfairly.

Facebook, and to a lesser extent Twitter, control online social networks in Europe. Social media represent a different kind of threat; they are not simply a threat to the economic survival of individual EU firms. Rather than merely a threat to EU firms, they are now a threat to European society. Online social platforms have demonstrated the ability to manipulate elections in the US and referenda and other forms of voting in the EU, with Cambridge Analytica the first widely reported abuse of these platforms to manipulate public opinion before voting (Cadwalladr, 2017). President Trump's use of social media to foment unrest, and, perhaps, to foment insurrection, show just how dangerous these firms can be (Massie, 2021). This phenomenon is not unique to the US, as illustrated by "The Movement", a right-wing populist group that was founded by Trump's former advisor Steve Bannon in Brussels to undermine the EU elections in 2019, albeit with limited impact (Horowitz, 2018) or by the role Cambridge Analytica played in UK's Brexit Referendum (Wylie, 2019). Currently, these firms are not subject to European regulation, and Facebook in particular has been defiant about the prospect of submitting to EU regulators (European Commission, 2017b). For this reason, they have been called "existential threats" to Western democracy (Naughton, 2018).

In this paper, we will focus primarily on Google and Amazon. We will mention Apple iOS only in passing when we discuss autonomous vehicles. In this paper, we will ignore Facebook, Twitter, and Microsoft, entirely. We do so not because these last three lack power but because their power does not represent the same kind of threat to EU firms that Google and Amazon do, since they do not yet operate their own LCIs. Moreover, we believe that threats based on operation of LCIs will become increasingly important as the Internet of Things (IoT) gains in importance (European Commission, 2021). Communications on the net today are mostly person-to-person. The IoT will increase the importance of machine-to-machine communications (Parker et al., 2016; Pauli et al., 2021).

Literature review: Essential facilities, platform envelopment, and forms of monopoly power and domination

Contestable Markets and Monopolies without Power

It is possible for monopoly market share to be associated with *benign domination*; that is, sometimes monopoly market share does not confer monopoly power to set prices, sometimes this occurs naturally. Economists have identified what are technically called contestable markets, where a firm is able to sustain its monopoly market share only by offering the lowest possible prices, and where any attempt at exploitation would lead to immediate entry of viable competitors.

[2] To calculate this number, we took EU companies' search ad spending and Google's market share (Statista Research Department, 2021b) into account and subtracted ad spending from the UK (Statista Research Department, 2021a).

This is referred to as monopoly market share without monopoly power or monopoly pricing (Baumol et al., 1983).

Contestable markets are characterized by costless entry and exit. A generally accepted indication that a market is not contestable is the ability to continue to earn super-normal profits, profits that are high enough to enable subsidies to other markets, allowing monopoly power in one market to create and defend subsidiary monopolies in other markets. This is both the most obvious sign that a company has monopoly power and the most obvious danger of that power because it allows a company to leverage a monopoly in one area to create and defend additional monopolies elsewhere.

There are other times when monopoly power is so obvious, and inevitable, that there is little dispute over the need for regulation. The earliest examples were in *network industries*, most obviously in telecommunications, and to a lesser extent, in rail transportation (McCraw, 2009). The more users there were present on a network, the more conversations were possible. The value of a network increased faster than the increase in the number of participants. Estimates of $O(n \log n)$ or even $O(n^2)$are frequently used.[3] These are called *positive participation externalities* or simply *network effects* (Rochet & Tirole, 2003). Primitive technology imposed limited interoperability on early telephone networks; a subscriber could not be connected to a subscriber of a competing company's network. This meant that all subscribers wanted to be on the largest network and that it was socially beneficial to have only one network. Since it was socially beneficial to have only a single telephone network and since telephony was too important to have under the control of a single monopoly company without regulation, all countries took one of two approaches during the emergence of traditional telephony at the end of the 19th and beginning of the twentieth century. The US considered the Bell System a natural monopoly and negotiated a regulatory regime with it (Thierer, 1994). The UK considered telephony a natural monopoly and placed the telephone system with its Post, Telegraph, and Telephone state-operated monopoly.

Essential facilities and their role as examples of monopoly power in the absence of a monopoly

Essential facilities have monopoly power even when they are not monopolies. An *essential facility* is a product or service that is too expensive for most companies to duplicate, and that is critical for the delivery of a range of other services (Evrard, 2003; OECD Policy Roundtable, 1996; Werden, 1987). Once again, telephony provides an example. With modern technology, it became possible for a range of companies to compete in long-distance telephony. However, only the Bell System owned the local link, the last mile, the wire connection into each home, and without access to this last mile no company could enter long-distance service or compete effectively with the Bell System. For this reason, part of the regulatory change that accompanied the deregulation of American telephone service in 1984 was the requirement that the Bell System makes its local link system available to all long-distance competitors.

Online gateways and platform envelopment as essential facilities

At the other extreme, opposed to benign monopolies, are essential facilities based on platform envelopment. Essential facilities based on platform envelopment are virtually impervious to competition (Clemons, 2019c; Eisenmann et al., 2011; Krämer, 2021). At the center of an essential facility is a core technology, like the Android platform or Microsoft's Windows operating system. This core often does not initially appear to have the characteristics of a monopoly. Android was not the first mobile phone operating system, and there was no reason to suspect that a viable competitor would not emerge after it. Microsoft's DOS was not the first operating system for a personal computer, and there was no reason initially to assume that it would emerge with global domination of the market for IBM-compatible personal computers.

Moreover, since it was always possible to call any mobile phone from any other, the network effects that created monopolies in traditional telephony did not appear to support an equivalent source of monopoly power in mobile operating systems. The next step in the development of an essential facility through platform envelopment is layering additional functionality onto the core. Google Search, Gmail, Google Maps, Google Street View, and a host of additional applications operate seamlessly on Android devices. The combination offers super-additive value creation, that is, the seamless integration of this portfolio of applications, makes the Android device and its applications worth far more than the sum of their individual values (Schreieck et al., 2019). This super-additive value creation attracts users, which attracts third-party developers, which leads to an enormous array of additional applications now available on Google Play, their proprietary app store. This accelerates the process of super-additive value creation.

