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We Need to Talk About Data: How Digital Monopolies Arise and Why They Have Power and Influence

Daniel McIntosh

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WE NEED TO TALK ABOUT DATA: HOW DIGITAL MONOPOLIES ARISE AND WHY THEY HAVE POWER AND INFLUENCE

Daniel McIntosh

Abstract

Over the last 10 years, while we have seen the emergence of digital technologies able to improve human welfare, we have also seen the unparalleled concentration of that technology into the hands of a few global behemoths such as Microsoft, Google, Amazon, Facebook, and Apple (Big Tech). However, we would be wise to tame this runaway concentration of power in Big Tech; the recent revelations about the role that Facebook data played in the United States presidential election provides a stark illustration as to why.

This Article will analyze how and why the monopolization of digital technology occurred. In particular, this Article examines the role of intangible property, such as data and intellectual property, as well as the phenomenon known as the “network effect.” Intellectual property has been suspected of driving the monopolization of digital platforms. However, intellectual property is normally an afterthought and does little to prevent competition with the core business of Big Tech companies. Rather, what allows these companies to monopolize their business is the network effect acting on data in a positive feedback loop.

Dealing with the problems of a network effected market has always been difficult. In the past, competition regulations were the go-to tools. However, such regulations have so far proven largely ineffective because data does not fit squarely into traditional economic models. The other traditional alternative was consumer law. Even though we will soon see the implementation of stricter data protection laws with the introduction of the GDPR in Europe, its primary focus is on individual privacy, not monopolized power.

This Article will argue that the reason for the ineffectiveness of laws to deal with some of the harmful effects of Big Tech monopolies is that there is something about monopolies on data that is inherently different from other more benign goods or services. Data is information. It is this distinctive characteristic of data that has implicated Big Tech monopolization across such a broad range of fields, including personal privacy, democracy, security, innovation stifling, hacking, political influence, and media. So, while re-imagined competition and consumer regulations may work to prevent inflated prices and Draconian privacy policies, they will not address the more pressing problems of Big Tech monopolies on data.

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INTRODUCTION

The digital age is here and its benefits offer a tantalizing glimpse of its promise to democratize institutions and provide increased access to information, tools, and power for all.¹ At its loftiest, the digital age may even empower the most underprivileged. But will we witness a revolution that tears down established institutions, or will we witness the introduction of a new technology that, like others before it, is ultimately controlled by an elite few?

1. KAREN MOSSBERGER ET AL., DIGITAL CITIZENSHIP: THE INTERNET, SOCIETY, AND PARTICIPATION (2008); Dirk Helbing & Evangelos Pourmaras, *Build Digital Democracy*, 527 NATURE 33 (2015).

Digital technology has provided universal and widespread empowerment in an extremely short amount of time, a phenomenon that has not occurred arguably since the invention of the printing press.² The Organisation for Economic Co-operation and Development (OECD) recently described digital technology as having “as much importance as electricity, water, [and] highways.”³ A 2012 World Bank report on international development said that “[m]obile communication has arguably had a bigger impact on humankind in a shorter period of time than any other invention in human history.”⁴ For example, a middle class African in Kenya has access to the same iPhone owned and used by tech billionaire Elon Musk.⁵

It would not be an overstatement to say that digital technology has the power to solve, or at least substantially ameliorate, the current challenges we face. Such challenges include the environment, gender inequality,⁶ institutionalized tyranny, disease, and inequitable civil participation.⁷ To ensure digital technology reaches its potential, we must push and pull the appropriate levers.

At the birth of digital technology in the nineties, there was great excitement about the internet and its ability to free people. It would be democratic and open. However, this rosy optimism was perhaps a little premature. Now, in 2019, we are in the midst of an era in which large technology companies penetrate and influence the citizenry in ways not previously possible for private enterprises.

The top five most valuable companies in the world are no longer real estate owners or oil companies, but the Big Tech companies: Apple,

2. In Africa, mobile telephone usage went from two percent in 2000 to around ninety percent in 2014. Muriithi Mutiga & Zoe Flood, *Africa Calling: Mobile Phone Revolution to Transform Democracies*, GUARDIAN (Aug. 8, 2016, 2:00 PM), www.theguardian.com/world/2016/aug/08/africa-calling-mobile-phone-broadband-revolution-transform-democracies.

3. Org. for Econ. Co-Operation and Dev. [OECD], *Big Data: Bringing Competition Policy to the Digital Era: Note by Annabelle Gawer*, at 15, DAF/COMP/WD(2016)74 (Dec. 16, 2016) [hereinafter *Gawer Note*], [https://one.oecd.org/document/DAF/COMP/WD\(2016\)74/en/pdf](https://one.oecd.org/document/DAF/COMP/WD(2016)74/en/pdf).

4. WORLD BANK, INFORMATION AND COMMUNICATIONS FOR DEVELOPMENT 2012: MAXIMIZING MOBILE 11 (2012).

5. *Cell Phones in Africa: Communication Lifeline*, PEW RESEARCH CTR. (Apr. 15, 2015), www.pewglobal.org/2015/04/15/cell-phones-in-africa-communication-lifeline.

6. Those working in international development continually explain that the best way to end poverty is the education of women. Surely digital technology is the greatest tool for doing so in countries where cultural norms and dogma make it difficult. See, e.g., Ana Revenga & Sudhir Shetty, *Empowering Women Is Smart Economics*, FIN. & DEV., Mar. 2012, at 40.

7. MARTA POBLET & ENRIC PLAZA, DEMOCRACY MODELS AND CIVIC TECHNOLOGIES: TENSIONS, TRILEMMAS, AND TRADE-OFFS (2017), https://www.researchgate.net/publication/317164590_Democracy_Models_and_Civic_Technologies_Tensions_Trilemmas_and_Trade-offs.

Alphabet,⁸ Microsoft, Amazon, and Facebook.⁹ In just the first quarter of last year, these five companies amassed \$25 billion USD in profits.¹⁰ Only fifteen years ago, Facebook did not exist, Google had only a loyal following,¹¹ and Amazon was just selling a few books.

There is now a widespread feeling, both in the public and in the mainstream press, that Big Tech has too much power over many aspects of our lives.¹² The recent revelations about the role that Facebook data played in the United States presidential election provides one disturbing example of the platforms.¹³ Google has been able to monopolize information in other ways, placing itself in prime position to capitalize on future innovation, especially in the field of artificial intelligence (AI).¹⁴ Most of the concerned discussion has centered around the various manifestations of data monopolization, such as data privacy, media influence, and lack of consumer choices. However, few have been able to tease out precisely what it is that provides Big Tech with its power and influence.

This Article will analyze how and why the monopolization of digital technology has occurred. Part I examines the possible driving factors in the monopolization of digital technologies, focusing in particular on the contribution of intangible property, such as data and intellectual property, and the phenomenon known as the network effect. It is the network effect

8. Alphabet Inc. is Google's parent company.

9. As of March 2017, the market capitalization in USD are: (1) Apple: \$754 billion; (2) Google: \$579 billion; (3) Microsoft: \$509 billion; (4) Amazon: \$423 billion; and (5) Facebook: \$411 billion. PWC, GLOBAL TOP 100 COMPANIES BY MARKET CAPITALIZATION 32 (2017), <https://www.pwc.com/gx/en/audit-services/assets/pdf/global-top-100-companies-2017-final.pdf>. See also, *The World's Largest Public Companies*, FORBES, www.forbes.com/global-2000/list/#header:marketValue_sortreverse:true (last visited Aug. 16, 2019).

10. *The World's Most Valuable Resource Is No Longer Oil, But Data*, ECONOMIST, May 6, 2017, at 9, <https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data>.

11. Lucy Hooker, *How Did Google Become the World's Most Valuable Company?*, BBC NEWS (Feb. 1, 2016), <https://www.bbc.com/news/business-35460398>.

12. See, e.g., Xavier Rizos, *The Age of Internet Empires*, ABC NEWS (Dec. 19, 2013, 5:21 PM), <https://www.abc.net.au/news/2013-12-20/rizos-the-age-of-internet-empires/5168818> ("[T]he internet has shifted from the free innovative market people still imagine towards a juxtaposition of private empires . . ."); Robert B. Reich, Opinion, *Big Tech Has Become Way Too Powerful*, N.Y. TIMES (Sept. 18, 2015), <https://www.nytimes.com/2015/09/20/opinion/is-big-tech-too-powerful-ask-google.html>.

13. See David Folkenflik, *Facebook Scrutinized Over Its Role in 2016's Presidential Election*, NPR (Sept. 26, 2017, 4:59 AM), <https://www.npr.org/2017/09/26/553661942/facebook-scrutinized-over-its-role-in-2016s-presidential-election>.

14. Robert Wright, *Google Must Be Stopped Before It Becomes an AI Monopoly*, WIRED (Feb. 23, 2018, 8:00 AM), <https://www.wired.com/story/google-artificial-intelligence-monopoly/>.

that has provided Big Tech companies with their monopolies by acting on data in such a way as to create a data-opoly.

Part II discusses the current legal measures being utilized to combat such monopolization. While the two primary streams of law—consumer and competition law—are showing some positive progress in addressing problems associated with data monopolization, especially in the European Union (EU), they continue to focus on the symptoms rather than the causes of monopolization. This Article argues that the difficulty in dealing with data monopolies is likely due to the nature of data itself. As explained in Part III, it is the subject matter of the monopoly—big data, with its myriad of applications—that is the core of the power and influence of companies such as Google, Facebook, and Amazon. Part IV presents some solutions, the most promising being the use of digital technology itself, namely blockchain technology, to solve the problem of the monopolization of big data.

