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Guidepost: The Evolution of Research on Industry Platforms

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Guidepost: The Evolution of Research on Industry Platforms

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Abstract:	<p>Industry platforms have become an increasingly popular topic. Scholars in fields ranging from economics and strategy to operations management, marketing, law, and computer science all are contributing to the growing body of research. Several previously separate streams in the strategy field seem to be converging around platform dynamics, business models, and ecosystems. The topic also has attracted considerable attention in the media at least in part because the most valuable companies and the first trillion-dollar businesses are built around industry platforms – Apple, Microsoft, Alphabet-Google, Amazon, Facebook, Tencent, and Alibaba. At the same time, dominant platforms have come under increasing scrutiny for their accumulation of market power as well as abuses or misuses of that power. What specifically are platform businesses and how did they become a focus of such broad and intense inquiry? What gaps remain in the research? These questions are the subject of this essay.</p>

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The Evolution of Research on Industry Platforms

Michael A. Cusumano
MIT Sloan School of Management

Keywords: Platform strategy | Ecosystems | Business models | Open innovation | e-commerce

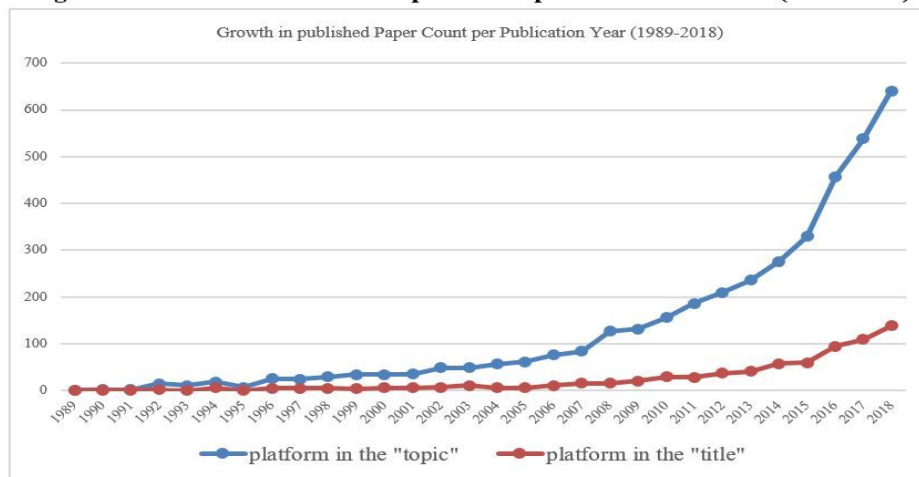
Abstract

Industry platforms have become an increasingly popular topic. Scholars in fields ranging from economics and strategy to operations management, marketing, law, and computer science all are contributing to the growing body of research. Several previously separate streams in the strategy field seem to be converging around platform dynamics, business models, and ecosystems. The topic also has attracted considerable attention in the media at least in part because the most valuable companies and the first trillion-dollar businesses are built around industry platforms – Apple, Microsoft, Alphabet-Google, Amazon, Facebook, Tencent, and Alibaba. At the same time, dominant platforms have come under increasing scrutiny for their accumulation of market power as well as abuses or misuses of that power. What specifically are platform businesses and how did they become a focus of such broad and intense inquiry? What gaps remain in the research? These questions are the subject of this essay.

The Evolution of Research on Industry Platforms

Industry platforms have become an increasingly popular topic (Figure 1). Scholars in fields ranging from economics and strategy to operations management, marketing, law, and computer science all have contributed to the growing body of research (Jia, Cusumano, and Chen, 2019). Several previously separate streams in the strategy field seem to be converging around platform dynamics, business models, and ecosystems (Massa, Tucci, and Afuah, 2017; Jacobides, Cennamo, and Gawer, 2018). The topic also has attracted considerable media attention at least in part because the most valuable companies and the first trillion-dollar businesses are built around industry platforms – Apple, Microsoft, Alphabet-Google, Amazon, Facebook, Tencent, and Alibaba. At the same time, these and other platform companies have come under increasing scrutiny for their accumulation of market power as well as abuses or misuses of that power (Khan, 2017; Conger, Dance, and Isaac, 2019).

