

The political economy of Facebook's platformization in the mobile ecosystem: Facebook Messenger as a platform instance

Media, Culture & Society

1–23

© The Author(s) 2018



Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/0163443718818384

journals.sagepub.com/home/mcs**David B Nieborg** 

University of Toronto, Canada

Anne Helmond 

University of Amsterdam, The Netherlands

Abstract

Facebook's usage has reached a point that the platform's infrastructural ambitions are to be taken very seriously. To understand the company's evolution in the age of mobile media, we critically engage with the political economy of platformization. This article puts forward a conceptual framework and methodological apparatus to study Facebook's economic growth and expanding platform boundaries in the mobile ecosystem through an analysis of the Facebook Messenger app. Through financial and institutional analysis, we examine Messenger's business dimension and draw on platform studies and information systems research to survey its technical dimension. By retracing how Facebook, through Messenger, operationalizes platform power, this article attempts to bridge the gap between these various disciplines by demonstrating how platforms emerge and how their apps may evolve into platforms of their own, thereby gaining infrastructural properties. It is argued that Messenger functions as a 'platform instance' that facilitates transactions with a wide range of institutions within the boundaries of the app and far beyond.

Keywords

Facebook, infrastructure, mobile apps, multi sided markets, platform, platform instance, political economy

Corresponding author:

Anne Helmond, University of Amsterdam, 1012 XT Amsterdam, The Netherlands.

Email: a.helmond@uva.nl

Introduction

Advertising-driven platforms such as Google and Facebook are offered as prime examples of businesses that have shown an unprecedented ability to grow their user and partner base and to expand into markets far and wide. Critical media theorists (Srnicek, 2016), mainstream economists (Haucap and Heimeshoff, 2014), and software and platform studies scholars (Bechmann, 2013) point toward the inherent inequalities that constitute the political economy of digital platforms. We contribute to these critiques by offering an analytical framework to examine the evolution, that is, the *economic growth* and *technological expansion*, of digital platforms.

In this article, we will focus on Facebook, which next to sporting 2.13 billion monthly active users (FBE2018) is in the global top 10 in terms of market capitalization.¹ One of Facebook's economic growth drivers has been the rapid diffusion of mobile media (Goggin, 2014). Since 2013, Facebook's suite of mobile apps – chief among which are Facebook, Messenger, WhatsApp, and Instagram – occupied the global top 5 of most downloaded apps in the iOS (Apple) and Play (Google) app stores (APP2014; APP2015; APP2016; APP2017; APP2018a). In a matter of years, mobile advertising has become Facebook's primary revenue driver, representing 88% of its total advertising revenue (US\$39,942 million), which in itself constitutes 98% of its total revenue in 2017 (FBE2018).

While Facebook's relentless growth reflects the company's ability to rapidly transform in light of emerging technologies, competing platforms, and changing user practices, we will argue that these growth figures mask how Facebook contributes to the 'platformization of infrastructure' and the 'infrastructuralization of platforms' (Plantin et al., 2018). That is, how Facebook extends its boundaries – for example, via plug-ins or integrating services, a process theorized as 'platformization' (Helmond, 2015) – into the mobile app ecosystem. Historically, the process of platformization primarily concerned platforms extending into the web and pulling web data back into the platform. In this article, we build on this theory by asking how this process unfolds in the mobile ecosystem, through an analysis of the Facebook Messenger app (hereafter: Messenger).

Our analytical framework breaks down into two parts. On one hand, there is Facebook's role, position, and transformation as a public company, or the *business* dimension of its platform. Drawing on multisided market theory (Gawer, 2014; Rochet and Tirole, 2003), we account for the platform's economic growth by surveying which institutions Messenger partners with. On the other hand, we consider Facebook's *technical* platform dimension as a programmable computing system (Bogost and Montfort, 2009: 2). This means that we examine how the company expands itself infrastructurally, through Messenger, into the app ecosystem by offering a set of application programming interfaces (APIs), software development kits (SDKs), and plugins, which facilitate Messenger's, and therefore the platform's, programmability. Through financial and institutional analysis, we examine Messenger's business dimension and we draw on platform studies and information systems research to study its technical dimension. With 1.3 billion daily active users, who have over 7 billion conversations per day (FBM2017f), Messenger is of particular interest because it displays Facebook's ambitions to, in the words of Facebook CEO Mark Zuckerberg, position its 'family of apps'

as ‘ubiquitous utilities’ (FBE2015a; FBE2016a). Infrastructural ambitions such as these, coupled with the fact that Facebook’s messaging apps are in a crucial phase of development and diffusion, open the door for policy interventions and call for future research on platform evolution.

Studying Facebook: from social network to data infrastructure

Before we examine Messenger’s position in the wider app ecosystem, let us start with a deceptively simple question: What is Facebook? As we aim to expand our inquiry and go beyond Facebook’s main website, we want to challenge the colloquial understanding of Facebook as a social network *site*. A clear understanding of Facebook’s growth and boundaries is complicated by the company’s – that is, their key executives’ – self-description, ranging from a ‘social directory’ to a ‘social utility’ to the ‘core social infrastructure’ of the web (Hoffmann et al., 2018: 204–205). Whereas Facebook executives tend to play up its empowering potential for users as citizens, investors and business analysts are constantly reminded of the monetary potential of users as consumers and targets of advertising (Hoffmann et al., 2018). These alternating rhetorical interventions aim to normalize the company’s infrastructural ambitions and prevent a coherent analytical framework that accounts for the platform’s expanding boundaries.

Facebook’s prominence coincides with a marked increase in scholarly interest, to the extent that half of social media scholarship in the social sciences focuses on Facebook (Stoycheff et al., 2017). This sizeable body of work tends to follow Zuckerberg’s emphasis on user-to-user interaction and the platform’s supposed emancipatory promise: only 3.2% of these studies focus on organizational and corporate issues and relationships (Stoycheff et al., 2017). What is more problematic is that this body of work understands Facebook as a singular, user-facing website. For example, in their review of 114 Facebook-related studies, Caers et al. (2013) refer to Facebook as ‘the website Facebook.com’. Similarly, in their literature review, Wilson et al. (2012) identify 412 articles that ‘assess the impact of Facebook on social life’, noting how it has changed social interactions among users online and offline, as well as how users interact with organizations (companies, political organizations, non-governmental organizations) (p. 203). Even though the authors acknowledge that Facebook is ‘constantly updating the features of the site’, they contend that such ‘changes are largely additive, with drastic changes becoming less common as the site matures’ (Wilson et al., 2012: 208). While these review articles are to some extent sensitive to Facebook’s business dimensions, they offer a narrow and static understanding of Facebook as a single destination on the web. We will demonstrate that the changes to Facebook have been quite drastic and can have significant political economic effects on citizens, businesses, politicians, and policies.