I. THE DRIVERS OF MONOPOLIZATION

A. *Intellectual Property*

Any analysis of the monopoly power of companies that work largely with intangible products¹⁵ requires an investigation of intellectual property—the legal demarcator of ownership of intangibles.¹⁶ Intellectual property is undoubtedly an imperative for tech companies, evidenced by the number and value of patents they own.¹⁷ However, of the monopolies

15. Google is not a product you can buy and put into your hands, Facebook is not a plumber fixing your toilet, and Amazon is not a shop whose shelves you can peruse. Tangible property, such as a bicycle or real estate, is physically exclusive. The owner (or user) of a bike will use it to the exclusion of all others as it cannot be used by others at the same time. Intangible property never finds itself in such a conundrum. This crucial difference is the reasoning behind the legal protection for intellectual property.

16. James Eyers, *Facing Up to the IP Tsunami*, AUSTL. FIN. REV., Aug. 11, 2009, at 61, https://www.wipo.int/export/sites/www/about-wipo/en/dgo/interviews/pdf/gurry_afr_09.pdf (explaining that intellectual property is set to become the basis of competition in the future); see also Manoj P. Dandekar, Managing Director, Enter. Econ. Evaluation, Presentation at the Society of Depreciation Professionals Annual Conference: Valuation of Intangible Assets and Intellectual Property (Sept. 11, 2017), https://c.yimcdn.com/sites/www.depr.org/resource/resmgr/2017_Conference/2017Presentations/MDandekarValuationIntangible.pdf (explaining that the definition of the intellectual property sets its boundaries and limits, that the boundaries represent the scope of the commercial intangible assets, and that—generally—the value and power of some companies should be evaluated based on the value of these intangible assets).

17. The key role intellectual property plays in digital technology can be evidenced by the number and value of patents owned by companies in digital technology. In the mid-1990s, the United States courts opened the door to allow software patents. By the end of the '90s, there were 20,000 software patents per year being granted in the United States. By 2013, that figure had tripled to 68,000 software patents. See James E. Bessen, *A Generation of Software Patents*, 18

that have presented themselves on the digital landscape, few trace their initial establishment to intellectual property. It is only after a company's rise to dominance and wealth that it seeks to bolster its position with intellectual property rights. For example, Microsoft had only five patents in its first fifteen years, while now—as a billion-dollar company—it applies for 2,000 patents annually.¹⁸ Similarly, Google's surprising \$12.5 billion purchase of Motorola—a stagnant company at the time—was largely considered to be motivated by the latter's 17,000 patents.¹⁹

Although these extensive intellectual property portfolios may inhibit competition,²⁰ they tend not to cover the core of a Big Tech monopoly's business. Take Facebook as an example. While it was arguably innovative in its initial concept in 2004,²¹ the core of Facebook's business today is scarcely protected by intellectual property apart from the trademark on its name. Facebook's website is not covered by any significant patents and its functionality could be re-coded over the course of a weekend by a group of Finnish teenagers.²² Even the appearance of

B.U. J. SCI. & TECH. L. 241, 253 (2012). Their wealth is also largely intangible. While more traditional large companies like McDonald's and Exxon may have had incredible wealth in land or machinery, the Big Tech companies are asset poor by comparison, clearly preferring intangible property. For example, in 2016, Apple had \$20 billion in cash, \$216 billion invested, and only \$27 billion in property, plants, and equipment. *Apple Company Financials*, NASDAQ, www.nasdaq.com/symbol/aapl/financials?query=balance-sheet (last visited Feb. 20, 2019). Indeed, Apple does not even care to own its factories. See Malcolm Moore, *Why Apple Can't Control Its Chinese Factories*, TELEGRAPH (Mar. 5, 2010, 7:27 AM), <https://www.telegraph.co.uk/technology/apple/7375684/Why-Apple-cant-control-its-Chinese-factories.html>.

18. Issie Lapowsky, *EFF: If You Want to Fix Software Patents, Eliminate Software Patents*, WIRED (Feb. 25, 2015, 9:00 PM), <https://www.wired.com/2015/02/eff-eliminate-software-patents/>.

19. Amir Efrati & Spencer E. Ante, *Google's \$12.5 Billion Gamble*, WALL ST. J. (Aug. 16, 2011), <https://www.wsj.com/articles/SB10001424053111903392904576509953821437960>; see also Brian Womack & Zachary Tracer, *Google Agrees to Acquire Motorola Mobility for \$12.5 Billion*, BLOOMBERG (Aug. 15, 2011, 4:48 PM), <https://www.bloomberg.com/news/articles/2011-08-15/google-agrees-to-acquisition-of-motorola-mobility-for-about-12-5-billion>.

20. Many commentators have pointed out that intellectual property is not particularly well-suited to encouraging innovation in the field of digital technology because unlike other fields such as pharmaceuticals, where the process of innovation is “long, risky and expensive,” it seems all you need to start a software company is a computer and, of course, a garage. See Steve Brachmann, *How Tech's Ruling Class Stifles Innovation with Efficient Infringement*, IPWATCHDOG (Mar. 17, 2017), <https://www.ipwatchdog.com/2017/03/17/tech-ruling-class-stifles-innovation-efficient-infringement/id=79391/>.

21. Sarah Phillips, *A Brief History*, GUARDIAN (July 25, 2007, 5:29 AM), <https://www.theguardian.com/technology/2007/jul/25/media.newmedia>.

22. Ravi Kumar, *How to Create Your Own Website like Facebook for Free?*, GET EVERYTHING, www.geteverything.org/how-to-create-your-own-website-like-facebook-for-free/ (last updated Oct. 20, 2017).

the website could, within limits, be copied without breaching the company's intellectual property.²³

Google finds itself in a similar situation. Google's initial PageRank²⁴ technology—developed by Larry Page and Sergey Brin as part of a Ph.D. project at Stanford University—was groundbreaking at the time and was rightly granted a patent.²⁵ Despite the impending expiration of the PageRank patent and the existence of superior search algorithms that competitors have already invented, however, nobody is questioning whether Google's search engine, which accounts for 85% of Google's \$136.2 billion USD revenue through advertising,²⁶ is under imminent competitive threat. The same lack of intellectual property protection applies to other dominant platforms such as Airbnb, Uber, eBay, and Amazon.

B. *The Network Effect*

If digital technology companies generating billions of dollars—whose functionalities can be so easily copied—are not protected at their core by intellectual property, what then is thwarting competitors? The broadly accepted answer is what economists call the network effect.²⁷

A network effect occurs where the benefit to a user of a product or service increases as the number of users increases, a sort of user begets user scenario.²⁸ A classic example is the fax machine. While the benefit of owning the first fax machines was minimal, the benefit increased

23. Mark Davison & Ian Horak, *Shanahan's Australian Law of Trade Marks and Passing Off* (5th ed. 2012).

24. Danny Sullivan, *What Is Google PageRank? A Guide for Searchers and Webmasters*, SEARCH ENGINE LAND (Apr. 20, 2007, 1:18 AM), <https://searchengineland.com/what-is-google-pagerank-a-guide-for-searchers-webmasters-11068>.

25. John Battelle, *The Birth of Google*, WIRED (Aug. 1, 2005, 12:00 PM), http://www.wired.com/wired/archive/13.08/battelle.html?pg=2&topic=battelle&topic_set=

26. ALPHABET INC., ANNUAL REPORT (FORM 10-K) 7, 26–27 (2018), https://abc.xyz/investor/static/pdf/2017_google_annual_report.pdf?cache=5504fde.

27. Mark A. Lemley & David McGowan, *Legal Implications of Network Economic Effects*, 86 CAL. L. REV. 479, 481 (1998) (“A Network effect exists where purchasers find a good more valuable as additional purchasers buy the same good.”).

28. A network effected market is not always undesirable. There can be benefits from the enabling of interactions between a consumer and others who own the product. The “benefits of a purchaser, in other words, is access to other purchasers.” *Id.* at 488. For example, the Apple app ecosystem is a strongly network-effected market, yet there have been countless new and useful apps created by all levels of entrepreneurs and newcomers. See Daniel D. Garcia-Swartz & Florencia Garcia-Vicente, *Network Effects on the iPhone Platform: An Empirical Examination*, 39 TELECOMMS. POL'Y 877, 877–79 (2015) (discussing how Apple's business platform has grown under network effects).

exponentially as more people adopted the technology. Other examples include rail gauges and telephone lines.

Digital platforms have a high propensity to undergo network effects because they function on interoperability and communication with other similar products and users.²⁹ In the beginning, a new platform, a website service or app, needs to adequately meet some need. Then, the pervasiveness of the platform's use, which is the result of its initial success,³⁰ also serves as the driver for its further uptake.³¹ In the case of Microsoft Office, once it became the dominant word processor, user familiarity and software compatibility meant that more and more users were encouraged to adopt the product, resulting in an arguably inferior product at an inflated price.

While a network effect does not inevitably result in a "winner takes all" outcome,³² the consensus in the literature appears to be that for digital platforms like software and websites, the network effect is the main

29. A great example can be seen in keyboards. While the Dvorak keyboard has been shown to allow for a more rapid typing speed, the QWERTY keyboard is more widespread, making it not worthwhile for a typist to learn Dvorak typing. See Matthew T. Clements, *Inefficient Standard Adoption: Inertia and Momentum Revisited*, 43 *ECON. INQUIRY* 507, 507–08 (2005), <https://onlinelibrary.wiley.com/doi/epdf/10.1093/ei/cbi034>.

30. See Lemley & McGowan, *supra* note 27, at 495–96; see Paul Klemperer, *Network Effects and Switching Costs: Two Short Essays for the New Palgrave* (Mar. 2005) (unpublished essays), www.nuffield.ox.ac.uk/users/klemperer/NewPalgrave.pdf.