Once super-additive value creation is achieved, the true power of platform envelopment strategies becomes manifest through the ability to selectively deny access to some competitors in some specific product areas. Super-additive value creation makes the device almost irresistible and almost irreplaceable; the only other devices with comparable functionality and value are Apple's iPhone and iPad, which likewise rely upon their super-additive value creation. Moreover, paradoxically, monopoly power is manifest through limiting

[3] The Big O notation describes the behavior of a function in the limit as its arguments tend towards infinity.

interoperability and selectively blocking access—when the platform owner has an app on the platform, then a competitor's offering does not greatly increase super-additive value for the consumer and does significantly reduce the platform owner's ability to harvest value (Clemons, 2019b; Parker et al., 2016; Schreieck et al., 2019). Like all essential facilities, it is too expensive for any single competitor to attempt to duplicate the platform owner's complete portfolio, and thus it is too expensive for anyone to compete with a successful platform envelopment strategy. These platforms, like Android, are too important to leave in the hands of a monopoly business when they begin to exploit their power. Again, this was the basis of the EU's record-setting fine imposed on Google for its abuse of Android's power (European Commission, 2018).

Many of the most important essential facilities are online gateways, designed to link buyers and sellers. When the gateway becomes essential to consumers it thus becomes essential to sellers, and the platform operator enjoys almost unlimited ability to charge for services (Clemons & Kleindorfer, 1992).

Online gateways as parallel monopolies

Perhaps the most powerful new online business model was created by merging online gateways with mandatory participation third-party payer systems (MP3PPs). These MP3PP gateways are actually *parallel monopolies* (Clemons, 2019d, p. 121; Clemons & Wilson, 2016) as long as consumers *single home* (Rochet & Tirole, 2003). That is, as long as some consumers search only using Google and others search only using Bing, merchants have to participate in both. At present Bing does not represent much competition for Google, but experience shows that even if Bing enjoyed significant market share it would not reduce Google's pricing power. This is clear from the historical record. When Sabre and Apollo were essential online gateways in the 1970s and 1980s, Computer Reservations Systems (CRSs) linking airlines with the travel agencies that sold the majority of their tickets, airlines had to participate in both; no airline could afford to lose a double-digit percentage of its traffic, and since agencies used either Sabre or Apollo, agencies had to pay whatever Sabre and Apollo demanded. Sabre and Apollo were not competing in a duopoly; each had its unique collection of users, each provided monopoly access to those users, and every airline had to cooperate with both Sabre and Apollo (Copeland & McKenney, 1988).

Moreover, competition between CRSs did not lower what they charged airlines for access to passengers, but paradoxically competition actually increased what the CRSs charged. The idea is simple. The CRSs' only power came from obtaining travel agent traffic, so the CRSs actually competed for market share by *increasing* what they charged the airlines for inclusion on their platform and then raised the subsidies that they provided to the travel agencies. Agencies loved the CRSs because they made it faster and easier to serve their clients and because they were paid for usage, and as long as the agencies used the CRSs airlines had to pay to participate. Since some agencies used one CRS and others used the other, airlines learned that they had to participate in both; leaving one CRS would cause a catastrophic loss of passengers. And since payments were made by airlines, which had learned that their participation was essential to keeping customers, airlines paid whatever they had to pay. These were among the earliest mandatory participation third-party payer businesses (Clemons, 2019a, d). Eventually they were regulated (Copeland & McKenney, 1988).

Interestingly, although Sabre and Apollo were eventually regulated, the business model they represent has re-emerged as one of the most powerful business models online. Sabre and Apollo have re-emerged as the Global Distribution Systems Sabre and Travelport, and these Global Distribution Systems have been described as still among the most powerful monopolies online (Clemons & Madhani, 2010, 2011). That is clearly hyperbole now; while the GDSs remain powerful in their small niche, online travel, Google's market, the market for everything, is many times larger.

Regulating online gateways, MP3PPs, and platform envelopment

Successful platform envelopment represents another natural candidate for regulation, and yet platform envelopment does not look precisely like other forms of monopoly power. Much of the monopoly power is generated by a core and often that core is made available without charge, exploiting monopoly power by providing your monopoly product to consumers without charge does not look like any other form of abuse of monopoly power. Increasing the price you charge to third parties, who have no choice and simply must pay what you demand, even in the presence of competition, does not look like any other abuse of monopoly power. We already have a well-developed philosophy of monopoly, monopoly power, and abuse of monopoly power, and mandatory participation third-party payer systems just don't fit most existing models of monopoly power or abuse of monopoly power. It is important to remember that before the Industrial Revolution made scale a significant asset and made coordination of massive firms possible, no form of business looked like a potential abuser of monopoly power. Understanding of monopolies, their abuses, and their regulation has continued to evolve to deal with railroads, manufacturing, and telecommunications (McCraw, 2009; Wu, 2010).

Understanding of monopolies, their abuses, and their regulation needs to continue to evolve, in order to deal with the emerging power of near-monopolist retailers, mandatory

participation third-party payer gateways, and search engine providers. When these three business models intersect as LCIs, they create a truly novel source of monopoly power, one that will greatly limit competition in all sectors of the economy without timely and innovative regulatory intervention.

The emergence of Life Control Interfaces

Although users today are more reliant on LCIs then at any time in the past, they rely on only a very small set of them. In particular, smartphones have become LCIs as users rely on them to wake them in the morning, manage their schedules, stay in touch with friends, plan their activities, shop, take photos, and much more (Schreieck et al., 2019). These LCIs are further expanded through voice assistants such as Google Assistant and Amazon's Alexa as part of intelligent home devices, and to a lesser extent, Apple's Siri.

These LCIs have become increasingly active and increasingly operate under split loyalties; they advance the agenda of the platform owner that created them and operates them, while staying within the constraints of doing a good enough job for the consumer using them. They are not simply passive tools provided to consumers and doing the bidding of those consumers in ways that are most beneficial to the consumers. Instead, they offer consumers choices that are good enough for consumers, but that are ideal for the platform owner. Consumers use them to control their lives, but increasingly platforms use them to control consumers' lives (European Commission, 2021; Kreps et al., 2020; Schreieck et al., 2019; Zuboff, 2015, 2020).