Put differently, this body of scholarly work only examines the proverbial tip of the iceberg, that is, the part of Facebook that is most visible part to end-users. What is omitted are, the much bigger, invisible technical dimensions of the platform, as well as its business dimension, which together dictate how the platform is transforming over time and how it interacts with other inhabitants in the wider ecosystem of ‘connective media’ (Van Dijck, 2013). However muddled at times, Zuckerberg’s relentless proselytizing on the

company's future direction should be taken seriously and subjected to rigorous critique. In February 2017, after a wave of criticism on the company's alleged role in spreading misinformation and influencing the 'Brexit' referendum and the US elections, Zuckerberg posted a 6000-word manifesto outlining Facebook's changing direction from 'connecting people' to building 'social infrastructure' (FB2017a). Implying that the solution to Facebook is simply more Facebook, this framing positions the platform as a ubiquitous, foundational, if not essential gateway supporting 'social' services. In his blistering critique of the company, Vaidhyathan (2018) contends that this new vision reflects Facebook's changing ambition from being the 'operating system of our laptops and desktops' to becoming 'the operating system of our lives' (p. 99). Next to investments in Facebook's family of apps and services, the Internet.org initiative and the acquisition of Oculus Rift's virtual reality technology are indicative of the company's efforts to build such a social infrastructure by cultivating new partnerships, markets, and audiences.

Facebook's long-term strategy complicates using the website, the user profile, or the News Feed as sole units of analysis to understand Facebook's users, usage, and evolution. To analyze Facebook's evolution, particularly its expansion into the mobile ecosystem, we view it as a *data infrastructure* hosting a variety of *platform instances* that include websites and a 'family' of over 72 apps.² We introduce the concept of platform instances to offer a deeper level of granularity in our analysis of Facebook's evolution.

Drawing on infrastructure studies (Bowker and Star, 1999), Gray et al. (2016) define 'data infrastructure' as 'socio-technical systems implicated in the creation, processing, and distribution of data' (p. 234). Correspondingly, Alaimo and Kallinikos (2017) argue that social media platforms, by encoding social activities into data for further processing, are performing 'infrastructural, backstage data work' (p. 175). This data work, that is the extraction, analysis, and distribution of data, is central to Facebook's advertising-driven business model (Srnicek, 2016).

While Facebook's data infrastructure operates in the back-end, on the front-end it operates a variety of distinct user-facing platform instances to distribute and perform these data work. These platform instances include *web instances*, such as Facebook.com and Messenger.com, and dozens of *app instances*, including the Facebook and Messenger apps. We consider each platform instance as a technical and economic platform configuration that facilitates connectivity and interactions among end-users and multiple partners. Put differently, individual platform instances serve as stand-alone derivatives that each provide a distinct 'view' of the platform as a whole and offer different functionalities tailored to distinct user groups. Each platform instance contributes to Facebook's overall data work while simultaneously engaging in its own. The Messenger app, then, is such an app instance that facilitates mobile messaging among end-users and interactions between end-users, advertisers, institutions, content developers, and businesses. As we will discuss more in-depth below, by offering building blocks for third-party development, Messenger constitutes a multisided market within the iOS or Android ecosystems.

The technical and business dimensions of platforms

Our analytical framework concerns ad-supported social media platforms the likes of Google, Facebook, and Twitter. When discussing platforms, media and communication

scholars, ever anxious to be seen flirting with economic or technological determinism, tend to shy away from either explicitly economic or technical perspectives. Instead, discussions gravitate toward ‘platform politics’ (Gillespie, 2010), examining how platforms are anything but neutral intermediaries shaping interactions and organizing content. Others have offered approaches that are more inclusive to both the economic and technical dimensions of platform analysis (Bucher, 2012; Helmond, 2015; Langlois and Elmer, 2013; Van Dijck, 2013). To a certain extent, the division between Facebook as a business platform and a technical platform might seem artificial. We want to emphasize that both dimensions are mutually constituted, or to be considered a ‘double articulation’ (Langlois and Elmer, 2013: 5), as Facebook’s economic imperatives are enacted through its software. By focusing on specific platform instances and how they evolve individually, our framework offers an approach for a more fine-grained, historical analysis of platform evolution.

To get a firmer grip on Facebook’s economic and technical dimensions and to critically evaluate its increasingly dominant position in the digital economy, we draw from recent work in business studies, critical political economy, platform studies, and information systems research. Our contribution attempts to bridge the gap between these various disciplines by demonstrating how quickly platforms evolve and how new platform instances, particularly apps, emerge and transform.

First, these approaches offer us the conceptual tools to critically examine platform growth, expansion, and ultimately, power. Business and platforms studies and information systems research are particularly sensitive to the medium-specificity of platforms as programmable and extensible technical systems that enact institutional relationships through software (Bogost and Montfort, 2009; Gawer, 2014; McIntyre and Srinivasan, 2017). Rather than measuring growth in pure financial terms, we widen the economic lens by pointing toward the development of new services, websites, and apps, which increasingly have infrastructural properties, and toward the subsequent creation of institutional partnerships and capturing of markets.