31. Economic modeling has shown that, in this way, a market share of 40% can lead to an almost automatic increase to 80% of the market share. Timing is important, as the first-mover or best-timed product—rather than the superior product—is often triumphant. See John T. Soma & Kevin B. Davis, *Network Effects in Technology Markets: Applying the Lessons of Intel and Microsoft to Future Clashes Between Antitrust and Intellectual Property*, 8 *J. INTEL. PROP. L.* 1, 3, 46 (2000).

32. See Gawer Note, *supra* note 3, at 9. In the OECD Committee Hearing, Germany noted that the network effect may lead to a winner takes all scenario, while Professor Annabelle Gawer explained that this is also not a given and there are many "counterexamples of markets with network effects that have not been monopolised." Org. for Econ. Co-Operation and Dev. [OECD], *Summary of Discussion of Hearing on Big Data: Annex to the Summary Record of the 126th Meeting Competition Committee*, at 2, 5, DAF/COMP/M(2016)2/ANN2/FINAL (Apr. 26, 2017) [hereinafter *OECD Big Data Hearing Summary*], [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DAF/COMP/M\(2016\)2/ANN2&docLanguage=En2](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DAF/COMP/M(2016)2/ANN2&docLanguage=En2) (2017). Further, the OECD reports that "the very specific features of the digital economy imply that, in many cases, firms compete for the market instead of competing in the market, leading to 'winner takes all' outcomes, as it was observed when Facebook was able to displace Myspace as the most popular social network. Org. for Econ. Co-Operation and Dev. [OECD], *Big Data: Bringing Competition Policy to the Digital Era: Background Note by the Secretariat*, at 17, DAF/COMP(2016)14 (Oct. 27, 2016) [hereinafter *Background Note by the Secretariat*].

determinate of market dominance.³³ As tech billionaire and Facebook's first outside investor Peter Thiel says, "competition is for losers."³⁴ His recommendation: "If you want to create and capture lasting value, look to build a monopoly."³⁵

C. Data Driven Network Effect

The network effect needs a network. The network effects observed previously were due to physical manifestations such as telephone lines or rail gauges.³⁶ More recently, a new form of network effect has loomed into view in the digital world. It is conceptually similar to the walled gardens of intellectual property seen in early digital technology: a network effect not in relation to compatibility, but rather, in relation to data. The data-opoly.³⁷

Markets with a high reliance on data are experiencing positive feedback loops: the more data an enterprise has, the better the product. This leads to strong data-driven network effects. A search engine like Google is able to improve its search results by using the immense data its search database continually collects from its billions of users.³⁸ This may include popular search queries that are easily answered, as well as the more obscure and rare searches that can only be well served with gigantic datasets. The same principle enables Facebook to improve its content and to target users with sublimely specific advertising on account of the sheer volume of user data it possesses.³⁹

With so many inputs, big data and its processing are now capable of what is known as "now-casting":⁴⁰ real-time forecasting of traffic conditions, restaurant crowds,⁴¹ or flu outbreaks. Discovering such information requires a huge volume of data from which the data of

33. Maurice E. Stucke & Allen P. Grunes, *Data-opolies* 8, 11 (Univ. of Tenn. Legal Studies Research, Paper No. 316, 2017), <https://ssrn.com/abstract=2927018>.

34. Peter Thiel, *Competition Is for Losers*, WALL ST. J. (Sept. 12, 2014, 11:25 AM), www.wsj.com/articles/peter-thiel-competition-is-for-losers-1410535536.

35. *Id.*

36. Note, *Smith v. Illinois Bell Telephone Company: A Development in the Law of Public Utilities*, 44 HARV. L. REV. 833, 834 ("Of utilities, the telephone industry presents the most notable instance of centralized organization and monopolistic control.").

37. See MAURICE E. STUCKE & ALLEN P. GRUNES, *BIG DATA AND COMPETITION POLICY* (2016) (coining the term "data-opoly"); see also Stucke & Grunes, *supra* note 33.

38. Stucke & Grunes, *supra* note 33, at 6.

39. See *id.* at 11.

40. Now-casting is defined as "the prediction of the present, the very near future and the very recent past." Marta Banbura et al., *Now-Casting and the Real-Time Data Flow*, in 2 HANDBOOK OF ECONOMIC FORECASTING 195, 196 (Graham Elliott & Allan Timmermann eds., 2013).

41. See sources cited *supra* note 32.

interest can be extracted. Otherwise, the data would be collected at too low a frequency to enable now-casting.

Size matters when it comes to data. Stucke and Grunes demonstrate that a poorly designed algorithm can find more valuable information and insights in high volumes of various data than a superior algorithm can when working with a cleaner, but smaller, dataset.⁴² Google's chief scientist admitted: "We don't have better algorithms than anyone else. We just have more data."⁴³ The end result is that consumers may be locked into using a dominant service such as Google rather than their preferred service, which may offer them better privacy options or less advertising.

This is why Facebook, Google, and Amazon offer their social, search, and e-commerce platforms for free. Rather, they receive user data as their remuneration. So, although Google,⁴⁴ Microsoft,⁴⁵ and Facebook⁴⁶ often claim that competitors can easily gather their own data and that competition is therefore just "one click away"⁴⁷ because "data is not valuable *per se*,"⁴⁸ the evidence increasingly suggests otherwise.⁴⁹ If data were not valuable, there is little to explain why Facebook paid \$16 billion USD to purchase WhatsApp, a company of only 60 employees and no assets.⁵⁰ In reality, data is acting as an entry barrier to many

42. STUCKE & GRUNES, *supra* note 37, at 23.

43. Matt Asay, *Tim O'Reilly: "Whole Web" Is the OS of the Future*, CNET (Mar. 18, 2010), www.cnet.com/news/tim-oreilly-whole-web-is-the-os-of-the-future/ (quoting Peter Norvig, chief scientist at Google).

44. OECD *Big Data Hearing Summary*, *supra* note 32, at 3 ("[D]ata does not necessarily act as a barrier to entry since, regardless of its size, data is nowadays very cheap to collect, can be easily generated . . .") (statement of Hal Varian, Chief Economist at Google and Professor at Berkeley School of Information).

45. *Id.* at 4 ("[D]ata is abundant and has only value when properly structured and categorised.") (statement of Chris Meyers, Associate General Counsel of Antitrust from Microsoft).

46. *See* Case M.7217, Facebook/WhatsApp, 2014 EUR-Lex CELEX LEXIS 32104M7217, 12 (Mar. 10, 2014).

47. Eric Schmidt, *Why Google Works*, HUFFINGTON POST (Jan. 20, 2015, 4:14 PM), www.huffingtonpost.com/eric-schmidt/why-googleworks_b_6502132.html.

48. OECD *Big Data Hearing Summary*, *supra* note 32, at 3 (statement of Prof. Hal Varian).

49. *Id.* at 2 ("Big Data has blurred the line between [supply and demand] allowing users of an online service to behave simultaneously as consumers and suppliers of data. In turn, that data can be immediately used by the service provider to improve the quality of the service, leading to a real-time feedback loop that was not observed before.")

50. *Facebook to Acquire WhatsApp*, FACEBOOK (Feb. 19, 2014), <https://newsroom.fb.com/news/2014/02/facebook-to-acquire-whatsapp/>.

competitors.⁵¹ In 2016, the OECD, the French Autorité de la Concurrence, and the German Bundeskartellamt all acknowledged the existence of data-driven networks and that they give a competitive advantage over rivals.⁵²

II. CURRENT MEASURES

A. Introduction

The law is struggling to find solutions to the new challenges of Big Data.⁵³ In the context of privacy and security of big data, as explained by one commentator, current legislation “is still grounded in, and focused upon the twentieth century’s responses—to the . . . processing and distribution of data”⁵⁴

The current legislative go-to tools of regulators to combat data monopolization are competition law and consumer law. As discussed below, competition law is arguably ineffective at resolving intellectual property and network-effected monopolies, and seems even less equipped to deal with data because it currently has no real market. With the soon to be introduced EU General Data Protection Regulation (GDPR),⁵⁵ consumer law is shaping up to be a sharper tool for willing regulators. But at its heart, it remains a bastion of the individual consumer versus Big Tech and does not consider the impact of Big Data monopolization from the perspective of the bigger picture of creating a better society.

B. Competition Law

Prior to the arrival of data-opolies, there had been some partial success in limiting network effects using competition regulations, or antitrust laws as it is known in the United States. In the late nineties, Microsoft held an 80% market share.⁵⁶ However, on the back of an antitrust suit, the

51. Stucke & Grunes, *supra* note 33, at 2–6; Inge Graef, *Market Definition and Market Power in Data: The Case of Online Platforms*, 38 *WORLD COMPETITION* 473, 473 (2015).

52. Autorité de la Concurrence & Bundeskartellamt, *Competition Law and Data*, at 15–16 (May 10, 2016), https://www.bundeskartellamt.de/SharedDocs/Publikation/DE/Berichte/Big%20Data%20Papier.pdf?__blob=publicationFile&v=2.

53. *See generally id.*

54. Pompeu Casanovas et al., *Regulation of Big Data: Perspectives on Strategy, Policy, Law and Privacy*, 7 *HEALTH & TECH.* 335, 340 (2017).

55. *See* Regulation 2016/679, of the European Parliament and of the Council of 27 April 2016 on the Protection of Natural Persons with Regard to the Processing of Personal Data and on the Free Movement of Such Data, and Repealing Directive 95/46/EC (General Data Protection Regulation), 2016 O.J. (L 119) 1.