Figure 1. Growth of Published Paper Count per Publication Year (1989-2018)



Note: The literature search was conducted in Web of Science Core Collection. The indexes for the Web of Science include: Social Sciences Citation Index (SSCI) --1956-present. The search uses "platform" as keywords in 3 subject fields (Management; Business; and Economy).

Source: Jia, Cusumano, and Chen (2019).

What are the main characteristics of platform businesses and how did they become a focus of such broad and intense inquiry? What major gaps in the research remain and what topics should scholars tackle next? These questions are the subject of this essay.*

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ORIGINS AND EVOLUTION OF PLATFORM RESEARCH

For the origins of platform research, we usually go back to the 1980s, when several economists began to write about the peculiarities of “two-sided markets” driven by “network externalities” (Katz and Shapiro 1985, 1986; Farrell and Saloner 1986), or earlier work at AT&T (Rohlf, 1974; Schmalensee, 2011). Economists initially used phrases such as external economies or network externalities or to indicate that the value of a good or service such as the telephone (a “one-sided” platform linking users with other users) came primarily from an outside factor, for instance, the growing number of users or of complementary products (a second “market side”). Scholars came to use the term “network effects” when referring to positive feedback loops with increasing returns that users experience when there is an externality (Liebowitz and Margolis, 1994, 1998).

Management researchers picked up the topic of multi-sided markets and network externalities in the early 1990s and gradually began referring to the core products or technologies as “platforms” (Cusumano, 2010a, 2010b). Use of this term built on the idea of a “product platform” from industries such as automobiles and consumer electronics, where a firm could build families of related products around common components (Meyer and Lehnerd, 1997). However, one distinguishing feature of *industry platforms* is the ability to generate “indirect” or “cross-side” network effects, such as between users and third-party complementors. The contrast was to “direct” or “same-side” network effects, such as user to user within the telephone network or a social media or messaging platform. A second distinguishing feature was that complementors to an industry platform generally joined an “ecosystem,” such as to build applications for a Windows PC or Google Android smartphone, without the formal supplier contracts required for a company’s product platforms (Gawer, 2014; Gawer and Cusumano, 2014).

My initial foray into industry-level platform research came in 1992 with an analysis of how network externalities in video-cassette recorders through complementary products (prerecorded tapes) and a broad licensing strategy led to the dominance of the VHS standard from Japan Victor Corporation over Sony’s Betamax (Cusumano, Mylonadis, and Rosenbloom, 1992). The power of network externalities became even clearer in the personal computer industry and then Internet browsers and what we today call smartphones and app stores (Cusumano and Selby, 1995; Cusumano and Yoffie, 1998; Gawer and Cusumano, 2002). More recently, my co-authors and I summarized what we and other researchers have learned about platform market dynamics, strategy, and business models. We proposed a simple typology,

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3 published in *The Business of Platforms* (Cusumano, Gawer, and Yoffie, 2019). The remainder of this article
4 summarizes some key findings and then discusses two areas for further research.
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8 **DEFINITIONS, TYPOLOGIES, AND EVOLUTION TO MULTIPLE “SIDES”**