Second, our framework is grounded in critical political economic thought by adopting a decidedly historical and normative perspective on ‘platform capitalism’ (Srnicsek, 2016). It has almost become a truism to note that the concentration of Facebook’s media power is unprecedented. Facebook’s evolution has been duly noted by critical media scholars studying platforms (Bodle, 2011; Bucher, 2012), inviting a more historically informed mode of analysis (Brügger, 2015). Following Vaidhyanathan (2018), we are similarly troubled by the company’s ambition to become the ‘operating system of our lives’. Our concerns relate to the litany of recent revelations about the company’s dubious role in elections, the spread of misinformation, and the unauthorized sharing of end-user data (Vaidhyanathan, 2018), as well as to the implications of the platformization of cultural production (Nieborg and Poell, 2018). For example, in the field of journalism, Facebook’s ability to set technological and economic standards has created ‘institutional dependencies’ by news organizations (Caplan and Boyd, 2018). These challenges signal the emergence of ‘infrastructural capture’ instigated by platforms and signal a further encroachment of journalists’ autonomy (Nechustai, 2018). All of these concerns are only exacerbated by Facebook’s complete lack of corporate transparency and accountability.

Facebook as a business platform

Nowhere is Facebook's economic dominance more apparent than in the digital marketing ecosystem, where the company, together with Google, rakes in the majority of advertising-related revenue in the US market (Mosco, 2017). Oligopoly power, or duopoly power in the realm of digital advertising, is nothing new to the cultural industries. Next to mergers, acquisitions, and takeovers, transnational media and communications companies gain market share by setting up corporate partnerships and forging alliances, for example, through equity swaps, setting industry or technology standards, or through licensing agreements (Mosco, 2009). Facebook follows this historical trajectory by leveraging its high capital position through constant acquisitions (e.g. Instagram and WhatsApp), establishing industry and marketing partnerships (Helmond et al., 2017; Nieborg, 2016), as well as through other common forms of institutional synergy, such as board interlocks (Van Dijck, 2013: 37).

Typically, critical political economic studies consider a company's horizontal integration (industry diversification), vertical integration (extending control over the production and circulation process), and transnationalization (Mosco, 2009). An emerging body of work by a prolific group of orthodox economists (Rochet and Tirole, 2003) and business scholars (McIntyre and Srinivasan, 2017) challenges this understanding of industry organization by arguing that a seemingly diverse group of companies – ranging from Uber to Airbnb and from Apple to Facebook – all share a similar organizational and business logic. That is, these companies give way to *multisided markets* where platforms facilitate interactions between distinct 'sides' or 'users', which include end-users (i.e. consumers), businesses (e.g. content developers), advertisers, and others.³ For example, rather than offering a subscription service directly to users, Facebook started as a two-sided platform offering free access to students while generating revenue via targeted advertisements (Brügger, 2015).

The proliferation of multisided markets resulted in a broad swath of scholars focusing on network economics, industrial organization, information systems, technology management, strategic management, and engineering design (De Reuver et al., 2018; McIntyre and Srinivasan, 2017). These conceptual and empirical efforts are relevant for our understanding of Facebook in two ways. First, the political economy of platforms is one of deep power asymmetries between a platform, and its users and partners (Nieborg and Poell, 2018). These asymmetries are partly a result of positive same-side or cross-side network effects, which increase the value of a platform when users join either the same side or indirectly when users join the cross side. In our analysis of Messenger, we will illustrate how Facebook leverages network effects to grow its user bases and draw on the notion of multisidedness to examine how this particular platform instance is positioned to facilitate connectivity among a wide range of users. Second, the literature on multisided markets forwards a socio-technological understanding of platforms by considering the issue of platform governance and design. As aggregators, platforms reshape the formation of institutional relationships by setting up a standardized, technological infrastructure for user connectivity and business transactions.

Despite its conceptual and analytical value, multisided market theory has noticeable gaps, particularly for critical media scholars. First, platforms tend to be considered as

static objects instead of evolving platforms (Gawer, 2014; Tiwana, 2014). Second, while platform design is a research focus in the multisided market literature, an understanding of the implications of the technological expansion of platforms, such as Facebook's many instances, into other services, remains underdeveloped. That is to say, platform power is intrinsically disproportionate and the dramatic shift toward app-based user practices signals a further intensification of the commodification of audiences (Nieborg, 2015, 2016), or in the case of Facebook, of user activity and connectivity (Fisher, 2015).

Facebook as a technical platform

Drawing from business studies, Gawer (2014: 1239) emphasizes the dual nature of platform analysis – the business dimension of platforms, which is rooted in economic theory – and conceptualizes platforms as multisided markets, and the technological dimension, which builds on insights gleaned from engineering design and approaches platforms as technological architectures. The latter approach is similar to recent work in information systems where 'digital platforms' are conceptualized as programmable, technical artifacts with an extensible codebase (De Reuver et al., 2018). Similarly, under the umbrella of 'platform studies', media studies scholars engage with the materiality and technical specificity of new media's underlying computer systems to examine how the lower 'platform layer' enables and constrains particular activities and produces social, cultural, and political effects (Bogost and Montfort, 2009). Referring to the technical dimension of platforms in the context of computer systems, their emphasis is on 'computational platforms' or 'a computing system of any sort upon which further computing development can be done', again drawing attention to the reprogrammable dimension of computer systems (Bogost and Montfort, 2009).

Platforms afford programmability by offering a set of APIs that provide third-party developers access to platform data and functionalities to build new platform integrations and extensions such as plug-ins and apps (Bodle, 2011; Helmond, 2015). As such, APIs are not only used to make platform data and functionality accessible outside of its boundaries, but they simultaneously decentralize data extraction, as platform extensions collect data for the platform from external websites and apps (Gerlitz and Helmond, 2013). This dual logic of platform expansion and decentralized data capture is understood as 'platformization', which emphasizes not only how a platform's technical design and evolution are related but also how the infrastructural and economic ambitions of social media platforms are interconnected (Helmond, 2015). Platformization, then, encompasses a platform's *outwards extension* into other websites, platforms, and apps, as well as *inwards extension*, with third-party integrations that operate within the boundaries of the core platform. In our analysis of Messenger, we will draw on this dual understanding to analyze the app's, and therefore the wider platform's, evolution.

To structure and formalize platform extensions and integrations, platforms such as Facebook offer numerous APIs, which can be understood as sets of stable and standardized interfaces that are part of a platform's so-called 'boundary resources', which are made available to 'support third-party development in their development work' (Ghazawneh and Henfridsson, 2013). Platform boundary resources are important technical and social resources that coordinate and govern third-party development, as they

provide the technical building blocks, the codified instructions in the form of developer documentation, as well as the platform rules governing this development in the form of terms of services (Ghazawneh and Henfridsson, 2013). Often, these resources are bundled in SDKs to facilitate third-party development. As we will explicate in our methodology, boundary resources offer important entry points for understanding a platform's technical expansion as they enable a platform to implement and extend their data infrastructure into third-party websites, platforms, and apps, and facilitate inwards integrations.