56. Tim Worstall, *Microsoft’s Market Share Drops from 97% to 20% in Just over a Decade*, *FORBES* (Dec. 13, 2012, 11:16 AM), <https://www.forbes.com/sites/timworstall/2012/12/13/>

United States government was able to persuade Microsoft to share its programming interfaces with other companies.⁵⁷

There is a glut of analysis on the effectiveness of competition regulations as applied to digital technologies prior to the emergence of Big Data.⁵⁸ The inadequacies of these regulations in addressing network-effected markets, however, has been attributed to the features unique to a network-effected monopoly that differ from a natural monopoly.⁵⁹ In the case of a natural monopoly, as demand increases, the margins decrease according to classic economic principles of the scale of production, whereas in a network-effected market, value is added by existing users through increased demand.⁶⁰

The literature reveals that while the lawmakers recognized the outcome—the monopoly—they struggled⁶¹ with understanding the contribution of the network effect. Even by 2001, “[o]nly a few courts in antitrust cases [had] recognized the existence of network effects, and attempted to factor it into their analysis.”⁶² Further, the Federal Trade Commission (FTC) has not lodged a serious case against Big Tech this century. Consequently, they largely failed in limiting the prevalence of network-effected markets. Perhaps the most compelling evidence is the fact that the five most valuable companies in the world today are Big Tech companies⁶³ who owe a large part of their value to network effects.

Even apart from dealing with the complexities of a network market, there is the additional difficulty that data, unlike word processing software, is currently not valued. When most of the services in question

microsofts-market-share-drops-from-97-to-20-in-just-over-a-decade/#6409340351cf.

57. See *United States v. Microsoft Corp.*, 980 F. Supp. 537, 539–40 (D.D.C. 1997).

58. E.g., Ariel Katz, Making Sense of Nonsense: Intellectual Property, Antitrust, and Market Power, 49 ARIZ. L. REV. 837 (2007); Emanuela Arezzo, Intellectual Property Rights at the Crossroad Between Monopolization and Abuse of Dominant Position: American and European Approaches Compared, 24 J. MARSHALL J. COMPUTER & INFO. L. 455 (2006); Lemley & McGowan, *supra* note 27.

59. Lemley & McGowan, *supra* note 27, at 484 (“While the two problems may be difficult to distinguish in practice—and some courts may treat them the same—the two cases are analytically distinct and therefore may require different legal treatment . . .”).

60. *Gawer Note*, *supra* note 3, at 9; Soma & Davis, *supra* note 31, at 5.

61. Lemley & McGowan, *supra* note 27, at 485 (“The theoretical implications of network markets have not been fully elaborated even in the economic literature. The theoretical legal analysis that has drawn upon such literature is even less complete, and empirical data on the behavior of firms and consumers in network markets is scarcer still.”).

62. Soma & Davis, *supra* note 31, at 6.

63. Lucinda Shen, *Here Are the Fortune 500’s 10 Most Valuable Companies*, FORTUNE (May 21, 2018), <http://fortune.com/2018/05/21/fortune-500-most-valuable-companies-2018/>.

are offered for free to its users and the data collected is not later sold, it is “particularly difficult”⁶⁴ to assess market power and value.⁶⁵

However, there has been a notable change in Europe in the last two years. There is now a growing recognition that data can be used as a barrier to entry and that data-opolies are problematic.⁶⁶ Last year, the European Commission handed Google a record-breaking €2.42 billion fine for abusing its dominance as a search engine by giving illegal competitive advantage to its own services in the lucrative online shopping market.⁶⁷

In November 2016, addressing concerns raised by Big Data and data-driven network effects, the OECD conducted an investigation into what it considered a “first step in a broader work stream”⁶⁸ in “identifying some of the competition challenges from the increasing use of consumer data for business purposes, and to discuss possible reactions by competition authorities and other agencies.”⁶⁹ The report outlines its view that the problem of too much concentration of data in so few companies could be best remedied with appropriately adapted competition laws.⁷⁰ The report states that “[t]raditional antitrust tools can be adapted and applied to tackle such data-related anticompetitive practices, by treating data as any other input. For instance, in merger control and exclusionary abuse cases, competition authorities may consider the risks of foreclosure and design remedies accordingly.”⁷¹

64. *Background Note by the Secretariat*, *supra* note 32, at 16.

65. In collecting the data itself, the platform is not doing anything that is considered anti-competitive under the traditional analysis. This is precisely why the EU regulator decided to look no further when assessing any possible anti-competitive issues regarding the aforementioned \$19 billion USD Facebook/WhatsApp merger. Facebook answered all concerns by showing they did not sell data or charge for their services. *See* Case M.7217, *supra* note 46, at 12.

66. *See, e.g.*, Stucke & Grunes, *supra* note 33, at 5–6; Autorité de la Concurrence and Bundeskartellamt, *supra* note 52, at 11.

67. European Commission Press Release IP/17/1784, Antitrust: Commission Fines Google €2.42 Billion for Abusing Dominance as Search Engine by Giving Illegal Advantage to Own Comparison Shopping Service (June 17, 2017), europa.eu/rapid/press-release_IP-17-1784_en.htm.

68. *Background Note by the Secretariat*, *supra* note 32, at 5.

69. Org. for Econ. Co-Operation and Dev. [OECD], *Big Data: Bringing Competition Policy to the Digital Era: Executive Summary*, at 4, DAF/COMP/M(2016)2/ANN4/FINAL (Apr. 26, 2017) [hereinafter *OECD Executive Summary*], [https://one.oecd.org/document/DAF/COMP/M\(2016\)2/ANN4/FINAL/en/pdf](https://one.oecd.org/document/DAF/COMP/M(2016)2/ANN4/FINAL/en/pdf).

70. *Background Note by the Secretariat*, *supra* note 32, at 5 (noting that initially, the concerns of big data and its implications were around consumer protection, but that after several high-profile mergers and the increasing amount of monopolization and control of data, the outcome on competition and the broader implications for markets need to be considered.).

71. *OECD Executive Summary*, *supra* note 69, at 4.

In the same way, Graef suggests a reworking of competition law to where, instead of looking at purely price indications of monopoly, it would look at other qualities in determining when antitrust provisions should be triggered.⁷² More recently, in December 2017, Germany's Federal Cartel Office, the Bundeskartellamt, made its preliminary assessment that Facebook was using its dominance to extort personal data from users by bullying them into agreeing to their unfavorable privacy terms and conditions.⁷³ This is likely to be the first time a regulator is using data as a measure of anti-competitive practices.

C. Consumer Law

Consumer law protections are also routinely cited in data regulation discourse. Amongst the literature, there is an acknowledgement that collection of data and its misuse may harm consumer interests, including privacy, data protection, freedom of speech, consumer choice, and non-discrimination rights.⁷⁴ The OECD summarizes the situation as follows:

The development of the digital economy and of Big Data has raised concerns that users of online services may lose control over the way that their data is collected and used. In the absence of a regulatory framework that promotes transparency and consumer's control over their own data, there is a risk of undermining the good functioning of the digital markets.⁷⁵

The introduction of the GDPR on May 25, 2018, initiated deep and sweeping changes into how personal data is managed in Europe and for

72. Graef suggests a more objective measure of the data power of an enterprise would be to "look at their ability to monetize the collected information. The revenue gained by a provider through licensing of data to third parties, delivering targeted advertising services or offering other paid products and services to customers having data as input indicates how successful it is in the market." Graef, *supra* note 51, at 502.

73. The case had not been finalized at the time of the preliminary assessment. The Bundeskartellamt gave Facebook time to respond and negotiate. The proceedings were administrative, not offense proceedings with the potential for fines. Bundeskartellamt Press Release, *Preliminary Assessment in Facebook Proceeding: Facebook's Collection and Use of Data from Third-Party Sources Is Abusive* (Dec. 19, 2017), https://www.bundeskartellamt.de/SharedDocs/Meldung/EN/Pressemitteilungen/2017/19_12_2017_Facebook.html.

74. Executive Summary of the Opinion of the European Data Protection Supervisor on Effective Enforcement in Digital Society Economy, 2016 O.J. (C 463) 8, 8, [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016XX1213\(01\)&qid=1565004591543&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016XX1213(01)&qid=1565004591543&from=EN); *European Data Protection Supervisor Opinion on Coherent Enforcement of Fundamental Rights in the Age of Big Data*, at 5 (Sept. 23, 2016), https://edps.europa.eu/sites/edp/files/publication/16-09-23_bigdata_opinion_en.pdf.

75. OECD *Executive Summary*, *supra* note 69, at 5.

EU citizens.⁷⁶ The aim of the GDPR is to give EU citizens far-reaching rights and control over their personal data.⁷⁷ The strict data compliance framework will be enforced by severe penalties of up to €20,000,000, or in the case of an undertaking, up to four percent of the total worldwide annual turnover,⁷⁸ which could potentially mean millions or even billions of euros in fines. These strong sanctions perpetuate the EU's increased willingness to regulate Big Tech—something yet to be seen in the U.S.

The GDPR provides citizens various rights in relation to their data, namely, the right of access to their personal data,⁷⁹ the right to be forgotten,⁸⁰ a requirement that consent to collect personal data be freely given,⁸¹ a right to notification of any data breach,⁸² and a right not to be subject to a decision based solely on automated processing.⁸³ Most significantly, the GDPR introduces a “data portability right,” which gives a person the right to be able to transfer his or her personal data from one provider to another.⁸⁴ This data portability was introduced with individual rights in mind. However, it may have a significant impact on competition as users are able to easily switch platforms. Thus, the GDPR operates in the “intersection between data protection and other fields of law (competition law, intellectual property, consumer protection, etc).”⁸⁵

Personal data portability is novel—it has no precedent in any previous framework of law.⁸⁶ The GDPR gives no mechanism for effectuating portability other than that data must be in a “commonly used and machine-readable format and . . . [transmitted] to another controller without hindrance”⁸⁷ It remains to be seen how data controllers will execute the portability.