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11 One ongoing problem is that researchers use the word platform in different ways. Gawer and
12 Cusumano (2002), for example, defined platforms as system-like products or technologies that increased
13 in value with external complementary innovations. We can see this when compatible software
14 applications complement operating systems, Internet browsers, or personal digital assistants and
15 smartphones. Over the past two decades, scholars and the media expanded use of the term to refer to
16 online marketplaces such as at Amazon, Alibaba, and eBay, as well as Internet applications such as Google
17 search (with AdWords), Facebook’s social media and messaging properties, and then sharing-economy
18 services like Uber and Airbnb. But why do we refer to all these different businesses as *platforms*?
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21 A good answer is in a definition proposed by Eisenmann, Parker, and Van Alstyne (2006):
22 “Products and services that bring together groups of users in two-sided networks are platforms.” We
23 should add that linking two or more market sides generates cross-side network effects (e.g., users to
24 innovators, or buyers to sellers). These types of network effects, which extend across more than two
25 market sides, are a common feature of all industry platforms (Cusumano, Gawer, and Yoffie, 2019). In
26 short, platforms are distinctive businesses in which the more one side of the market is populated (such as
27 users), the more valuable the platform becomes to other sides (such as app developers or sellers and
28 advertisers).
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31 But a second problem is that scholars cannot agree on how many distinct types of platforms and
32 business models there are. We have “invisible” software platforms like operating systems (Evans, Hagiu,
33 and Schmalensee, 2006) as well as online “marketplaces” (Evans and Schmalensee, 2016) – which seem
34 very different. We have “intermediaries” that connect labor, machines, and data or that aggregate market
35 players (Parker, Van Alstyne, and Choudary, 2016). Some researchers define platforms simply as
36 “interfaces” that connect two or more market participants (McIntyre and Srinivasan, 2017). Others have
37 tried to categorize platforms by the type of value creation, such as “co-creation” with ecosystem partners
38 (Fehrer, Woratschek, and Brodie, 2018) or degree of platform “openness” to third parties versus control
39 by the platform owner (Eisenmann, Parker, and Van Alstne, 2009; Boudreau, 2010). We even have
40 research that argues there are six different kinds of marketplaces (Tauscher and Laudien, 2018).
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3 In *The Business of Platforms*, we decided to divide all platforms into two types, based on their
4 primary function and approach to value creation. The first type we call *innovation platforms*. These
5 include the multi-sided businesses we saw with personal computers and PDAs and smartphones
6 (Cusumano and Selby, 1995; Gawer and Cusumano, 2002). They resemble the “software platforms” later
7 described by Evans, Hagiu, and Schmalensee (2006), but can include hardware features, such as the
8 combination of an operating system with a particular microprocessor or physical product design. The
9 multi-sided connection and network effects appear because the value of the platform increases with each
10 additional complement, such as a software application, which the platform owner or outside firms can
11 produce. The second type we call *transaction platforms*. These connect two or more market sides for the
12 purpose of linking buyers and sellers, exchanging information, or arranging for purchase or rental of a
13 product or service. These platforms include social media properties as well as “matchmaker” businesses
14 as described by Evans and Noel (2005) and Evans and Schmalensee (2016). They include credit cards as
15 described in a recent Supreme Court briefing (Supreme Court of the United States, 2018).
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25 Notably, the most valuable and powerful platform companies (Microsoft, Apple, Amazon,
26 Alphabet-Google, Tencent, and Facebook) have followed *hybrid strategies* – they have both innovation
27 and transaction platforms and benefit from connecting different types of platform businesses. For
28 example, Apple has both the iPhone and iOS operating system as well as the App Store transaction
29 platform, in addition to the Macintosh personal computer and iPad tablet. Amazon has both an online
30 store and Amazon Marketplace as well as Amazon Web Services, a cloud-computing service but also a
31 popular development environment for building web applications, in addition to the Kindle and Alexa
32 hardware platforms. Facebook and WeChat (owned by Tencent) focus on social media and messaging,
33 but their application programming interfaces (APIs) provide access to millions of applications and external
34 sources of digital content. WeChat also benefits greatly from a payment platform and marketplace
35 investments, as does Alibaba.
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44 A third problem in the research has been the lack of large-sample data on the performance of
45 platform companies over time and comparisons to non-platform businesses. As a first attempt to rectify
46 this gap, Cusumano, Gawer and Yoffie (2019) analyzed the Forbes Global 2000 list of companies. We
47 identified 43 public firms in 2015 that derived at least 20 percent of their revenues from businesses driven
48 by network effects related to the personal computer, Internet, or mobile device platforms. We then
49 compared their performance between 1995 and 2015 to a control sample of 100 non-platform firms in
50 the same businesses (Table 1). The two samples had roughly the same level of median annual revenues
51 (about \$4.5 billion). However, platform companies achieved these sales with *half the number of*
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employees. Platforms were also *twice as profitable, growing twice as fast, and more than twice as valuable*, probably because they leveraged employees and assets outside the firm. We also estimated that 60 to 70 percent of the billion-dollar private “Unicorn” startups were platform businesses, with many investors and entrepreneurs looking for the next blockbuster platform. Yet simply finding sides to match and creating an industry platform was no guarantee of success. We identified 209 public and private platforms that competed with these 43 success stories and either failed or disappeared as independent firms.