Among other functions, LCIs offer consumers convenience in shopping. We illustrate this with a hypothetical scenario: If a consumer wants to buy specific ingredients to cook dinner for guests, they can order it via Alexa and voice command:

> *"Alexa, get me a pork tenderloin, two pounds of new potatoes, and two bunches of asparagus for dinner tonight."*

However, given the data an LCI aggregates over time, Alexa has sufficient background information to fulfill a vaguer request. Alexa might know the consumers purchasing history and its past schedule, thus the consumer might order:

> *"Alexa, you know who's coming to dinner tonight. Recommend a meat or fish course that I haven't served any of them before, a potato recipe that I haven't served any of them before, and whatever vegetables are in season right now. Nothing fried, please."*

Thus, beyond smartphones, intelligent homes will incorporate LCIs. Intelligent devices and appliances not only help to monitor home settings, they include everything from enhanced home security to enhanced energy efficiency to the ability to have a TV show follow you from room to room to appliances that monitor their own state of repair and can even update their software as necessary to adapt to changing condition of the hardware (Kang et al., 2017; Soliman et al., 2013).

Likewise, in an emerging Internet of Things, cars will also become dependent upon LCIs in the future. For example, users could tell a self-driving car to pick up family members for a dinner reservation, expecting the car to know the locations of individual family members, the location of the restaurant, and even driving times based upon local traffic condition. The car would certainly be expected to communicate with the family members via text to coordinate for pickup.

These innovative and disruptive technologies are associated with risk-reward and cost-benefit trade-offs. On the one hand, consumers will benefit from increased convenience in all aspects of their daily lives by interacting with LCIs such as intelligent homes or autonomous vehicles (Roy et al., 2007; Saad al-sumaiti et al., 2014).

On the other hand, the traditional commercial counterparties of the providers of LCIs—such as retailers, appliance manufacturers, and automobile manufacturers—are harmed as the dominant platforms presume to expand their LCIs in their domains (Dawar, 2018). This raises two questions:

- Does the harm consumers experience from lack of competition in any way outweigh the benefits of convenience? Are consumers being overcharged or denied access to the products that they would choose if they had access to alternatives not screened out by the LCI?
- Is it possible to achieve the same levels of convenience for consumers, without reducing consumers' choices and without harming EU firms?

The sources of harm to both consumers and firms have both been documented. Harm to firms is created when they may be denied access to shoppers, as occurs when Amazon Alexa chooses products based on an algorithm that gives preference to products that are part of the Amazon Choice, Amazon Prime, or Whole Foods in the US (Valdez, 2018). Harm is likewise caused when firms are forced to pay for access to shoppers whenever Google uses revenue-maximizing ranking algorithms in their online search. However, even when all companies pay to be found, Google gives customers something *good enough* for their shopping experience, but not necessarily the company they asked for, if that company did not pay enough to earn a top ranking (Clemons, 2019b). Providing less-than-ideal selections to shoppers is one source of consumer harm. The pass-through of the firms' higher costs of doing business is probably the greater

source of consumer harm, since today's form of free search is actually among the most expensive ways of providing search (Clemons, 2019b).

For appliance manufacturers, future harm will once again result from not being able to establish an LCI and having to rely on the interfaces of dominant platforms to remain in contact with their consumers and with their consumers' devices. While it is possible for consumers to connect individual appliances directly to the web, consumers will get increased convenience by simply connecting smart appliances to their home control network, based, for instance, on Amazon's Alexa or Google's Nest. Both will be essential facilities, and appliance manufacturers will have no control over which smart home control network consumers select; they will therefore need to deal with both, and will be dealing in essence with *parallel monopolies,* analogous to the power of traditional travel agency computer reservations systems operated by the airlines in the 1980s (Clemons & Madhani, 2011) or analogous to search today (Clemons, 2019b). They will therefore be forced to pay for access, and will be forced to set prices determined by the value of the connection to the manufacturer, and not set by competition between Alexa and Nest, and not determined by the cost to produce the service.

Automotive manufacturers will be harmed in much the same way, as their cars will require interconnection with an existing platform's LCI in order to deliver full capabilities to their users. While automotive manufacturers could try to develop their own limited Life Control Interfaces for their cars, perhaps based on the cars' internal operating system and entertainment control system, this would never be effective; the car simply does not have access to sufficient data to function as an LCI, nor will it ever have the functionality of Alexa or Google to be a truly empowered digital agent. In contrast, it is easy for the dominant providers of LCIs such as Google and Apple to extend their LCIs in a way that they also serve as interface to cars. Google and Apple already offer solutions that let consumers mirror their smartphone on the cars' information and entertainment screen (Android Auto, Apple CarPlay) and Google even provides an Android version that is adapted to running directly on the cars' head-unit (Android Automotive OS) (Weiss et al., 2020).

As discussed previously, autonomous cars will need to rely on user data to provide convenient services to consumers. Google and Apple already possess most of this data, such as current location, past trips, schedules, and preferred locations. Consequently, whether the manufacturer chooses to base its service on iOS or Android devices, it will still be dependent upon Apple or Google for access to essential data. Thus, the more important autonomous vehicles become, and the more important their services become, the more dependent automobile manufacturers will become upon data from Apple or Google.

Understanding why Life Control Interfaces are both essential and not vulnerable to competition

If LCIs are essential, why are they not vulnerable to competition? While the technology behind LCIs might be relatively easy to imitate by competitors, data has emerged as critical co-specialized asset, without which it is not possible to implement most of the innovative functions of an LCI Teece (1986); (Clemons & Row, 1991; Teece, 2013). For instance, the LCI that Google can offer consumers through their Android devices or Google Assistant is attractive because it can leverage user data from various services such as Google Search, Google Maps, Gmail, Google Fit, Google Photos, and YouTube to tailor services to the users' preferences.

The dominant providers of LCIs, such as Amazon Alexa, Apple iOS, or Google Nest, have convinced numerous companies to participate in the platform and provide their services. These platforms have so many apps interacting and contributing to super-additive value creation that it is virtually impossible now for any new entrant to achieve scale and scope, and it is virtually impossible for any new entrant to become viable. These platforms have further expanded the services they provide, especially by integrating their earlier offerings into their current LCIs. Amazon provides a music streaming service that is included in the Amazon Prime offering and competes with standalone offerings such as Spotify Music. Users can access the full range of Amazon's offerings simply by telling Alexa what to play next, just as they can ask Alexa to order groceries, play a movie on the living room TV, or dim the lights while they watch the movie. Because these dominant platforms already provide so much value for their users, a new provider of an LCI without a wide range of services and a wide range of service providers would not provide enough value for a consumer to acquire it, and it certainly would not have enough value for consumers to consider it as an alternative to Alexa.