76. Dale Walker & Keumars Afifi-Sabet, *What Is GDPR? Everything You Need to Know, from Requirements to Fines*, ITPRO (July 23, 2019), <https://www.itpro.co.uk/it-legislation/27814/what-is-gdpr-everything-you-need-to-know>.

77. *Id.*

78. Regulation 2016/679, *supra* note 55, at 83.

79. *Id.* at 43.

80. *Id.* at 43–44 (“The data subject shall have the right to obtain from the controller the erasure of personal data concerning him or her without undue delay and the controller shall have the obligation to erase personal data without undue delay . . .”).

81. *See id.* at 37.

82. *Id.* at 52–53.

83. *Id.* at 46.

84. *Id.* at 45; Paul De Hert et al., *The Right to Data Portability in the GDPR: Towards User-Centric Interoperability of Digital Services*, 34 *COMPUTER L. & SECURITY REV.* 193, 194 (2018).

85. De Hert et al., *supra* note 84, at 193.

86. *See id.* at 203.

87. Regulation 2016/679, *supra* note 55, at 45.

De Hert argues that the right to data portability may have two possible scenarios.⁸⁸ The first would require only the transfer of “provided” personal data. In contrast, the second and wider scenario would require the transfer of all data, including data that is generated from the personal data.⁸⁹ In supporting the latter, broader definition, De Hert says:

This scenario does not only encourage a real competition between service providers (limiting barriers for users willing to change service in the digital market), but it also avoids the monopolisation of the Internet by large companies, by encouraging interoperable formats, developing multilevel platforms where the centre is the user and the actors are different service providers.⁹⁰

However, as the implementation of the GDPR is considered to be its biggest challenge and greatest unknown,⁹¹ it is difficult to predict any impact it will have on reducing data monopolization. Furthermore, the real aim of the GDPR is to protect personal privacy—not to regulate competition by proxy. Finally, only personal data falls within its gambit⁹² and so it will not address problems on monopolization of big data generally.

D. *Inadequacy of Current Regulations*

This two-pronged regulatory approach, using appropriately retooled antitrust and consumer laws, shows promise in reducing the monopolistic state of digital platforms, particularly in Europe where regulators are starting to show some real teeth. In practice, however, both streams of law are ill-equipped to fully resolve the issues of big data monopolization because they merely address the downstream manifestations of big data, but not the origin of the problem: the monopoly itself. Consumer law may ensure users have better privacy policies and competition law may prevent large anticompetitive mergers, though this remains to be seen. Perhaps even a version of media pluralism laws could ensure that large platforms do not have so much media influence. However, even if successful, the other downstream consequences of big data monopolization will remain.

88. De Hert et al., *supra* note 84, at 202.

89. *Id.*

90. *Id.*

91. *See id.* at 194.

92. *See* Miranda Mourby et. al., *Are “Pseudonymised” Data Always Personal Data? Implications of the GDPR for Administrative Data Research in the UK*, 34 *COMPUTER L. & SECURITY REV.* 222, 222 (2018) (discussing whether Article 4(5) of the GDPR, dealing with “pseudonymization,” will have the effect of expanding the scope of personal data).

Most notably, Big Data is set to become key for future innovation and growth.⁹³ Especially in the field of artificial intelligence, companies such as Google have an enormous head start, as Big Data is the fuel from which artificial intelligence runs.⁹⁴ For example, Tesla collects data from its cars which it then uses to optimize its self-driving algorithms and thus operates in a data-driven, network-effected market—making it difficult for competitors to innovate ahead of Tesla.⁹⁵ However, this application of big data does not appear on the radar of antitrust or consumer law.

This is why Stucke questions “whether competition law is the appropriate tool for dealing with issues arising from the use of Big Data.”⁹⁶ Part of the failure of competition law is likely to be that Big Data is just so new—its usefulness and implications are only a few years old. It is only in the last two years that legal scholars and governments have begun to discuss the issue of monopoly ownership of Big Data as a problem in itself.⁹⁷ Thus, while the OECD investigation of data monopolies pondered how to ensure that monopolies face “competitive pressure to constantly improve their products and preserve low prices,”⁹⁸ it made no mention of the distinction in power and influence between Facebook and Uber.

III. WE NEED TO TALK ABOUT DATA

A. *Data Is Different*

Efforts thus far to address the consequences of the centralized power of Big Tech have attended to the symptoms, but not the underlying problem. Data monopolies are different from previous monopolies because there is another dimension to the nature of data that other, more benign goods or services do not have. It is the nature of the data itself—

93. JAMES MANYIKA ET AL., MCKINSEY GLOB. INST., *BIG DATA: THE NEXT FRONTIER FOR INNOVATION, COMPETITION, AND PRODUCTIVITY* 2, 6 (2011), https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/Big%20data%20The%20next%20frontier%20for%20innovation/MGI_big_data_full_report.ashx (“[O]ur research suggests that we are on the cusp of a tremendous wave of innovation, productivity, and growth The use of big data is becoming a key way for leading companies to outperform their peers. For example, we estimate that a retailer embracing big data has the potential to increase its operating margin by more than 60 percent.”).

94. Christian Ehl, *Data—the Fuel for Artificial Intelligence*, MEDIUM (Jan. 24, 2018), <https://medium.com/@cehl/data-the-fuel-for-artificial-intelligence-ed90bf141372>.

95. Bernard Marr, *The Amazing Ways Tesla Is Using Artificial Intelligence and Big Data*, FORBES (Jan. 8, 2018, 12:28 AM), <https://www.forbes.com/sites/bernardmarr/2018/01/08/the-amazing-ways-tesla-is-using-artificial-intelligence-and-big-data/>.

96. *Background Note by the Secretariat*, *supra* note 32, at 5.

97. *See, e.g.*, Stucke & Grunes, *supra* note 33, at 8; Autorité de la Concurrence and Bundeskartellamt, *supra* note 52, at 11.

98. *Background Note by the Secretariat*, *supra* note 32, at 17.

in being akin to information—that has produced consequences across such a broad range of fields, including personal privacy, democracy, security, innovation stifling, hacking, political influence, and media. To put it into the context of the first historic network-effected monopoly, what we are seeing today would be something analogous to if the Bell Telephone Company had not only the monopoly on the physical telephone lines, but also on the recording and analysis of the conversations traveling through the lines, as well as control over 80% of the major newspapers—all while being the world's largest company.⁹⁹ This highlights why data, with its likeness to information itself, can allow companies like Google and Facebook to create monopolies that are fundamentally different from our previous experience with network-effected monopolies like Microsoft Office.

When a data set becomes so vast and ubiquitous that it encompasses wide-ranging fields of human endeavor, then the controller of that data likewise becomes a powerful gatekeeper and influencer. When data is amassed—as Big Data is now—it is no longer something passive with discrete application, like a car, but something with all-inclusive utility. Rather, it transforms into knowledge—which can be political, personal, influential, private, or even confidential—and an essential element to innovation.

Not all data-opolies have as much power, value, and influence as Facebook and Google, however, because a data-opoly's dominion depends on the type and variety of data. For example, Airbnb may essentially have a data-opoly over share accommodation, but it is simply not in a position to impact an election or act as a filter to our experience of the world. Similarly, Tesla may be in a data-driven network-effected market but, again, this data would seem to be limited to transport.

B. *Data Is Big*

In 2014, IBM estimated that 90% of the data in the world had been created in the previous two years alone.¹⁰⁰ Data is no longer concerned only with stock information such as a person's name, email address, sex, and age. It now encompasses unstructured data from multiple, unlikely sources, including anything from dietary habits, heart rate, location,

99. Morgan Stanley estimated in 2016 that 85% of all online advertising expenditure would go into Google or Facebook. Jason Kint, *Google and Facebook Devour the Ad and Data Pie. Scraps for Everyone Else*, DIGITAL CONTENT NEXT (June 16, 2006), <https://digitalcontentnext.org/blog/2016/06/16/google-and-facebook-devour-the-ad-and-data-pie-scraps-for-everyone-else/>.

100. Todd Vare & Michael Mattioli, *Big Business, Big Government and Big Legal Questions*, MANAGING INTELL. PROP., Oct. 2014, at 46, <http://www.managingip.com/Article/3382483/Big-business-big-government-and-big-legal-questions.html>.

recycling habits, microenvironment rainfall, voting preference, when a car's thermostat turns on, to sexual pronouns used in speech. This vast unorganized data is then analyzed by sophisticated algorithms and artificial intelligence¹⁰¹ to find otherwise undiscoverable—and at times highly surprising¹⁰²—insights. Hagstrom writes that “[t]he combination of unconventional data sources, new problem-solving approaches, and the ability to use big data to access collective knowledge will enable organizations to devise innovative solutions to global problems.”¹⁰³

Big Data has been defined as information that is characterized by the four Vs: high volume, velocity, variety, and value.¹⁰⁴ It is now not so much the quality of the data that is important, but the sheer quantity. And over the past decade, “each ‘v’ has increased enormously.”¹⁰⁵ But the most noteworthy increase has been in value.¹⁰⁶

101. See Bernard Marr, *The Complete Beginner's Guide to Big Data Everyone Can Understand*, FORBES (Mar. 14, 2017), <https://www.forbes.com/sites/bernardmarr/2017/03/14/the-complete-beginners-guide-to-big-data-in-2017/#45d7d6e27365> (explaining how big data is collected and analyzed).

102. An example of a surprising find of big data was Walmart “finding that Strawberry pop-tarts sales increased by 7 times before a Hurricane. After Walmart identified this association between Hurricane and Strawberry pop-tarts through data mining, it places all the Strawberry pop-tarts at the checkouts before a hurricane.” *How Big Data Analysis Helped Increase WalMart's Sales Turnover?*, DEZYRE, <https://www.dezyre.com/article/how-big-data-analysis-helped-increase-walmart-s-sales-turnover/109> (last updated Nov. 10, 2017).