Table 1. Median Values for Forbes Global 2000 Industry Control Sample and Platforms, 1995-2015

Variable	Industry Control Sample	Industry Platforms
Number of Firms	100	43
Sales (Million\$)	\$4,845	\$4,335
Employees	19,000	9,872***
Operating Profit %	12%	21%***
Market Value (Million\$)	\$8,243	\$21,726***
Mkt Value-Sales Multiple	1.94	5.35***
Sales Growth vs. Prior Year	9%	18%***
Observations	1,018	374

Source: M. A. Cusumano, A. Gawer, and D. B. Yoffie, *The Business of Platforms* (2019), p.23. This data is also cited in Cusumano, Yoffie, and Gawer 2020 and Cusumano 2020.

Notes:

***Differences significant at $p < 0.001$ for Industry Sample vs. Platforms using two-sample Wilcoxon rank-sum (Mann-Whitney) test.

Mkt Value-Sales Multiple = ratio of market value compared to prior year sales.

Average of 13 years of data for 18 innovation platforms and 5 years for 25 transaction platforms.

Several factors influence whether or not a platform business does well financially or wins all or most of its market. As described in Eisenmann, Parker, and Van Alstyne (2006), first, there need to be strong network effects that keep the sides interacting. Second, the market should not be too fragmented with differentiated or niche competitors. Third, users and complementors, including supply-side participants, should mostly stay with one platform rather than use multiple platforms for the same purpose (called “multi-homing”). Fourth, as in any business, entry barriers such as technical standards or economies of scale need to be high to limit the intensity of competition (Parker, Van Alstyne, and Choudary, 2016; Cusumano, Gawer, and Yoffie, 2019).

Managers and entrepreneurs also need to determine which market side is most important to attract another side. This “trigger” side needs to be free or very easy to access. As usage on that side builds up, then the other side will expand if there is increasing utility – the positive feedback loop (network effect). But how to identify the most important side and generate strong network effects *ex ante* is not so

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3 easy. Not surprisingly, researchers commonly term this dilemma the “chicken-or-egg” problem (Calliaud
4 and Jullien, 2003; Evans, Hagiu, and Schmalensee, 2006).

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6 What decisions entrepreneurs and strategists make can greatly influence whether or not their
7 platforms succeed. For examples: Steve Jobs failed to understand the importance of third-party
8 applications and charged outside developers, whereas Bill Gates made the software development kit
9 (SDK) for DOS and then Windows free. The paucity of applications is a big reason (along with a high price
10 and no licensees) why the Apple Macintosh, introduced in 1984, lost out to DOS (introduced in 1981) and
11 then Windows computers (introduced mainly from 1990) in market share (Cusumano, 2010b; Yoffie and
12 Cusumano, 2015). Mark Zuckerberg understood that he had to build his social network around a large
13 number of users, so he made user access (side one) free. He soon began to charge advertisers (side two)
14 and then opened up the platform for free to application developers (side three) and content partners
15 (side four). Google gave away for free the Android smartphone operating system to handset makers (side
16 one) and the SDK for app developers (side two) but charged advertisers (side three).