The process of platformization has profound political economic and infrastructural implications. First, APIs ensure interoperability – the ability of software to programmatically communicate and exchange data – not only internally among different platform instances but also externally with competing platforms and third-party web services and apps (Bodle, 2011; Tiwana, 2014: 98). However, the interoperability offered by APIs rarely concerns a symmetrical relationship (Caplan and boyd, 2018). Instead, dominant platforms such as Google and Facebook are able to enforce 'intraoperability' instead (Bechmann, 2013). Intraoperability denotes a digital platform becoming such a dominant hub in the data economy that it can enforce asymmetrical power relationships, 'thereby enhancing the importance of their standards', which in turn entrenches their position of power even further (Bechmann, 2013: 55). Second, by having third-party developers accept intraoperability and the subsequent commodification of end-user connectivity and personal data, platforms are able to gain infrastructural properties as they are becoming perceived as ubiquitous communication utilities (Plantin et al., 2018).

In sum, we point toward a platform's programmability and intraoperability, and the infrastructural implications of platformization to analyze Messenger's growth and expansion. Together with an understanding of platforms as multisided markets, this approach allows us to examine how power is enacted and negotiated among platform owners, between platform owners and third parties, and how platform owners envision third-party development on top of their data infrastructure. Before introducing our analysis of Messenger, we survey the methodological challenges associated with analyzing platforms and apps in motion.

Methodology: studying Facebook's evolution

As an object of study, Facebook comes with a unique set of methodological challenges. To examine Facebook's evolution as a technical and business platform, we follow two approaches: 'boundary analysis' of platform documentation and 'document analysis' of financial and managerial data.

The analysis of boundary resources relies on documentation provided by the platform and includes developer documentation, product documentation, and financial disclosures, which collectively functions as an archive that enables a reconstruction of a platform's evolution (Apperley and Parikka, 2018; Eaton et al., 2015). This material does come with its own set of issues, as archives from websites, platforms, and apps are often incomplete and old documentation has been moved, overwritten, or simply deleted (Brügger, 2015). To locate these missing or removed resources, we turn to the largest publicly available web archive, the Internet Archive Wayback Machine, which has saved over hundreds of thousands of snapshots of Facebook's platform documentation since its

Table 1. Overview of data sources.

Platform boundary resource (timeframe: number of pages or archived pages, analysis interval)	URL	Scope
Facebook Developers Docs (August 2006–March 2018: 15,993 pages, monthly)	https://web.archive.org/ web/*/https://developers. facebook.com	Technical, historical
Facebook Developers Blog (August 2012–March 2018: 409 pages, monthly)	https://developers.facebook. com/blog/	Technical
Facebook Newsroom (April 2006–March 2018: 730 pages)	https://newsroom.fb.com	Business and technical
Facebook Blog (August 2006–August 2011: 458 pages)	https://web.archive.org/ web/*/https://blog.facebook.com	Business and technical, historical
Facebook Developers Blog (August 2006–March 2018: 258 pages)	https://web.archive.org/ web/*/https://developers. facebook.com/blog/	Technical, historical
Facebook Business (February 2008–March 2018: 8281 pages, monthly)	https://web.archive.org/ web/*/https://www.facebook. com/business/	Business, historical
Messenger (November 2014–March 2018: 44,611 pages, monthly)	https://web.archive.org/ web/*/http://www.messenger. com	Business, historical
Messenger Platform Developer Docs (April 2016–March 2018)	https://developers.facebook. com/docs/messenger-platform	Technical
Messenger Platform (March 2015–March 2018: 57 pages)	https://web.archive.org/ web/*/https://messenger.com/ platform	Technical, historical
Messenger Platform Blog (November 2016–March 2018: 61 pages)	https://messenger.fb.com/blog	Business and technical
Messenger Business (March 2015–March 2018: 59 pages)	https://web.archive.org/ web/*/https://messenger.com/ business	Business, historical
Investor Relations (February 2012–March 2018: 23 transcripts)	https://investor.fb.com/	Business

launch. More specifically, we analyze the platform's current and archived boundary resources, as they offer insights into Facebook's infrastructural ambitions (Table 1; Appendix 1). These technical documents provide detailed information about (1) the introduction of new platform resources, such as new APIs and SDKs; (2) the data, functionality, and development options they make available; and (3) the instructions for their technical implementation. Consequently, these resources may offer important insights into the technological expansion of a platform. All (archived) platform boundary resources in Table 1 were searched for mentions of [Messenger], [messaging], [mobile], [API], [SDK], and [plugin] to chronicle the platform's evolution.

To gain a deeper understanding of Facebook's business strategy as a public company, we analyzed Facebook quarterly investor calls, the transcripts of which are publicly available on Facebook's Investor Relation pages (cf. Elmer, 2017; Hoffmann et al., 2018). We collected 23 transcripts, which were loaded into a textual analysis tool (NVivo). The corpus totaled over 240,000 words on which we applied a descriptive coding scheme that included statements on Facebook's long-term strategic business goals, its mobile platform strategy, third-party partnerships, how to 'monetize messaging', the growth and role of mobile advertising, and any statements specific to the Messenger app and its rollout. Second, we used the same corpus to conduct exploratory financial analysis to be able to substantiate political economic claims about the platform's growth as a business platform.

Finally, our approach is informed by the work of Bodle (2011), who studied the ongoing development of Facebook's APIs and notes how API analysis is able to identify the relations between new technical features and a platform's business strategies. To this end, we matched managerial statements with the insights gleaned from analysis of Facebook's platform documentation in order to reconstruct the historical trajectory of Messenger.