103. Mikael Hagstrom, *How Big Data Can Help Solve the World's Woes*, WORLD ECON. FORUM (Oct. 25, 2015), www.weforum.org/agenda/2015/10/how-big-data-can-help-solve-the-worlds-woes/.

104. Analyst Douglas Laney first defined the three “v”s of volume, velocity and variety. Andrea De Mauro, Marco Greco, and Michele Grimaldi added the “value” component. See Andrea De Mauro et al., *A Formal Definition of Big Data Based on Its Essential Features*, 65 LIB. REV. 122, 130–31 (2016). The definition has been adopted recently by Stucke and Grunes, as well as by the OECD Competition Committee. STUCKE & GRUNES, *supra* note 37, at 16.

105. STUCKE & GRUNES, *supra* note 37, at 16.

106. Org. for Econ. Co-Operation and Dev. [OECD], *Exploring Data-Driven Innovation as a New Source of Growth: Mapping the Policy Issues Raised by “Big Data,”* at 12, DSTI/ICCP(2012)9/FINAL (Apr. 18, 2013), <https://www.oecd-ilibrary.org/docserver/5k47zw3fcp43-en.pdf?expires=1551680853&id=id&accname=guest&checksum=0971F2CD3870BD189D4B81DC55EFC985>. The OECD estimates that use of Big Data by 2020 could save \$500 billion USD in traffic congestion and fuel costs by use of mobile tracking; reduce the cost of carbon dioxide emissions by €79 billion by use of smart appliances; and in the U.S. medical sector, reduce medical errors, improve diagnosis, increase efficiency in management and pricing, foster R&D, and achieve other goals that would allow savings of about \$300 billion USD. *Id.* at 5.

Data is being called “the new oil.”¹⁰⁷ It is now “in every sector, in every economy, in every organization and user of digital technology.”¹⁰⁸ The more information, or Big Data, the better—those who possess such data can analyze it and make it into something useful.¹⁰⁹ The implications of Big Data are likely to appear in many various guises and its applications will be unusual and unpredictable. In this way, we would be better off to ensure adequate regulation of Big Data itself, not merely its discrete applications.

C. Facebook Case Study

Facebook has over two billion active users.¹¹⁰ The “Like” and “Share” buttons appear daily on almost 10 million websites, and every sixty seconds there are 510,000 comments posted, 293,000 statuses updated, and 136,000 photos uploaded.¹¹¹ When working with such numbers, even a slight tweak will enable seismic shifts. The data that Facebook collects and presents to its users has inherent political significance. Facebook is, in effect, the world’s largest media company. As former Gawker founder Nick Denton opines, “[t]he Silicon Valley . . . monopolies now have . . . more power than the [entire traditional] media industry.”¹¹²

Facebook’s capacity to affect users’ behavior in society is substantiated by its own research. Facebook funded a study that was later published in *Nature* during the 2010 United States congressional elections. By selectively giving some users an “I voted” button but not others, the study found that the presence of the button increased the total vote count in the election by 340,000 votes.¹¹³ In short, Facebook was actually able to subtly encourage 340,000 people to vote who otherwise would not have. In another experiment, Facebook researchers¹¹⁴ showed

107. *The New Oil: Data Is the World’s Most Valuable Resource*, AUSTL. (May 6, 2017, 1:00 AM) <https://www.theaustralian.com.au/news/inquirer/the-new-oil-data-is-the-worlds-most-valuable-resource/news-story/f386217a9c63ac5ee6e1473413e90bda>.

108. JAMES MANYIKA ET AL., *supra* note 93, at 2.

109. *See Data, Data Everywhere*, ECONOMIST, Feb. 27, 2010, at 3, <https://www.economist.com/special-report/2010/02/25/data-data-everywhere>.

110. FACEBOOK, INC., ANNUAL REPORT (FORM 10-K) 35 (2019), <https://www.sec.gov/Archives/edgar/data/1326801/000132680119000009/fb-12312018x10k.htm>.

111. *The Top 20 Valuable Facebook Statistics*, ZEPHORIA, <https://zephoria.com/top-15-valuable-facebook-statistics/> (last updated July 2019); *see also*, Press Release, Facebook, Facebook Reports Second Quarter 2017 Results (July 26, 2017), <https://investor.fb.com/investor-news/press-release-details/2017/Facebook-Reports-Second-Quarter-2017-Results/default.aspx>.

112. NOBODY SPEAK: TRIALS OF THE FREE PRESS (Netflix June 23, 2017) (quoting Nick Denton at 38:32).

113. Robert M. Bond et al., *A 61-Million-Person Experiment in Social Influence and Political Mobilization*, 489 NATURE 295, 297 (2012).

114. Adam D. I. Kramer et al., *Experimental Evidence of Massive-Scale Emotional Contagion Through Social Networks*, 111 PROC. NAT’L ACAD. OF SCI. U.S. 87, 88 (2014).

how manipulating the Facebook news feeds could alter moods in users. Placing “positive emotional content” on users’ news feeds resulted in positive posts and, similarly, “negative emotional content” resulted in negative posts.¹¹⁵

Until recently, commentators questioned whether Facebook had the data to influence a U.S. election.¹¹⁶ But now that question seems to have been answered affirmatively in light of the Cambridge Analytica and Russian hacking scandals. Cambridge Analytica, a private data firm “funded and promoted by secretive [billionaire] Robert Mercer,”¹¹⁷ worked on advertising for the Trump presidential campaign.¹¹⁸ It used Facebook data, which it had bought from an application built by a Cambridge University academic, of 277,000 users who consented to their data being collected.¹¹⁹ However, Cambridge Analytica was able to mine and scrape data from friends of the original user so that, in the end, it had the personal data of 87 million people.¹²⁰ Using the insights extrapolated from the data, Cambridge Analytica microtargeted advertisements to swing voters, and all-told, the campaign launched 4,000 different ad campaigns and placed 1.4 billion web impressions.¹²¹ The way in which Cambridge Analytica was able to microtarget and influence voters using the data of 87 million people garnered much attention and criticism from the media, wider public, and commentators.¹²² Many believe it was instrumental in the success of the Trump campaign to the point where it seems to have disrupted democratic institutions.

115. The experiment is what prompted Clay Johnson, co-founder of the firm who ran the Obama online campaign, to postulate: “Could the CIA incite revolution in Sudan by pressuring Facebook to promote discontent? Should that be legal? Could Mark Zuckerberg swing an election . . . ? Should that be legal?” Robert Booth, *Facebook Reveals News Feed Experiment to Control Emotions*, GUARDIAN (June 29, 2014, 7:57 PM), <https://www.theguardian.com/technology/2014/jun/29/facebook-users-emotions-news-feeds>.

116. Michael Brand, *Can Facebook Influence an Election Result?*, ABC NEWS (Sept. 27, 2016), www.abc.net.au/news/2016-09-28/can-facebook-influence-an-election-result/7881660.

117. Sasha Issenberg, *Cruz-Connected Data Miner Aims to Get Inside U.S. Voters’ Heads*, BLOOMBERG (Nov. 12, 2015, 5:00 AM), <https://www.bloomberg.com/news/features/2015-11-12/is-the-republican-party-s-killer-data-app-for-real->.

118. Matthew Rosenberg et al., *How Trump Consultants Exploited the Facebook Data of Millions*, N.Y. TIMES (Mar. 17, 2018), <https://www.nytimes.com/2018/03/17/us/politics/cambridge-analytica-trump-campaign.html>.

119. Olivia Solon, *Facebook Says Cambridge Analytica May Have Gained 37m More Users’ Data*, GUARDIAN (Apr. 5, 2018, 6:01 PM), <https://www.theguardian.com/technology/2018/apr/04/facebook-cambridge-analytica-user-data-latest-more-than-thought>.

120. *Id.*; Mike Schroepfer, *An Update on Our Plans to Restrict Access on Facebook*, FACEBOOK (Apr. 4, 2018), <https://newsroom.fb.com/news/2018/04/restricting-data-access/>.

121. Dirk Helbing et al., *Will Democracy Survive Big Data and Artificial Intelligence?*, SCI. AM. (Feb. 25, 2017), <https://www.scientificamerican.com/article/will-democracy-survive-big-data-and-artificial-intelligence/>.

122. *Id.*

This informs us of another consequence of data monopolization. Even if we accept Facebook's claims that it has no agency¹²³ or political interest, its role as a centralized media outlet with deep and unique insights by virtue of data monopolization had the unintended consequence of enabling third parties to use that data for nefarious purposes. In response, CEO Mark Zuckerberg was called before the U.S. congressional committee. During the hearing, Zuckerberg admitted Facebook had failed in preventing Cambridge Analytica from gathering the personal information of users.¹²⁴

Facebook is promising to implement a policy that aims to more clearly explain the data it gathers on users, but not to actually change what information it collects and shares.¹²⁵ Again, while better privacy policies may prevent the same scenario, Facebook will continue to be the centralized commercial entity of the personal data of its billions of users.

The GDPR will similarly force Facebook to better outline its privacy policy. But for those who accept the policy, Facebook will still be vacuuming up data. Thus, Facebook's influence and power will likely be unaffected by the GDPR.

D. Google Case Study

To learn just about anything nowadays, the first instinct is to "Google it" because Google has become synonymous with knowledge. It is the portal through which we seek understanding. As the prism through which we discover and see much of the world, this places Google in a unique position of power and influence.