And, of course, users do get enormous convenience from these dominant LCIs. Just as it is difficult to imagine the circumstances under which a new platform could create sufficient value to compete with the existing dominant competitors, it is difficult to imagine a user preferring a new entrant or switching to a new entrant. A dominant platform will attract more users, which means it will attract more companies to participate with it and will attract more apps. That, in turn, will create more value for users, and will attract more users.

An increasing number of companies, from merchants and service providers to the manufacturers of consumer durables like appliances and automobiles, are going to become dependent upon the providers of LCIs. The advent of the Internet of Things and the increasing prevalence of smart

homes, smart appliances, and autonomous vehicles will ensure that (Gubbi et al., 2013). In short, these platforms will become essential facilities.

As we have seen above, essential facilities exhibit a novel form of monopoly power, one that regulators do not yet fully appreciate. And, as we have seen, gatekeeper essential facilities can operate as mandatory participation third-party payer systems. With these MP3PPs the presence of a competitor does not reduce monopoly power and does not reduce the prices that both gateways can charge. As long as consumers can choose to use Alexa or Google as their LCI, retailers and service providers are dependent upon both; as long as some shoppers are on Alexa and others use Google, retailers need to participate on both platforms.

Moreover, the dominant providers of LCIs possess data as co-specialized assets. This means that even if a user were willing to accept a minimal LCI developed by a retailer or a manufacturer, it really would not be able to perform adequately. If Lidl or Netto put in a voice-activated home shopping device, it would not know what to order if the user repeated the request from section 4 above, requesting suggestions for courses that the dinner guests have not been served by the user before.

This request could not be satisfied without access to the users' most complete and accurate information on their preferred LCIs. The preferred LCIs for requests like these are Alex, Google, and increasingly Siri.

Necessary steps to allow cooperation among EU firms to be successful

We have already shown that the dominant LCIs are essential facilities; retailers, service providers, and manufacturers of smart devices are going to need them to reach their customers, and we have already shown that it is impossible for individual retailers, service providers, and manufacturers to provide their own alternatives. Individual firms' offerings will not exhibit super-additive value creation, and individual firms will not have timely and complete access to all the information already stored on a user's existing LCI.

We next explore what would be required to allow the creation of a successful EU-based LCI (EuLCI). An EuLCI would be subject to European regulation, and would not represent an expensive essential facility with the ability to charge monopoly prices to the European firms that became dependent upon it for access to their customers.

Super-additive value creation would be enabled by recruiting enough companies to make the platform viable. Presumably no consumer would acquire a separate EuLCI to communicate with each supermarket and a separate EuLCI to communicate with each appliance and to communicate with each automobile that the family owned. How many of us carry a laptop and an iPad and an iPhone and an iPod and a camera when we are walking through a new city? But if there were enough companies associated with the single new EuLCI platform, there would be sufficient value to attract users. This would require regulators to accept the fact that when all automobile companies, supermarkets, and appliance manufacturers cooperate to create a single platform this is not anticompetitive or restraint of trade.

Paradoxically, allowing all European firms to cooperate would not be collusion and would not reduce consumers' choice. This would increase the number of viable platforms subject to EU regulation from zero to one, and would increase consumers choices. We call this *The Cooperation Paradox:* By closely cooperating and coordinating on a single offering, which appears like collusion, firms actually generate more choice for consumers. And since the EuLCI would be regulated and its costs to firms would be far less than under current dominant American LCIs, this would reduce firms' operating expenses and thus reduce costs to consumers. If this were not the case, an EuLCI would not automatically solve the problems created by American LCIs, like high costs imposed on sellers and possible restriction of some sellers' access to consumers.

This consortium would also be able to solve the problem created by the need for data as a co-specialized asset. While no single user would be able to force existing LCIs to permit automated pulling of data to users' competing EuLCI, the consortium would certainly have the power to do so. The European GDPR ensures that consumers have the legal right to access their data (Art. 20, GDPR). The EuLCI could ensure that users' data was always available as needed. That is, the EuLCI could implement the users' right to access their data, in ways that no individual consumer could. This would allow the EuLCI to provide functionality equivalent to the of current American LCIs, and is essential to eliminating the power of the American LCIs and their ability to operate as MP3PPs, by eliminating their control of the *co-specialized assets* essential to their control over the users' interactions.

An appropriate body in the EU would need to take two steps to make this EuLCI possible.

- First, regulators would need to permit the creation of a single cross-industry platform. This would make creation of the new EuLCI possible.
- Second, consumers would need to understand the harm caused by the current dominant platforms. The majority of users appear vaguely aware that they are losing some control, but most do not appear to be aware of any actual danger that this might cause (Kreps et al., 2020). Our most recent research shows that a majority of consumers object to the privacy practices and data mining of dominant American platforms, but do not see any concrete

harm that results from these activities (Hermes, Clemons, Wittenzellner, et al., 2020). A clear understanding of the harm caused by current LCIs would facilitate users' acceptance of the new EuLCI.

An EuLCI would not be the first European consortium that addresses a lack of competitiveness of Europe's industries. In the commercial aerospace industry, the US firm Boeing was dominant until the European Airbus consortium was founded in 1970, as an initiative of the French, British and West German governments (Neven & Seabright, 1995). The consortium did not harm competition in Europe; rather, it increased competition because Airbus was able to enter market segments of commercial aerospace that none of its members would have been able to enter on their own. More recently, the European initiative Gaia-X, initiated by the German Federal Ministry for Economic Affairs and Energy, gathers actors from diverse industries to create a federated secure data infrastructure (Braud et al., 2021; Federal Ministry for Economic Affairs and Energy, 2021). With this cloud-based data infrastructure, strategically important industries such as automotive, healthcare and finance would have an alternative to hosting their data on the cloud infrastructures provided by dominant US firms (Green, 2021). Again, Gaia-X does not limit competition within the EU but it potentially increases competition on the market for cloud infrastructure providers.