The technical and economic expansion of the early Facebook platform

Before we discuss how the process of platformization unfolds for Messenger, we briefly retrace Facebook's transformation from an online college directory in 2004 into a popular, if not dominant 'family of apps'. There are numerous ways to retell Facebook's history, either by discussing its discursive positioning (Hoffmann et al., 2018), the social implications of its technical features over time (Bodle, 2011), its development as a media text (Brügger, 2015), or by offering a financialized history (Elmer, 2017). Drawing on these sources and following the boundary and economic analysis outlined above, it becomes clear that the foundation for Facebook's growth and expansion is rooted in its formative years. We consider the launch of the 'Facebook Development Platform' (FDP) in May 2007 a pivotal point in the company's early history as it jump-started the process of platformization.⁴ Moreover, FDP's rollout paved the way for Facebook's initial public offering (IPO), and as we argue in the next section, it offered a blueprint to transform Facebook into a mobile-first company.

Directly speaking to the platform's technological and economic dimensions, FDP offered third parties 'deep integration' to 'build applications like Facebook does', as well as a 'new opportunity' to 'build a business around your Facebook application' (FBP2007b; FBP2007c). To this end, developers were provided access to two key assets: Facebook's 'social graph' containing select, personal end-user data, and standardized technology – the Facebook API, Facebook Query Language, and Facebook Markup – to build applications on top of Facebook's data infrastructure (FBN2007a; FBP2007a; FBP2007d). FDP enabled third-party content developers, such as game developers, to build 'social' applications on top of the social graph within the boundaries of Facebook.com using so-called 'canvas pages' (FBN2007a).

The FDP documentation shows how Facebook took steps to open the platform up to third-party developers to expedite its *outwards* extension while simultaneously expanding *inwards*, by offering institutions an opportunity to establish a presence within the confines of the site. As for the latter strategy, once FDP was technically in place, the company started further developing its business dimension by formalizing its relations with partners, such as advertisers and businesses, by explicitly addressing them in key boundary resources. For example, the ‘Facebook Ads’ system was introduced in 2007 to offer new resources for businesses and consisted of three elements: (1) ‘Pages’, a new type of Facebook profile open to ‘businesses and organizations’ allowing institutions to ‘interact and affiliate’ with end-users; (2) ‘Social Ads’, ad technology to target specific demographics and distribute ads via the ‘social graph’, further connecting advertisers to businesses and end-users; and (3) ‘Facebook Insights’, an analytics product related to Pages and Social Ads (FBN2007b). Importantly, Pages significantly elevated the position of businesses, which previously had no official presence on the platform, whereas the new ad and analytics products marked a novel way for businesses and advertisers to target users on the platform via the social graph. The launch of FDP, together with the introduction of new sets of ‘products’ and associated boundary resources aimed at businesses, formalized Facebook as a multisided platform by facilitating interactions among end-users (consumers), businesses (e.g. content developers, small and medium-sized businesses), third-party content developers (e.g. game developers), advertisers, and others.

In these formative years, spanning 2006–2009, Facebook also invested in its platformization efforts by extending platform functionalities *outwards*. For example, 2008 marked the launch of ‘Facebook Connect’, a social login feature for third-party websites. This was followed by the rollout of the ‘Open Graph’ protocol in 2010, a mechanism for turning external web pages into objects that can be incorporated into the social graph, as well as including a set of social plugins – including the Like button – for integrating Facebook functionality into third-party websites (Bodle, 2011).

The successful, widespread technical expansion of the platform both inwards and outwards, together with the attraction of new sides to the platform, culminated in Facebook’s IPO in May 2012. The question then emerges, how did the platform evolve when expanding into the mobile ecosystem?

From web to app instances: building a mobile messaging infrastructure

Despite the mass diffusion of mobile media and somewhat surprisingly given Facebook’s current dominance in the app economy, the company initially ‘moved reluctantly’ to offer dedicated apps for mobile devices (Goggin, 2014: 1071). The company’s first app for Apple iOS became available in July 2008 and offered a limited set of functionalities compared to the Facebook website (FBM2008). However, Facebook’s reluctance dissipated quickly when in late 2012 Zuckerberg singled out three strategic ‘core areas’: ‘mobile, platform, and monetization’ (FBE2012). Later, in a moment of reflection, Zuckerberg observed, ‘If 2012 was the year we turned our core product into a mobile

product, then 2013 was the year when we turned our business into a mobile business' (FBE2013). Speaking to the company's ability to wield financial capital (through acquisitions) and to harness same-side network effects, Facebook's main revenue stream, advertising, moved from its web instances to its app instances in a matter of months.

To differentiate between Facebook's web presence and its burgeoning app collection, we reiterate our conceptualization of Facebook as a data infrastructure that hosts multiple platform instances. During its transformation into a 'mobile business', Messenger became the first platform instance to be launched after the Facebook app.⁵ Messaging functionality had been present for years on Facebook's web instance, Facebook.com, where it was first branded as 'Facebook Chat' (2008) and later morphed into 'Facebook Messages' (2010). Initially, the Facebook app mimicked the 'Facebook Chat' functionality of Facebook's web instance (FBM2008), but in late 2011 the company decided to unbundle the messaging portion by launching Messenger as a separate app instance, positioning it as 'an extension of Facebook Messages' (FBM2011).

Ultimately, the unbundling of Messenger is exemplary of Facebook's efforts to position itself as a central data-intermediary in the mobile ecosystem, or, to become the default connective layer – or mobile infrastructure – on top of mobile operating systems, thereby supplanting 'generative' technologies (Zittrain, 2009), such as making calls and texting. Over the course of several years, Zuckerberg fleshed out a three-step process, or 'formula' (FBE2015b), that tied together his three areas of 'mobile, platform, and monetization'. Step 1 is to build 'ubiquitous utilities', such as messaging, 'that 1 billion or 2 billion or more people are going to want to use' (FBE2016a). Once at scale, because of Facebook's unique position to leverage network effects, these 'utilities' (i.e. apps) then evolve into multisided markets or 'full ecosystems with developers and businesses' (FBE2016b), which then enables 'people to organically interact with businesses' (FBE2016c). The third and final step is to roll out 'monetization' and to 'really start dialing up advertising' (FBE2015b). Not only does this strategy reaffirm Facebook's infrastructural aspirations, it also demonstrates the interaction between Facebook's economic and technological dimensions in the mobile ecosystem.

Next, we will retrace Messenger's evolution and argue that the app's development follows a trajectory similar to the 2007 rollout of the FDP.