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18 One solution to the chicken-or-egg problem is to provide standalone value to one market side and
19 then get other companies to support the company’s product, service, or technology as a core solution to
20 a broad industry problem. Google did this with its Internet search toolbar. Intel and Microsoft did this
21 with the x86 microprocessor and DOS/Windows licenses for creating IBM-compatible personal computers.
22 Gawer and Cusumano (2008) have referred to this strategy as “coring,” which occurs when a new platform
23 emerges. But, if the platform company must heavily subsidize two market sides (such as Uber and Lyft
24 have done by making payments to drivers separate from ride commissions and keeping prices below the
25 market rates set by taxis), then the platform is likely to lose money. The bigger the platform gets, the
26 more money it may lose because “platformizing” a bad business does not make it a good business. We
27 can see this clearly with the gig or sharing economy platforms. Sharing taxis rides, walking pets, delivering
28 food and groceries, renting household tools, or cleaning houses are not, in the normal economy, highly
29 profitable businesses. They are also not digital businesses; they are physical services that can be expensive
30 to deliver, and most often they are local. Unless platforms can use digital technology to bring new scale
31 and scope economies to their activities, then even creating a digital interface to process orders and
32 payments, like Uber, Lyft, TaskRabbit, and other platform startups have done, does not change the
33 basically bad economics of the business (Cusumano, 2020).

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AREAS FOR FURTHER (AND MULTI-DISCIPLINARY) RESEARCH

Researchers are tackling many issues since platform studies become more mainstream. Literature reviews exist (for example, McIntyre and Srinivasan, 2017; and Jia, Cusumano, and Chen, 2019). There is also an annual conference on platform strategy research at Boston University. However, in two areas, at least, economists and management scholars, as well as lawyers and government regulators, need to collaborate more closely to make platform businesses more successful and acceptable in the future.

How Better Measure and Manage Platform Performance?

It would be useful to know if platform strategies and business models significantly increase the likelihood of growth, profits, market value, or firm survival over the long term, compared to non-platform companies. We associate platforms with linking multiple market sides rather than selling a standalone product or service, and growing through network effects rather than relying mainly on in-house investments in R&D or marketing. But we hear mostly about success stories and not the myriad of failures.

For example, to create the sample of 43 publicly-listed platforms summarized in Table 1, Cusumano, Gawer, and Yoffie (2019) used annual reports and other information to identify 209 public and private firms that competed with these platforms but failed or disappeared as independent companies. That would be a survival rate of 17 percent, crudely measured. This number does not compare well to the estimated survival rate of about one-quarter for high-tech startups, though it is better than the common assumption that 90 percent of new ventures will fail (Gage, 2012). But how many more failures of public and private platform ventures were there? How many of the public platform companies will survive for multiple decades? What are the common mistakes and how could some firms have avoided failure? Another issue is to what extent investors such as Softbank have temporarily inflated the market values for platform ventures, which offer the potential for exponential growth but also exponential increases in losses? At the core of these questions such as why, when, and how should we expect platforms to be more efficient or robust than non-platform companies? And is it possible for entrepreneurs, managers, and investors to identify and manage these businesses and market opportunities more effectively?