Establishing an EuLCI is not a straightforward task even it were approved by regulators. The consortium behind the EuLCI has to move quick to overcome the chicken-egg problem that is inherent to digital platforms (Caillaud & Jullien, 2003; Evans & Schmalensee, 2010); that is, until it has consumers as users it will not have corporations engaged, and until it has corporations engaged it will not have consumers as users. However, disagreements and the search for consensus in a consortium with actors from different EU member states and vested political interests can slow down the progress. For example, the Airbus consortium experienced drawbacks even before it was officially funded when the British government withdrew funding in 1969 over doubts of the first airplane's market potential (Schumacher, 1979). In the digital economy, consumers are used to rapid progress and the availability of new features in ever shorter intervals, making it crucial for the EuLCI consortium to overcome internal challenges quickly.

Once an EuLCI has been established and shown first promising growth, other companies—in particular those that the EuLCI set out to compete with—might try to acquire the EuLCI or companies involved in the consortium. In such a situation, the European Commission could intervene through its Merger Control procedures (European Commission, 2010), which can be applied to prevent mergers that harm competition on EU's internal market. The acquisition of the single EuLCI by an existing American platform giant would most certainly harm competition, based on the same reasoning that explains why cooperation within the EuLCI's consortium increases competition.

Justifying the creation of a single EuLCI

Current competition law encourages competing firms to compete broadly, and prohibits them cooperation that looks like collaboration and restraint of trade. However, we argue that a single EuLCI is justified in terms of providing better consumer choice.

Some innovations are strategic necessities, in that all firms must have them, but no firm gains competitive advantage from having them (Clemons & Row, 1988). Only those who don't have them suffer dramatically and may disappear (Clemons & Row; Rowe, 1994). In that case, the best way for firms to gain the necessary capability is with shared development, and potentially shared operation and shared ownership. For instance, the Philadelphia National Bank introduced a shared ATM network (MAC) in 1979, as a response to the first ATMs introduced in Philadelphia in the 70s. ATMs soon became a strategic necessity and a shared ATM network helped the network members to gain this capability (Clemons, 1990; Clemons & Knez, 1988).

Clemons and Knez (1988) lay out a set of distinct possibilities for when a single company is best suited to develop an essential service and when it is best done by a consortium. If executives believe they can gain competitive advantage within their industry by acting early and independently, they should do so and should build the necessary capability on their own. It is clear that no single European company can create an LCI that would compete effectively against one of the dominant American platforms. Also, new LCIs would represent late entries compared to the established LCIs.

If executives believe that functionality is essential, but that there is no competitive advantage available to anyone, and they believe that they have a temporary advantage in development costs, they should develop a system and immediately lease services to competitors within their industry. It is clear that no single European company has the expertise needed to design an LCI for all European companies, in all European industries, that would be able to compete effectively against one of the dominant American platforms.

If executives believe that functionality is essential, but that there is no competitive advantage available to anyone, they should cooperate on shared development, to achieve the lowest possible operating expense.

The above arguments suggest that the only feasible way to develop an effective ECLI is through widespread

cooperation. We believe that there are four reasons why regulators should not only permit this but should facilitate it:

- All firms will enable consumers to access them through an LCI. This is a strategic necessity. Firms that cannot afford to work through an existing LCI would fail without a safer and less expensive alternative, reducing competition and reducing consumers' choices. An EuLCI will allow more firms to survive.
- Existence of a single EuLCI will not reduce innovation or choices available to consumers. No individual European grocery chain or appliance manufacturer is going to develop a better LCI than those provided by the current platforms, and this is not how retailers or manufacturers compete. Traditional firms compete through better offerings, better products and services, and through better prices.
- Existence of a single EuLCI will increase innovation and choices available to consumers. The EuLCI will allow more firms to survive, forcing them to compete. It will reduce the operating expenses of these firms, enabling them to compete more aggressively on price as well.
- A single pan-European EuLCI will be subject to European regulation. A European EuLCI would be more consistent with intangible European objectives as well, such as respect for privacy and equal treatment of all users, both individuals and corporations.

Again, we are faced with the *Cooperation Paradox*. Allowing cooperation among firms to develop an LCI will enhance firms' ability to offer services at lowest cost, with less interference from the platforms that currently operate LCIs. But since all firms are going to be reachable through an LCI, the shared development, ownership, and operation of an LCI will not reduce competition among firms or the goods and services available to EU consumers.

Conclusions

We anticipate that European firms in a wide range of industries will be subject to the economic power of unregulated American LCIs, which as MP3PPs have extraordinary abilities to impose additional expenses when the firms need to access their customers, or even to deny some firms access to their customers at any price (Clemons, 2019b; Schreieck et al., 2019). This is true both for high tech firms and traditional retailers. To free these European firms from coming digital domination, we argue that a consortium offering an EuLCI is needed and should actively be encouraged and supported by European regulators. An EuLCI would protect European firms from the costs of monopoly domination and European consumers from the costs of monopoly domination that are passed through to them by the firms.

The EuLCI would provide an alternative to the dominant LCIs provided by US companies such as Google and Amazon. The EuLCI should be available to all European firms equally, unlike existing LCIs, which provide superior service to their own subsidiaries, or to firms that can afford to pay the most for access to consumers. The EuLCI should provide the full set of capabilities that consumers demand, and that consumers have come to expect from the dominant LCIs, such as easy access to digital content and easy online shopping. As we have discussed, to make the EuLCI a viable alternative to the dominant LCIs, it has to be initiated by a pan-industry coalition. It needs to be able to provide the wide scope consumers expect from Alexa and Google Nest. And it needs to have enough power to force American platforms to share the data that are essential for the functioning of any effective LCI.