The messenger platform: the evolution from apps into nested platforms

Shortly after Messenger reached over half a billion users in 2014 (FBE2014), the company shifted its focus toward expanding the app both inwards and outwards, and growing the app's business sides. By launching the Messenger Platform at its F8 Developer Conference in early 2015, Facebook opened Messenger to external developers – establishing its technical dimension – and a select group of 'commercial partners', taking initial steps to set up a multisided market (FBM2015a).

The launch ushered in the platformization of the app ecosystem, thereby adding an additional layer of analytical complexity to studying the platform's evolution as it demonstrates how an app instance can simultaneously become a technological platform and

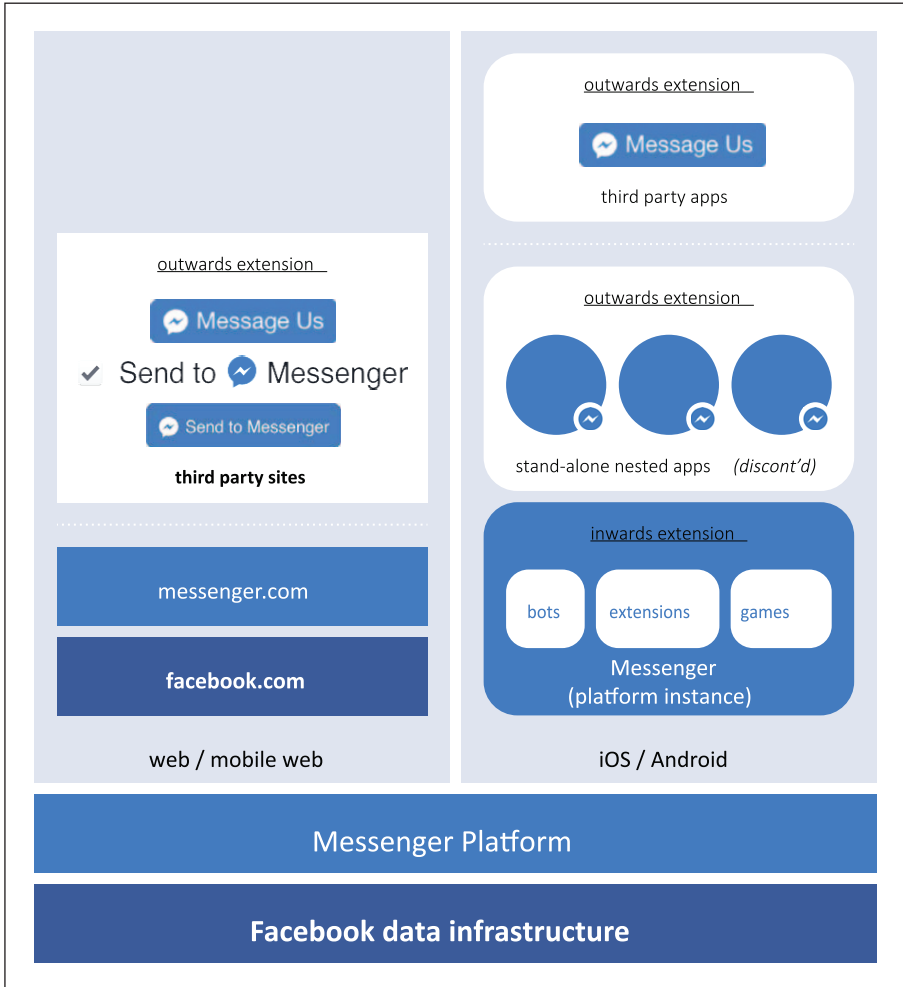


Figure 1. The expansion of Messenger Platform. Graphic by Fernando van der Vlist.

operate a multisided market. This blurring of the separation between, on one hand, platforms and, on the other hand, apps built on top of platforms is noted in recent work on software ecosystems and information systems. For example, Messerschmitt and Szyperski (2005) observe how app instances can evolve ‘into infrastructural platforms for other applications’ (p. 200), which Tiwana (2014) conceptualizes as ‘nested platforms’ or a platform within a platform (p. 264). We argue that with the introduction of Messenger Platform, the app evolved into a prototypical nested platform by establishing business partnerships and an ecosystem of third-party apps and other software services built both on top of and within Messenger. In Figure 1, we visualize how Messenger expanded its boundaries *inwards*, through third-party bots, bot extensions and games,

and *outwards* by allowing third-party app developers to develop standalone apps for Messenger and ‘Messenger plugins’ for external (mobile) websites and apps.⁶

The first version of Messenger Platform mainly developed the technical dimension of the platform. Together with the launch of Messenger Platform, a wealth of technical boundary resources became available, such as SDKs for iOS and Android and associated technical documentation ‘to integrate your app with Messenger’ (FBM2015a; FBM2015b). These resources enhanced the programmability of the platform and facilitated the outwards extension of Messenger into other apps. An example of how third-party developers seized the opportunity to integrate their services with Messenger was the introduction of a somewhat uncommon app genre which we, extending Tiwana’s terminology, conceptualize as *standalone nested apps*. The standalone qualifier derives from the necessity to install these ‘Apps for Messenger’ separate from Messenger via the Google or Apple app stores, similar to any other app. Yet, they are nested because their sole functionality is to share content within the boundaries of Messenger. This app genre was called ‘Expression Apps’ by Facebook, carrying a small blue Messenger logo in their app icons and were meant for end-users to ‘express themselves and get creative’ by creating and sharing content like images, animated gifs, and videos (FBM2015b; FBM2015c).

While no specific boundary resources were made available to businesses, Facebook did anticipate expanding Messenger’s business dimension by promoting use case scenarios, forthcoming functions, and a sign-up form for interested companies on the Messenger website (FBM2015d). This first announcement can be seen as the initiation of the second step in Zuckerberg’s ‘formula’, focused on attracting businesses to establish a presence in the app. As Zuckerberg told analysts and investors early 2016, and before moving on to ‘monetize’ end-users, he considered it essential for end-users to have ‘organic interactions’ with businesses and to have ‘that feel good and be a good part of the experience with good content’ (FBE2015b). Therefore, at the 2016 Facebook F8 Developer Conference, the company announced another major iteration of Messenger Platform, which marked the official introduction of the platform’s business dimension as well as the further development of its technical dimension as reflected in its new tagline: ‘a platform designed for businesses and developers’ (FBM2016a). Similar to the launch of FDP, which addressed the lack of business ‘Profiles’ on Facebook’s web instances, Messenger Platform now allowed every business to have a visible profile within the app. It gave institutions, but above all companies, a more prominent, structural presence in the app thereby morphing into a multisided nested platform connecting end-users, content developers, and businesses.