We need a larger sample of companies to answer these and other questions about platform performance, operations, and strategic management. However, we first need more consensus on what constitutes an industry platform. We also need to separate out platform from non-platform business units within diversified firms. For example, in *The Business of Platforms*, we used 20 percent of revenues as a threshold to determine if a company was a platform business or not. But is this the right number? If we

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3 had set the threshold to 50 percent of revenues, then many fewer companies would have qualified as
4 platforms and we would not have been able to do much statistical analysis. We also found it extremely
5 difficult to measure network effects reliably from publicly available data. Another challenge is to tie
6 network effects to the ability of a business to generate revenues and profits versus other factors, such as
7 product quality or brand.
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11 For example, Amazon (established in 1994), for most of its history, has derived more than half its
12 revenues from an online store. The store is not a two-sided platform since Amazon buys and resells goods
13 itself (Hagiu and Wright, 2013). According to the company's annual reports, only since 2015 have the
14 majority of Amazon's retail sales shifted to its two-sided marketplace, launched in 1999-2000. Amazon
15 first met the 20 percent threshold in 2003, when 22 percent of retail sales came from the marketplace.
16 But should we say that Amazon did not become a platform business until 2015? We may also over-
17 estimate the value of Amazon's retail businesses since, over the past decade, the vast majority of
18 Amazon's profits have come from Amazon Web Services, which is neither a store nor a marketplace, but
19 rather an innovation platform and cloud service. Nor does Amazon publish data on the number of Kindles
20 sold, which makes it impossible to measure network effects for this platform.
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24 Similarly, it is difficult to distinguish how much of Apple's revenues and profits come from its
25 brand and superb product designs, which allow the company to charge a premium. We can still argue
26 that Apple's revenues and profits depend on network effects and the ecosystem that provides millions of
27 third-party innovations through the App Store; the iPhone has little value without these applications. But
28 Apple also adds value with its product designs as well as its online digital store, iTunes, and other services
29 such as iCloud, and the iPad tablet. So how much of Apple's revenues and profits come from industry-
30 level network effects versus the strength of the iPhone as a product and Apple's broader portfolio
31 strategy? It is difficult to say.
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35 Another issue is how platforms compete. One way is through network effects that impact a
36 platform's *demand side* (such as the number of Facebook, iPhone, Uber, or Airbnb users). But network
37 effects also exist on the *supply side* (such as the number and quality of apps or the number and reliability
38 of drivers and room providers) (Chegu et al., 2020). For example, Uber and Lyft appear very similar in
39 terms of drivers and rides, and so they compete largely on price and scale, and have difficulty generating
40 a profit. By contrast, Airbnb can offer diverse overnight stay properties and compete more on the basis
41 of variety, quality, and location than on price. Similarly, Upwork, the skilled staffing platform, qualifies
42 only two percent of applicants seeking jobs and competes on dimensions such as quality, reliability, and
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3 strength of its corporate client base on the demand side. By contrast, some other staffing platforms allow
4 anyone to upload their resumes and compete more on scale of their supply sides (Minor and Yoffie, 2018).
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8 **Have Successful Platform Businesses Become *Too* Successful?**