There are several potential obstacles that could block establishment of an EuLCI through a pan-industry consortium. First, EU regulations against the restraint of trade might inhibit the formation of such a consortium. A consortium is only possible if firms are allowed to cooperate to produce a single software interface. This looks like traditional anticompetitive collusion and like restraint of trade because it is designed to ensure that European firms develop only a single product for this vital category. Thus, regulatory resistance is to be expected based on the current regulatory setting. Second, an EuLCI could also lead to objections at the WTO by the United States. Depending on how the initiative of an EuLCI is financed, it might receive government support. In any case, the European governments and the European Commission would endorse actions taken to restrict the behavior of American firms. Both aspects will strengthen the United States' case in front of the WTO. Third, the consumers' inertia and the ease of staying with their existing LCIs poses a difficulty for establishing an EuLCI. Consumers believe that they have everything they need when using the currently dominant LCIs, although they may see less than the complete set of alternatives available at any time. They might not be aware of any harm that the monopoly dominance causes to European firms, or they might value the convenience of an LCI enough that they do not care about any harm this may cause to European firms. Thus, from a consumer's point of view, the most convenient thing to do is to continue to use and be dependent upon, for instance, Alexa, Nest, and Siri.

If these obstacles can be overcome, an EuLCI would yield significant advantages for European firms and consumers. European firms would be freed from the domination by LCIs that restrict their access to consumers or that demand payment for access to consumers. European consumers will benefit from better access to goods and services from European manufacturers at lower prices. Furthermore, a wider choice would be available to consumers given that, for instance,

they will not need to consider whether their choicer of a new car is consistent with and compatible with their choice of mobile phone provider.

Our discussion of LCIs and a EuLCI is subject to limitations that yield opportunities for future research. First, we have not yet conducted widespread survey research to assess the extent to which EU executives are aware of the threats posed to them by the current dominant LCIs. Our initial informal surveys suggested that executives shared a moderate level of awareness of such threats (Clemons et al., 2019; Hermes, Clemons, Schreieck, et al., 2020), but it is necessary to augment that work with more recent and more comprehensive surveys. Second, we have not yet conducted widespread survey research to assess the extent to which EU executives believe that a cooperative response would be successful, or indeed the extent to which they believe that any European response would be effective. Our initial informal surveys suggested that executives shared only a low level of confidence that it would be possible to develop an effective response (Clemons et al., 2019; Hermes, Clemons, Schreieck, et al., 2020), but again it is necessary to augment that work with more recent and more comprehensive surveys. Third, we have not yet discussed this research with EU regulators. We therefore do not yet know the extent to which regulators understand the threat represented by LCIs. Additionally, since we do not know the extent to which they are aware of the threats, we do not yet know the extent to which they would be willing to endorse or even encourage extraordinary levels of cooperation among firms in order to develop an effective response. We intend to discuss our findings with regulators once we have a deeper level of understanding of support for our work among European executives.

With regard to future research, we suggest that further domains of the digital economy could warrant European cooperation. For example, in the domain of artificial intelligence, American firms have accumulated an advantage compared to European companies, mostly as a result of the enormous data sets that the American tech companies already have. These data sets allow the firms to more easily develop and train artificial intelligence solutions. Even more importantly, they are more able to profit directly by using AI applications to exploit the patterns hidden in their existing data sets. By collaborating and sharing data, European companies could catch up to their competitors. Such a collaboration already has potential ethical components, for instance, when artificial intelligence improves public health, responds more rapidly to changing pandemic risks, or helps to avoid accidents in self-driving cars through improved object recognition.

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References

Aalst, W. V. D., Hinz, O., & Weinhardt, C. (2019). Big Digital Platforms. *Business & Information Systems Engineering, 61*(6), 645–648. https://doi.org/10.1007/s12599-019-00618-y.

Baumol, W. J., Panzar, J. C., & Willig, R. D. (1983). Contestable markets: An uprising in the theory of industry structure: Reply. *The American Economic Review, 73*(3), 491–496.

Bourreau, M., Caillaud, B., & Nijs, R. D. (2018). Taxation of a digital monopoly platform. *Journal of Public Economic Theory, 20*(1), 40–51. https://doi.org/10.1111/jpet.12255.

Braud, A., Fromentoux, G., Radier, B., & Le Grand, O. (2021). The road to European digital sovereignty with Gaia-X and IDSA. *IEEE Network, 35*(2), 4–5. https://doi.org/10.1109/MNET.2021.9387709.

Cadwalladr, C. (2017). *The great British Brexit robbery: How our democracy was hijacked*. The Guardian (February 4, 2021). https://www.theguardian.com/technology/2017/may/07/the-great-british-brexit-robbery-hijacked-democracy.

Caillaud, B., & Jullien, B. (2003). Chicken & egg: Competition among intermediation service providers. *The Rand Journal of Economics, 34*, 309–328.

Ciriani, S., & Lebourges, M. (2018). The market dominance of US digital platforms: antitrust implications for the European Union. *Available at SSRN 2977933*.

Clemons, E. K. (1990). MAC — Philadelphia National Bank ' s strategic venture in shared ATM networks. *Journal of Management Information Systems, 7*(1), 5–25. https://doi.org/10.1080/07421222.1990.11517878.

Clemons, E. K. (2015). *Selbstschutz ist nicht gleich Protektionismus (self-protection is not protectionism)*. Huffington Post Deutschland. http://www.huffingtonpost.de/eric-k-clemons/eu-datenschutzrechtswidrige-unternehmenspraktiken_b_8490876.html, accessed on February 4, 2021.

Clemons, E. K. (2019a). The continuing power of third party payer businesses. In E. K. Clemons (Ed.), *New patterns of power and profit: A Strategist's guide to competitive advantage in the age of digital transformation* (pp. 125–134). Springer Nature, Cham, Switzerland.

Clemons, E. K. (2019b). *New patterns of power and profit: A Strategist's guide to competitive advantage in the age of digital transformation*. Springer Nature, Cham, Switzerland.

Clemons, E. K. (2019c). Resources, platforms, and sustainable competitive advantage: How to win and keep on winning. In E. K. Clemons (Ed.), *New patterns of power and profit: A Strategist's guide to competitive advantage in the age of digital transformation* (pp. 93–104). Springer Nature, Cham, Switzerland.

Clemons, E. K. (2019d). Understanding the power of third party payer businesses and online gateways. In E. K. Clemons (Ed.), *New*

patterns of power and profit: A Strategist's guide to competitive advantage in the age of digital transformation (pp. 105–124). Springer Nature, Cham, Switzerland.

Clemons, E. K., & Kleindorfer, P. R. (1992). An economic analysis of interorganizational information technology. *Decision Support Systems, 8*(5), 431–446. https://doi.org/10.1016/0167-9236(92)90027-M.