Following the F8 conference, the technical dimension of the platform changed significantly with Messenger’s move toward *inwards* expansion by adding bots (FBM2016a; FBM2016b). These extensions are different from standalone nested apps as they only function *within* Messenger. Bots were primarily positioned to facilitate ‘deeper interactions’ (FBM2016b) among businesses and end-users and to allow for ‘more personal, more proactive, and more streamlined’ conversations through chat automation (FBM2016c). Signaling Messenger Platform’s *outwards* extension, a number of ‘discovery tools’ were introduced to find different kinds of users (both end-users and businesses), such as ‘Messenger Codes’, usernames and links, as well as a novel set of ‘Message Us’ and ‘Send to Messenger’ plugins for third-party (mobile) websites. These

examples of outwards expansion serve as clear examples of the platformization of the app ecosystem. They are also indicative of Facebook's rapid iteration cycles and the expedited evolution of its platform instances. For example, while expanding the app's technological and business dimension, the standalone nested apps were unofficially discontinued by quietly removing their documentation from the main Messenger Platform resources and later by disabling their technical functionalities altogether. Such unannounced shifts in technical implementations and economic strategies demonstrate Messenger's intraoperability: asymmetrical power relations between the platform and its third-party developers, leaving developers who have invested in the app with broken apps and broken businesses.

Over the course of 2016 and 2017, Facebook experimented heavily with connecting new sides and new 'monetization options', thereby growing the app's business dimension. For example, it offered businesses tools to get information and analytics on its bot users, and to find and match their existing customers on Messenger (FBM2016d; FBM2018a). At the end of 2016, Facebook reconnected with game developers by introducing 'Instant Games for Messenger' (FBM2016e) in an effort to lure end-users away from competing game apps and add a potentially lucrative business side (Nieborg, 2015). After this introduction, the company started testing game monetization with in-app purchases and in-game ads (FBM2017e). Mid-2017 the company further professionalized its business dimension by launching a new set of resources to help businesses 'find providers that specialize in building experiences on Messenger' (FBM2017h). These 'Platform Development Providers' have specific certified expertise to help businesses implement Messenger. As such, this group of official partners are crucial in building extensions and integrations and thus facilitate and expedite the process of platformization (Helmond et al., 2017). Finally, late 2017 Messenger further expanded outwards with the introduction of the 'Customer Chat Plugin', enabling select businesses to integrate Messenger chat and bots into their websites (FBM2017g). At this point, Messenger featured 'more than 20 million businesses' that were 'communicating with customers' through the app (FBE2017), signaling Facebook's ability to enforce intraoperability among millions of users.

Taken together, these sustained efforts to add business sides to Messenger, combined with its technical expansion both inwards and outwards, paved the way for the third and final step in Zuckerberg's 'formula': the monetization of Messenger's 1.3 billion monthly active users. To this end, in the summer of 2017 'Messenger Ads' were introduced, initially shown to select users in the app's home tab (FBM2017a; FBM2017b), followed by the introduction of 'Sponsored Messages' later that year (FBM2017i).

At this point in its evolution, we consider Messenger to be in a crucial phase of app ambiguity (cf. Van Dijck, 2013). That is to say, Facebook is heavily experimenting with adding additional sides, exploring bot functionality and machine learning technology with its intelligent assistant M to further automate and translate conversations, augmented reality, and a variety of monetization strategies (FBM2018b). For example, late 2017 the company started experimenting with SDKs for payments and an in-app 'Buy Button' (FBM2017c), laying the foundation for a more expansive payment infrastructure (FBM2017d). Exactly because Messenger's rapid diffusion, Facebook's infrastructural aspirations for the mobile ecosystem and its attempts to further encapsulate generative digital practices, such as messaging and paying, deserve sustained critical attention.

Conclusion

'Who is your biggest competitor?', US Senator Lindsey Graham asked Mark Zuckerberg during the April 2018 hearings in the US Congress. In his answer, Zuckerberg pointed to other members of the Big Five tech platforms – Google, Apple, Amazon, and Microsoft – which, he said, offer 'overlapping services'. The irony of pointing toward companies that are also considered to dominate their respective markets notwithstanding, Zuckerberg's answer was disingenuous at best. From a purely economic perspective, direct network effects raise the 'switching costs' for end-users, thereby decreasing the ability to join a competing social media platform (Haucap and Heimeshoff, 2014). That is, if there *are* any viable competitors to Facebook. In a number of countries, particularly those rolling out Facebook's Internet.org Free Basics platform, such as the Philippines, Nigeria, and previously Myanmar, Facebook has become synonymous with 'the Internet' (Vaidhyanathan, 2018).

Senator Graham's question, however relevant, points to the limits of a purely economic perspective on platform power. Opting out of Facebook comes at a very high cost and is nearly impossible. Deleting one's Facebook account does not delete all data that have been shared with third-parties since the launch of the FDP in 2007. Nor does it prevent the company from tracking users (and non-Facebook users) across the web and app ecosystems. All this is to say, Zuckerberg's testimony, once again (Hoffmann et al., 2018), willfully ignores a decade-long effort to position Facebook as the core 'social infrastructure' of the web and mobile ecosystems. By combining and co-opting notions such as 'social' and 'infrastructure', Zuckerberg aims to appropriate the historical connotations of utilities and infrastructure as non-commercial services for the common good, thereby normalizing the commodification of connectivity and user data.

Looking forward, we argue that our analytical framework can be helpful to critically engage with Facebook's ambitions beyond the app ecosystem that include investments in global Internet infrastructure and connectivity. Facebook's past and current investments concern three levels: (1) internal growth through an increasing number of platform-owned and operated app and web instances; (2) through acquisitions of existing apps such as Instagram (2012) and WhatsApp (2014); and (3) external growth through the platformization of the web and app space. While political economists have traditionally focused on the first two levels, it is through the analysis of how platforms attract business sides, leverage direct and indirect network effects, afford programmability, and offer boundary resources, that platforms operationalize their infrastructural agendas.