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10 Platform researchers began by studying the peculiarities of two-sided markets and businesses
11 driven by network effects. We have made some progress in definitions and typologies, and we now have
12 some data on platform performance. However, many gaps in our knowledge remain. For example, much
13 of the academic literature seems to assume that digital platforms are good for entrepreneurs, investors,
14 and consumers. Although the business media has been more skeptical, many scholars focus on how to
15 optimize platform strategies, business models, and ecosystem development. But we really do not know if
16 platforms do more harm than good to society over the long term.
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21 Let's go back to Amazon, a familiar example in the news now almost every day. As an online store
22 and a company with both transaction and innovation platforms as well as a variety of digital services,
23 Amazon offers low prices and access to an extraordinary number of products, estimated to number about
24 500 million. Yet, as Amazon has grown, many small and large retail competitors have struggled or gone
25 out of business. Amazon also seems to give preference on its search engine to its own private-label goods
26 and has been accused of using information from its marketplace to make decisions on what goods to
27 supply on its own (Mattioli, 2020; Dudley, 2020; Satariano, 2020). Amazon accounts for about 40 percent
28 of online commerce, but it has merely four percent of total retail revenues in the United States, keeping
29 it largely beneath the radar of U.S. antitrust regulators. As Amazon moves deeper into groceries, clothing,
30 pharmaceuticals, digital media, and other businesses, how many more firms (and potential consumer
31 choices) will disappear?
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40 We have seen similar questions and complaints with regard to Microsoft (which has over 90
41 percent of the PC operating system market and has tied its browsers, Office suite, servers, media players,
42 and other products to Windows); Alphabet-Google (which has 80 percent of the smartphone operating
43 system market and also owns YouTube, Gmail, Google Maps, etc., and has tied these products and services
44 together in order to generate add revenue as well as been accused of giving preference on its search
45 engine to Google properties); and Facebook (which has billions of users and also owns the Instagram and
46 WhatsApp messaging platforms). We can also ask about the impact of struggling enterprises such as Uber
47 and Lyft (which have recycled billions of dollars in venture capital to subsidize their money-losing
48 operations) on traditional taxis or investors in taxi medallions. Or what has been the impact of Airbnb on
49 housing availability and real-estate prices or the value of hotel chains?
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3 Platform ventures attract investors and entrepreneurs at least in part because network effects
4 provide the potential for exponential growth and a Winner-Take-All-or-Most market outcome. But many
5 platforms that dominate their industries have created puzzles for anti-trust authorities as well as
6 regulators concerned with local or sectoral laws and labor policies (Khan, 2017). Is Uber a taxi business
7 and Airbnb a hotel business, or should governments view them as technology companies? Are Uber and
8 Lyft drivers independent contractors or should the government consider them as employees, entitled to
9 healthcare, unemployment insurance, and other benefits?

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15 E-commerce and social media platforms like Amazon, Alibaba's Taobao, Facebook, Tencent's
16 WeChat, and Twitter also have accumulated enormous amounts of data on their users (personal and
17 transactional), and they have given access to these data to other market actors (advertisers, app
18 developers, digital partners) and some government agencies. When should governments step in and
19 impose more regulation on these firms and the data they have collected? Do digital platforms with billions
20 of users and exponential growth potential require special treatment or special regulations? Or will
21 regulation of digital platforms overly restrict innovation (Thierer, 2013)? We also see different policies in
22 Europe, China, and the United States, even though most digital platforms operate in an online world with
23 no clear physical boundaries.

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30 Corporate social responsibility and government obligations to regulate "social goods" and "public
31 utilities" are not new topics. However, the giant digital platforms that we see today pose new challenges
32 for researchers, managers, and policy makers. We need more research on the total costs and benefits of
33 platform businesses to users and society, and not only to investors. Managers and entrepreneurs need to
34 know more about how they can launch, grow, manage, and globalize such powerful entities without
35 damaging the users and economies on which they depend. We argued in *The Business of Platforms* that
36 platforms should incorporate "self-curation" of digital content as well as "self-regulation" of their
37 competitive behavior and operating policies, such as for data privacy and protection. But we also argued
38 that these policies are likely to be insufficient. Companies need to cooperate with governments, and the
39 latter need to understand better how to regulate powerful platforms that have the potential to do
40 significant harm as well as good.

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48 In sum, platforms are here to stay. Once entrenched, they are difficult to dislodge. They also
49 provide the essential foundations of our digital world. But we now live in a multi-sided world, where many
50 digital products, services, and platforms are interdependent and tied together in complex ways. We have
51 made progress in research, but we have only begun to understand how to harness and regulate the
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3 powerful forces – multi-sided market dynamics and network effects – that have made industry platforms
4 such an important and intriguing area of study.
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Author Bio

Michael A. Cusumano (cusumano@mit.edu) is Deputy Dean and the SMR Distinguished Professor of Management at the MIT Sloan School of Management. His research focuses on platform strategy and entrepreneurship in software and other digital businesses, as well as automobiles and consumer electronics. He is the author or co-author of more than 100 articles and 14 books, including *The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power* (2019, with A. Gawer and D. Yoffie).