Google's mission is to "organize the world's information and make it universally accessible and useful."¹²⁶ Even without any suggestion¹²⁷ that

123. Facebook claims it has no agency. However, in 2016, Gizmodo broke the story that several former Facebook "news curators" admitted that they intentionally suppressed conservative new websites appearing in the "trending" news section despite the stories organically trending, and conversely, "injected" news articles they preferred into the trending news section. They were also instructed not to include news about Facebook itself. Michael Nunez, *Former Facebook Workers: We Routinely Suppressed Conservative News*, GIZMODO (May 10, 2016, 12:30 PM), www.gizmodo.com.au/2016/05/former-facebook-workers-we-routinely-suppressed-conservative-news/.

124. *Transcript of Mark Zuckerberg's Senate Hearing*, WASH. POST (Apr. 10, 2018), https://www.washingtonpost.com/news/the-switch/wp/2018/04/10/transcript-of-mark-zuckerbergs-senate-hearing/?noredirect=on&utm_term=.a300d547415c.

125. *Facebook Says up to 87m People Affected in Cambridge Analytica Data-Mining Scandal*, ABC NEWS, <https://www.abc.net.au/news/2018-04-05/facebook-raises-cambridge-analytica-estimates/9620652> (last updated Apr. 4, 2018, 6:32 PM).

126. *About*, GOOGLE, www.google.com/intl/en/about/ (last visited Mar. 4, 2019).

127. One commentator noted we now need to use new language to describe the pervasiveness of Facebook and Google. Ellen P. Goodman & Julia Powles, *Facebook and Google: Most Powerful and Secretive Empires We've Ever Known*, GUARDIAN (Sept. 28, 2016, 3:00 PM),

Google aims to present this information and data in anything other than a neutral portal, acting as a gatekeeper places it in a perilous spot. And while its famous motto is “Don’t be evil,”¹²⁸ it remains a commercial enterprise with responsibilities to shareholders to maximize profits. Google has been known to bias their search results to push its own products ahead of competitors’ products. In a leaked 2012 staff report¹²⁹ about the dominance of Google in online searches, the FTC found that Google was giving preference to its own products and had “adopted a strategy of demoting or refusing to display, links to certain vertical websites in highly commercial categories.”¹³⁰ Nevertheless, the FTC decided not to pursue the matter at the time.¹³¹

Google has a “God’s eye view,” as the data it collects provides Google with information that it¹³² then uses to quickly spot competitor trends and either acquire them or out-compete them. Many believe that AI is the next big application of Big Data in the future. But Google already has that covered, too. It has the largest number of AI experts in the world and has invested £400 million into DeepMind,¹³³ a program that aims to “solve intelligence”—a nice addition to go alongside hundreds of other start-ups Google has bought.¹³⁴ Last year, at the launch of its Pixel 2 phone in San Francisco, Google announced its plans to transition from a “mobile-first”

<https://www.theguardian.com/technology/2016/sep/28/google-facebook-powerful-secretive-empire-transparency> (“Google is not an ‘engine’ that simply drives us to an objectively correct destination . . . Facebook is not merely a ‘network’ for connection, like the old phone network or electrical grid, as if it had no agency . . . These are not mere ‘edge providers,’ peripheral to infrastructure, or mere ‘applications’ that we can select or refuse.”).

128. Julian Assange, Opinion, *The Banality of “Don’t Be Evil,”* N.Y. TIMES (June 1, 2013), <https://www.nytimes.com/2013/06/02/opinion/sunday/the-banality-of-googles-dont-be-evil.html>; Kate Conger, *Google Removes “Don’t Be Evil” Clause From Its Code of Conduct*, GIZMODO (May 18, 2018, 5:31 PM), <https://gizmodo.com/google-removes-nearly-all-mentions-of-dont-be-evil-from-1826153393>.

129. Brody Mullins et al., *Inside the U.S. Antitrust Probe of Google*, WALL ST. J. (Mar. 19, 2015, 7:38 PM), <https://www.wsj.com/articles/inside-the-u-s-antitrust-probe-of-google-1426793274>.

130. *Excerpts from FTC Google Report*, WALL ST. J. (Mar. 19, 2015, 6:30 PM), graphics.wsj.com/ftc-google-report/.

131. Press Release, Federal Trade Commission, Privacy Settlement is the Largest FTC Penalty Ever for Violation of a Commission Order (Aug. 9, 2012), www.ftc.gov/news-events/press-releases/2012/08/google-will-pay-225-million-settle-ftc-charges-it-misrepresented.

132. ECONOMIST, *supra* note 10.

133. Sam Shead, *The Founders of Google DeepMind Are Investing in a Startup That Lets You Talk to a Doctor Through Your Smartphone*, BUS. INSIDER (Jan. 14, 2016, 3:10 AM), www.businessinsider.com.au/deepmind-cofounders-invest-in-babylon-health-2016-1.

134. Jennifer Elias, *Google’s Acquisitions Are in the Spotlight 15 Years After It Went Public*, CNBC, <https://www.cnbc.com/2019/08/19/googles-best-and-worst-acquisitions-are-in-the-spotlight-15-years-later.html> (last updated Aug. 19, 2019, 12:20 PM).

business to an “AI-first” business.¹³⁵ If AI and the data it runs on is set to be the future of innovation, then Google is in the lead.

Like all large companies, Google also has more traditional power. According to Professor Reich, “Google is now among the largest corporate lobbyists in the United States. Around the time of the [FTC] investigation the company poured money into influencing both the commissioners and the commission’s congressional overseers.”¹³⁶

Another example of the power of Big Data is Google’s ability to predict influenza epidemics. By analyzing user searches for flu symptoms, it is able to predict outbreaks. There is even one report that Google was able to predict regional outbreaks of the flu up to ten days before the outbreaks were reported by the Center for Disease Control and Prevention in the U.S.¹³⁷ Google did not start out in the business of epidemiology. However, data enabled it to be a possible world leader in the field.

Google has found itself in this powerful data monopoly primarily on the back of a single innovation twenty years ago. However, it has no obligation or incentive to give access to its data, nor to explain how its algorithms function. The data we provide Google, and also Facebook, is extremely personal. In some way, each probably knows more about us than all our friends combined. Google knows what we say (Gmail), watch (YouTube), think (Google search), look like (Google Photos), buy (Google Wallet), where we drive (Maps), who we meet and where (Google Calendar), and it only just stopped short of wanting a live stream of our entire lives (Google Glass). This personal and sensitive aspect further illustrates the special nature of data as a commodity that makes it unlike any previous commodity controlled by centralized, commercial entities.

E. *Data as Something More*

These two case studies highlight the dark side to a data-opoly—the consequences of the monopolistic data control that Google and Facebook have over personal information, news media, information generally, and collective knowledge—to which neither competition nor consumer laws speak directly. To the civil rights advocate, the problem is that the personal data of the individual is being misused. To the economist, however, the problem is one of monopolistic prices and inferior goods.

135. Peter Marks, *Pixel 2: The Smartphone Age Is Over and Google Thinks AI Is Next*, ABC NEWS (Oct. 5, 2017, 3:19 AM), <https://www.abc.net.au/news/2017-10-05/google-pixel-2-heralds-the-ai-age/9018636>.

136. Reich, *supra* note 12.

137. Stucke & Grunes, *supra* note **Error! Bookmark not defined.**, at 7; see also Miguel Helft, *Google Uses Searches to Track Flu’s Spread*, N.Y. TIMES (Nov. 11, 2008), <https://www.nytimes.com/2008/11/12/technology/internet/12flu.html>.

Thus, the economic analysis is skewed towards the economic outcomes of data-opolies and how competition laws need to be re-tooled to better fit the anti-competitive nature of a monopoly when the subject matter is data. While higher prices and personal data privacy are serious, rectifying them will not resolve the problem of the power and control exercised by enterprises like Facebook and Google. At the other end, those in the mainstream and the more specialized financial press have been aware of the power and control issues of Facebook and Google, but have been largely unable to pinpoint the means through which the centralization of power was occurring: the data-opoly.

IV. SOLUTIONS

A. *Changing Our View of Data*

The value of digital technology, and Big Data in particular, as being amongst the world's greatest tools in a number of respects is only recently being discussed. Hagstrom predicts that "if the universe of data were suddenly made available, it would unleash the creativity of problem-solvers to combine different data sets—public and private—to develop innovative solutions to innumerable challenges."¹³⁸

Perhaps it is not surprising, then, that a likely reason we are not rectifying the quasi-monopoly control of data is because we have yet to recognize its intrinsic value. Instead, we have focused upon the downstream glitches—until now. What follows are some suggestions for possible solutions and are flagged here for further discussion. The common thread of these solutions is changing how we view data.

B. *Time Limiting Data*

One possible solution is the implementation of a mechanism—legal or computational—that imposes a time limit for preventing access to data. Collected data could be given a limited term, and once expired, the controller of the data would be compelled to make the data available for public consumption. So, for example, when a timestamped block of data reaches a certain maturity, say five years,¹³⁹ and if there are no privacy or security issues, then it is automatically rendered open access. This could act as the blunt tool that ultimately prevents companies from monopolizing their useful data.

138. Hagstrom, *supra* note 103.

139. This would not solve the problem of monopolized Big Data that has its value in its "velocity," such as traffic data. However, much of the big data collected now will still have relevance in 5 years—for example, data about the human body.

This idea is, of course, borrowed from the current regime that regulates data's first cousin, intellectual property.¹⁴⁰ Ever since its inception, intellectual property has experienced great difficulty in balancing the tension between encouraging innovation and preventing abuse of monopolistic power.¹⁴¹ This is analogous to the tension inherent to data-opolies. We recognize that data is useful and so on one hand we want to encourage its creation and collection, while on the other hand we want to allow access and disclosure of that data to the public. Currently, however, there is little reason for a company to share its data.¹⁴² Such a shift from privately controlled data to open access will subject data-opolies to the self-limiting mechanism in intellectual property: its term.