Clemons, E. K., & Knez, M. (1988). Competition and cooperation in information systems innovation. *Information & Management, 15*(1), 25–35. https://doi.org/10.1016/0378-7206(88)90027-4.

Clemons, E. K., Krcmar, H., Hermes, S., & Choi, J. (2019). American domination of the net: A preliminary ethnographic exploration of causes, economic implications for Europe, and future prospects. *52nd Hawaii International Conference on System Sciences.*

Clemons, E. K., & Madhani, N. (2010). Regulation of digital businesses with natural monopolies or third-party payment business models: Antitrust lessons from the analysis of Google. *Journal of Management Information Systems, 27*(3), 43–80. https://doi.org/10.2753/MIS0742-1222270303.

Clemons, E. K., & Madhani, N. (2011). *Why is there still litigation in third party payer distribution systems in air travel*. Huffington Post. https://www.huffpost.com/entry/why-is-there-still-litiga_b_887252, accessed on February 4, 2021.

Clemons, E. K., & Row, M. (1988). McKesson drug company : A case study of Economost — A strategic information system. *Journal of Management Information Systems, 5*(1), 36–50. https://doi.org/10.1080/07421222.1988.11517815.

Clemons, E. K., & Row, M. C. (1991). Sustaining IT advantage: The role of structural differences. *MIS Quarterly, 15*(3), 275–292. https://doi.org/10.2307/249639.

Clemons, E. K., & Wilson, J. (2016). Modeling competition in mandatory participation third party payer business models: The complex case of sponsored search. *49th Hawaii International Conference on System Sciences*.

Collin, P., & Colin, N. (2013). *Mission d'expertise sur la fiscalité de l'économie numérique*. French Ministry of Finance and Economy report.

Copeland, D. G., & McKenney, J. L. (1988). Airline reservations systems: Lessons from history. *MIS Quarterly, 12*(3), 353–370. https://doi.org/10.2307/249202.

Dawar, N. (2018). *Marketing in the age of Alexa*. Harvard Business Review.

Eisenmann, T., Parker, G., & Van Alstyne, M. (2011). Platform envelopment. *Strategic Management Journal, 32*(12), 1270–1285. https://doi.org/10.1002/smj.935.

European Commission. (2010). *EU competition law - Rules applicable to merger control: situation as at 1 April 2010* (Competition Handbooks).

European Commission. (2017a). *Antitrust: Commission fines Google €2.42 billion for abusing dominance as search engine by giving illegal advantage to own comparison shopping service*. http://europa.eu/rapid/press-release_IP-17-1784_en.htm, accessed on February 4, 2021.

European Commission. (2017b). *Mergers: Commission fines Facebook €110 million for providing misleading information about WhatsApp takeover*. https://ec.europa.eu/commission/presscorner/detail/en/IP_17_1369, accessed on February 4, 2021.

European Commission. (2018). *Antitrust: Commission fines Google €4.34 billion for illegal practices regarding Android mobile devices to strengthen dominance of Google's search engine*. http://europa.eu/rapid/press-release_IP-18-4581_en.htm, accessed on February 4, 2021.

European Commission. (2021). *Preliminary report - sector inquiry into consumer internet of things*. https://ec.europa.eu/competition-policy/system/files/2021-06/internet_of_things_preliminary_report.pdf.

Evans, D. S., & Schmalensee, R. (2010). Failure to launch: Critical mass in platform businesses. *Review of Network Economics, 9*(4), 1–28.

Evrard, S. J. (2003). Essential facilities in the European Union: Bronner and beyond. *Columbia Journal of East European Law, 10*, 491.

Federal Ministry for Economic Affairs and Energy. (2021). *GAIA-X: A federated data infrastructure for europe*. https://www.data-infrastructure.eu/GAIAX/Navigation/EN/Home/home.html, accessed on April 7, 2021.

Green, A. (2021). *Europe's Gaia-X looks to challenge Big Tech's cloud dominance.* Financial Times. https://www.ft.com/content/6ac505fd-5b90-4979-8c3c-b5ba756e9089, accessed on September 18, 2021.

Gubbi, J., Buyya, R., Marusic, S., & Palaniswami, M. (2013). Internet of things (IoT): A vision, architectural elements, and future directions. *Future Generation Computer Systems, 29*(7), 1645–1660. https://doi.org/10.1016/j.future.2013.01.010.

Hermes, S., Clemons, E. E., Schreieck, M., Pfab, S., Mitre, M., Böhm, M., Wiesche, M., & Krcmar, H. (2020). Breeding grounds of digital platforms: Exploring the sources of American platform domination, China's platform self-sufficiency, and Europe's platform gap. *28th European Conference on Information Systems*.

Hermes, S., Clemons, E. K., Wittenzellner, D., Hein, A., Böhm, M., & Krcmar, H. (2020). Consumer attitudes towards firms that monetize personal information: A cluster analysis and regulatory implications. *24th Pacific Asia Conference on Information Systems.*

Horowitz, J. (2018). *Steve Bannon's 'movement' enlists Italy's Most powerful politician*. The New York Times https://www.nytimes.com/2018/09/07/world/europe/italy-steve-bannon-matteo-salvini.html, accessed on September 16, 2021.

Kang, W. M., Moon, S. Y., & Park, J. H. (2017). An enhanced security framework for home appliances in smart home. *Human-centric Computing and Information Sciences, 7*(1), 1–12. https://doi.org/10.1186/s13673-017-0087-4.

Korreck, S. (2021). *Exploring prospects for digital Europe in the age of the US-China technology race* (p. 303). Observer Research Foundation - Occasional Paper.

Krämer, J. (2021). Personal data portability in the platform economy: Economic implications and policy recommendations. *Journal of Competition Law and Economics, 17*(2), 263–308. https://doi.org/10.1093/joclec/nhaa030.

Kreps, D., Rowe, F., & Muirhead, J. (2020). Understanding digital events: Process philosophy and causal autonomy. *53rd Hawaii International Conference on System Sciences.*

Massie, G. (2021). *A timeline to insurrection: The trump tweets that security experts say led to the capitol riots*. Independent https://www.independent.co.uk/news/world/americas/us-election-2020/trump-tweets-attacks-capitol-violence-b1786246.html, accessed on February 18, 2021.

McCraw, T. K. (2009). *Prophets of regulation*. Harvard University Press.

Moore, M., & Tambini, D. (2018). *Digital dominance: The power of Google, Amazon, Facebook, and Apple*. Oxford University Press.

Nadler, J., & Cicilline, D. N. (2020). *Investigation of competition in digital markets (majority staff reports and recommendations, subcommittee on antitrust)*. Commercial and Administrative Law of the Commitee on the Judiciary.

Naughton, J. (2018). *Social media is an existential threat to our idea of democracy*. The Guardian. Retrieved Janaury 13, 2021, from https://www.theguardian.com/commentisfree/2018/dec/23/social-media-existential-threat-idea-democracy.

Neate, R. (2019). *New study deems Amazon worst for 'aggressive' tax avoidance*. The Guardian. https://www.theguardian.com/business/2019/dec/02/new-study-deems-amazon-worst-for-aggressive-tax-avoidance, accessed on February 8, 2021.

Neven, D., & Seabright, P. (1995). European industrial policy: The Airbus case. *Economic Policy, 10*(21), 313–358. https://doi.org/10.2307/1344592.

OECD Policy Roundtable. (1996). *The essential facilities concept*. Organisation for economic cooperation and development.

Parker, G. G., Van Alstyne, M. W., & Choudary, S. P. (2016). *Platform revolution: How networked markets are transforming the economy and how to make them work for you*. WW Norton & Company., New York, USA.

Pauli, T., Fielt, E., & Matzner, M. (2021). Digital Industrial Platforms. *Business & Information Systems Engineering,* 63(2), 181–190. https://doi.org/10.1007/s12599-020-00681-w.

Petropoulos, G. (2021). A European Union approach to regulating big tech. *Communications of the ACM, 64*(8), 24–26. https://doi.org/10.1145/3469104.

Rochet, J.-C., & Tirole, J. (2003). *Platform competition in two-sided markets*. European Economic Association.

Rowe, F. (1994). Data network productivity and competitive behavior: The case of the French commercial banks. *Technological Forecasting and Social Change, 46*, 29–44. https://doi.org/10.1016/0040-1625(94)90015-9.

Roy, A., Das, S. K., & Basu, K. (2007). A predictive framework for location-aware resource management in smart homes. *IEEE Transactions on Mobile Computing, 6*(11), 1270–1283. https://doi.org/10.1109/TMC.2007.1058.

Saad Al-Sumaiti, A., Ahmed, M. H., & Salama, M. M. (2014). Smart home activities: A literature review. *Electric Power Components & Systems, 42*(3–4), 294–305. https://doi.org/10.1080/15325008.2013.832439.

Schreieck, M., Clemons, E. K., Wiesche, M., & Krcmar, H. (2019). Competing with giant platform operators: an analysis of which traditional manufacturing companies are at risk from strategic dependence on other companies' platforms in the emerging era of the internet of things. *Platform Strategy Research Symposium.*

Schumacher, H. H. (1979). Europe's Airbus programme and the impact of British participation. *The World Today, 35*(8), 332–339.

Soliman, M., Abiodun, T., Hamouda, T., Zhou, J., & Lung, C.-H. (2013). Smart home: Integrating internet of things with web services and cloud computing. *IEEE 5th International Conference on Cloud Computing Technology and Science.*

Soriano, S. (2019). Taking aim at big tech. *Intermedia, 47*(2), 10–15.

Statcounter GlobalStats. (2020). *Search Engine Market Share Europe*. Statcounter GlobalStats. https://gs.statcounter.com/search-engine-market-share/all/europe, accessed on February 1, 2021.

Statista. (2020). *Amazon's share of online retail sales in selected regions as of September 2020*. https://www.statista.com/statistics/1183515/amazon-market-share-region-worldwide/, accessed on February 4, 2021.

Statista Research Department. (2021a). *Digital Advertising*. https://www-statista-com.eaccess.ub.tum.de/outlook/216/156/digital-advertising/united-kingdom, accessed on February 2, 2021.

Statista Research Department. (2021b). *Digital search advertising revenue in selected countries in Europe in 2020*. Statista https://www-statista-com.eaccess.ub.tum.de/statistics/463223/digital-search-advertising-revenue-european-countries-digital-market-outlook/, accessed on February 2, 2021.

Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy*, 67–88. https://doi.org/10.1016/0048-7333(86)90027-2.

Teece, D. J. (2013). Profiting from innovation. In E. H. Kessler (Ed.), *Encyclopedia of management theory* (pp. 622–625). SAGE Publications, Inc., Thousand Oaks, CA, USA.

Thierer, A. D. (1994). Unnatural monopoly: Critical moments in the development of the bell system monopoly. *Cato Journal, 14*, 267.

Valdez, J. (2018). *How Amazon's Alexa chooses which products to buy*. AMZ Advisers https://amzadvisers.com/amazons-alexa-chooses-products-buy/, accessed on February 23, 2021.

Weiss, N., Schreieck, M., Wiesche, M., & Krcmar, H. (2020). From Product to Platform: How can BMW compete with Platform Giants? *Journal of Information Technology Teaching Cases*, 11(2), 90–100.

Werden, G. J. (1987). The law and economics of the essential facility doctrine. *Saint Louis University Law Journal, 32*, 433.

White, D. (2018). *Threat to retailers as 'Amazon effect' delivers market share to online giants*. Independent https://www.independent.ie/business/irish/threat-to-retailers-as-amazon-effect-delivers-market-share-to-online-giants-37067245.html, accessed on February 9, 2021.

Wu, T. (2010). *The master switch: The rise and fall of information empires*., New York, USA.

Wylie, C. (2019). *Mindf* ck: Cambridge analytica and the plot to break America*. New York, USA.

Zhu, F. (2019). *When tech companies compete on their own platforms*. Harvard Business Review https://hbr.org/2019/06/when-tech-companies-compete-on-their-own-platforms.

Zuboff, S. (2015). Big other: Surveillance capitalism and the prospects of an information civilization. *Journal of Information Technology, 30*(1), 75–89. https://doi.org/10.1057/jit.2015.5.

Zuboff, S. (2020). *You are now remotely controlled*. New York Times https://www.nytimes.com/2020/01/24/opinion/sunday/surveillance-capitalism.html, accessed on February 12, 2021.