C. *Thinking of Data as a Commodity, Labor, or a Human Right*

Currently, the data-opolies do not offer their data for sale.¹⁴³ Amazon, Facebook and Google explicitly state they do not sell their users' data.¹⁴⁴ Instead, data is kept private for the benefit of the data-opolies. However, if a market were established for data as a commodity, then data would no longer be locked away but could be traded on the free market and applied where the market determined there was a need.

140. Graef, *supra* note 51, at 6 (finding that data and intellectual property are non-rivalrous goods).

141. This balance finds expression in the "bargain" of the patent regime. *See* *Teva Canada Ltd. v. Pfizer Canada Inc.*, [2012] 3 S.C.R. 625 (Can.) ("The patent system is based on a 'bargain,' or quid pro quo: the inventor is granted exclusive rights in a new and useful invention for a limited period in exchange for disclosure of the invention so that society can benefit from this knowledge. This is the basic policy rationale underlying the Act. The patent bargain encourages innovation and advances science and technology.").

142. *Background Note by the Secretariat*, *supra* note 32, at 28. The OECD report identified this option but went on to say that requiring a company to share data would be an extreme remedy, only to be used where no less intrusive alternatives existed. OECD *Executive Summary*, *supra* note 69, at 4. A very different view is expressed by Larry Lessig when talking about intellectual property and our fascination with absolute control, however. Lawrence Lessig, *Intellectual Property and Code*, 11 J. CIV. RTS. & ECON. DEV. 635, 638 (1996) ("[W]hile we protect real property to protect the owner from harm, we protect intellectual property to provide the owner sufficient incentive to produce such property. 'Sufficient incentive,' however, is something less than 'perfect control.'"). The Productivity Commission observed the same problem in the context of confidential pharmaceutical data. *See* AUSTRALIAN GOVERNMENT PRODUCTIVITY COMMISSION, INQUIRY REPORT NO. 78: INTELLECTUAL PROPERTY ARRANGEMENTS OVERVIEW & RECOMMENDATIONS 19 (2016).

143. Twitter is an exception. *See* Selina Wang, *Twitter Sold Data Access to Cambridge Analytica-Linked Researcher*, BLOOMBERG (Apr. 29, 2018, 2:26 PM), <https://www.bloomberg.com/news/articles/2018-04-29/twitter-sold-cambridge-analytica-researcher-public-data-access>.

144. *See Amazon Privacy Notice*, AMAZON, <https://www.amazon.com/gp/help/customer/display.html?nodeId=201909010> (last updated Aug. 29, 2017); *Does Facebook Sell My Information?*, FACEBOOK, <https://www.facebook.com/help/152637448140583> (last visited Aug.

In a similar way, it is also possible to view data as the labor of the user who provided it. According to researchers studying a system for measuring the value of individual data contributions, “[d]ata is labour.”¹⁴⁵

In some scenarios, in times of a humanitarian crisis for example, data is also starting to be understood as a human right.¹⁴⁶ Elevating data to this position of reverence would change the mindset of both society and the data-opolies. Such a shift in how data is viewed would encourage data reform.

D. Blockchain Technology

The answer may not lie solely in the traditional legal frameworks, however. As the volume of data collected surges and the nature of data changes—as it is derived from increasingly complex and extensive global networks—it appears that building an automated computational system to regulate the data itself would be adequate to curb the effects of data-opolies.

Blockchain is a very recent digital technology that employs an “open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way.”¹⁴⁷ The transactions are recorded in data sets, called blocks, which are linked to each other by unique hash codes, generated and timestamped by the data block itself.¹⁴⁸ Blockchain technology is supremely well suited¹⁴⁹ to solve the problem of monopolization of Big Data: (1) it is by definition decentralized and distributed;¹⁵⁰ (2) it runs by unsupervised automated code—the best way

22, 2019); *Privacy*, GOOGLE, <https://support.google.com/googlecloud/answer/6056650?hl=en> (last visited Aug. 22, 2019).

145. See generally E. Glen Weyl, et al., *Should We Treat Data as Labor? Moving Beyond “Free,”* 108 AM. ECON. ASS’N PAPERS & PROC. 38 (2018).

146. See generally FAINE GREENWOOD ET AL., HARV. HUMANITARIAN INITIATIVE, *THE SIGNAL CODE: A HUMAN RIGHTS APPROACH TO INFORMATION DURING CRISIS* (2017), https://hhi.harvard.edu/sites/default/files/publications/signalcode_final.pdf.

147. Marco Iansiti & Karim R. Lakhani, *The Truth About Blockchain*, HARV. BUS. REV., Jan.–Feb. 2017, at 118. <https://hbr.org/2017/01/the-truth-about-blockchain>.

148. See ARVIND NARAYANAN ET AL., *BITCOIN AND CRYPTOCURRENCY TECHNOLOGIES: A COMPREHENSIVE INTRODUCTION* 11–12 (2016).

149. At its heart, blockchain technology provides a system whereby people and agents can interact in a trusted and virtually frictionless transactional system. Although a very new technology, it is already recognized—even hyped—to be particularly applicable for use in currency, voting, data privacy management, and legal transaction of property. See *Distributed Organization*, SYS. ACAD., <http://complexitylabs.io/blockchain-distributed-organization/> (last visited Aug. 22, 2019).

150. Blockchain technology distributes the load of data storage, thus dispensing of the previously inhibitory capital costs for newcomers. See *id.*

to regulate something of the massive scale of Big Data;¹⁵¹ (3) it deals with data, which is precisely the subject of the monopolization; and (4) it can employ token economics¹⁵² and smart contracts.¹⁵³

Currently, most digital platforms we use are within the Web 2.0 framework which is comprised of companies such as Google and Facebook vacuuming up any and all data we generate and storing them on centrally controlled data servers. However, researchers and designers anticipate Web 3.0, where digital platforms such as Ethereum¹⁵⁴—which are open-sourced and decentralized—can be used to run platforms previously only provided by centralized businesses. This will also solve the barrier of large data storing infrastructure.¹⁵⁵ The large servers needed to physically hold the data, and the human experts and development required to undertake the “deep” analysis is costly.¹⁵⁶ For example, Microsoft considered it necessary to outlay \$4.5 billion USD into “developing its algorithms and building the physical capacity necessary to operate Bing”¹⁵⁷ in its attempt to compete in the search engine market.

151. The scale of the big data is so great that the execution, enforcement, and administration of regulations can only be realistically performed by unsupervised computational regulation, whether it be using blockchain or artificial intelligence. It is simply impossible for a human to comb over such large and fluctuating data to determine whether it meets the definition of monopolized Big Data.

152. If a market was established for data as a commodity, then it could be traded and applied where the market determined there was need. The blockchain could use token economics to attempt to solve this using traditional economics. However, an added benefit of token economics is that of a multivalued and fully fungible economy, allowing us to represent value otherwise not well captured by traditional economics such as environmental or humanitarian value.

153. Smart contracts are the second generation blockchain. The additional feature is that the blockchain also contains executable code on the blockchain in this same distributed way. The smart contract is both defined and enforced by the code, without discretion. So more than just a passive distributed ledger, second generation blockchains with smart contracts can perform contractual obligations. For example, a smart contract can issue the access code for a house once the accommodation fee is paid.

154. Ethereum is an open-source public blockchain distributed computer platform featuring smart contracts. It was only recently created in a 2013 white paper, then went live one year later. *Who Created Ethereum?*, BITCOIN MAG., <https://bitcoinmagazine.com/guides/who-created-ethereum> (last visited Aug. 22, 2019).

155. Data storage infrastructure involves significant costs. *Background Note by the Secretariat*, *supra* note 32, at 11 (“[T]he information technologies required to store and process the data can be very costly, involving vast data centres, servers, data-analytical software, internet connections with advanced firewalls and expensive human resources, such as computer scientists and programmers.”).

156. In 2016, Amazon, Google and Microsoft spent \$32 billion USD in capital expenditure and capital leases. AUSTL., *supra* note 107.

157. *The FTC Report on Google’s Business Practices*, WALL ST. J. (Mar. 24, 2015, 7:40 PM), <http://graphics.wsj.com/google-ftc-report/> (stating that Microsoft invested over \$4.5 billion into developing Bing on page 76 of the memorandum prepared by staffers at the Federal Trade Commission); Stucke & Grunes, *supra* note 33, at 5.

Accordingly, under Web 3.0, the data exhaust generated by users is no longer controlled by a centralized, commercial entity. Instead, the massive amounts of data may be managed by the user or society collectively. The problem then is no longer one of accessing data that is useful, but what we do with that data. This provides a huge opportunity to employ blockchain technology to very efficiently manage the full potential of Big Data to change our lives.

CONCLUSION

The creation of digital powerhouses such as Google, Amazon, Apple, Microsoft, and Facebook has been largely due to a data-driven network effect. Traditionally, mitigating network-effected markets has been problematic. Mitigation has proved even more difficult in the case of data monopolies because the data itself is not openly traded.

More consequential, however, is that data is unlike other goods or services that have been monopolized previously. Data has inherent value. As more of our activities are being digitized, the Big Data being generated is proving to be a powerful tool across fields as varied as curing disease, feeding the hungry, reducing gender inequality, strengthening national security, and improving environmental and disaster responses. Thus, when large volumes of data are marshalled and monopolized, there is more at stake than simply higher prices and poor privacy policies.

The advent of the internet and digital technology is likely to be the defining feature of the history of humankind in this century. Its promise is great and so too is its potential for misuse. If data is to be the driving force behind this new technology, we must manage it well with the implementation of new laws for the purpose of preventing the misuse of data. Alternatively, we could possibly even look to digital technology itself to build an automated computational system of regulation.