Our framework, then, allows for a critical inquiry into the dynamics of platform evolution as it considers a platform's technical and economic dimensions in tandem. As such, we attempt to bridge the gap between economic disciplines and scholarship on platform boundaries and by doing so offering a new conceptual vocabulary to scholars in the area of platform studies. Our mixed-method approach suggests to move away from analyzing platforms as either (web)sites or (individual) apps and instead to consider platforms as data infrastructures that own and operate a variety of platform instances that each perform particular data work. Ultimately, the Messenger Platform is an instructive

example of how platform companies, such as Facebook, are able to enforce data intraoperability. For example, recent case studies on the relationship between Facebook and news organizations point toward increased platform dependency, organizational homogenization, and deep power asymmetries (Caplan and boyd, 2018; Nechushtai, 2018; Nieborg and Poell, 2018).

The Big Five technology companies, Vaidhyanathan (2018) argues, ‘share one long-term vision: to be the operating system of our lives’ (p. 99). Therefore, we encourage contributions to platform and app studies research exploring the concentration of platform power and the impact of platformization on all the actors in the app ecosystem, by analyzing either other apps in Facebook’s family or other platforms such as LINE, Twitter, or ‘super app’ WeChat. Our analysis of Messenger demonstrates that this is a crucial moment in Facebook’s evolution as it enters new markets, tests new technologies, and explores new business models in the mobile ecosystem. Exactly because of the global infrastructural ambitions of dominant platform companies, Facebook above all, the time for critical, policy and discursive intervention is now.

Acknowledgements

We are grateful for the support of Dr Ira Wells and a fantastic group of Research Assistants: Aparajita Bhandari, Mark Khalil, Amrita Maharaj, Anna Bianca Roach, and Saarah Sheikh.

Funding

This research received financial support from the 2017 Scholars-in-Residence program funded by the Jackman Humanities Institute at the University of Toronto. This work is part of the research programme Innovational Research Incentives Scheme Veni with project number 275-45-009, which is (partly) financed by the Netherlands Organisation for Scientific Research (NWO).

Notes

1. For the purpose of readability and clarity, we use a coding structure when referencing our corpus material (see Table 1 and Appendix 1).
2. As of May 2018, Facebook has 72 macOS, Amazon, iOS, and Android apps in total, tailored to end-users, (e.g. Facebook Messenger), developers (e.g. F8), businesses (Facebook Pages Manager), content creators (Facebook Creator), and advertisers (Facebook Ads Manager) (APP2018b).
3. We employ the term end-users to refer to individuals using websites and apps. Apart from end-users, other ‘sides’ in a market are those institutional actors that are economically and technically integrated with a platform. ‘Partners’ are institutional actors that have formalized platform relationships which may be equally dependent on a platform, but who are not necessarily technically integrated.
4. Facebook Development Program’s official launch was preceded by a ‘beta’ version in August 2006 (FBP2006a). Its rollout – starting with a beta launch to be followed by ‘official’ (re) launches – is typical of Facebook’s approach to major infrastructural initiatives, thereby challenging neat periodization.
5. In this article, we focus on Facebook Messenger for iOS and Android only. Facebook has also launched a Messenger ‘Lite’ and ‘Kids’ version.
6. Messenger is not the first to do so, as WeChat (Tencent Holdings) is one of the most prominent examples of a nested platform that affords app integrations.

ORCID iDs

David B Nieborg  <https://orcid.org/0000-0002-3498-789X>

Anne Helmond  <https://orcid.org/0000-0003-4327-4012>

References

- Alaimo C and Kallinikos J (2017) Computing the everyday: social media as data platforms. *The Information Society* 33(4): 175–191.
- Apperley T and Parikka J (2018) Platform studies' epistemic threshold. *Games and Culture* 13(4): 349–369.
- Bechmann A (2013) Internet profiling: the economy of data intraoperability on Facebook and Google. *Mediekultur: Journal of Media and Communication Research* 29(55): 72–91.
- Bodle R (2011) Regimes of sharing. *Information, Communication & Society* 14(3): 320–337.
- Bogost I and Montfort N (2009) Platform studies: frequently questioned answers. In: *Proceedings of the digital arts and culture conference*. Irvine, CA: University of California. Available at: <http://escholarship.org/uc/item/01r0k9br.pdf> (accessed 2 September 2017).
- Bowker GC and Star SL (1999) *Sorting Things Out: Classification and Its Consequences*. Cambridge, MA: The MIT Press.
- Brügger N (2015) A brief history of Facebook as a media text: the development of an empty structure. *First Monday*, 20. Available at: <https://journals.uic.edu/ojs/index.php/fm/article/view/5423>
- Bucher T (2012) Want to be on the top? Algorithmic power and the threat of invisibility on Facebook. *New Media & Society* 14(7): 1164–1180.
- Caers R, Feyter TD, Couck MD, et al. (2013) Facebook: a literature review. *New Media & Society* 15(6): 982–1002.
- Caplan R and boyd d (2018) Isomorphism through algorithms: institutional dependencies in the case of Facebook. *Big Data & Society* 5(1): 1–12.
- De Reuver M, Sørensen C and Basole RC (2018) The digital platform: a research agenda. *Journal of Information Technology* 33(2): 124–135.
- Eaton B, Elaluf-Calderwood S, Sorensen C, et al. (2015) Distributed tuning of boundary resources: the case of Apple's iOS service system. *MIS Quarterly* 39(1): 217–243.
- Elmer G (2017) Precorporation: or what financialisation can tell us about the histories of the Internet. *Internet Histories* 1(1–2): 90–96.
- Fisher E (2015) 'You media': audiencing as marketing in social media. *Media, Culture & Society* 37(1): 50–67.
- Gawer A (2014) Bridging differing perspectives on technological platforms: toward an integrative framework. *Research Policy* 43(7): 1239–1249.
- Gerlitz C and Helmond A (2013) The Like economy: social buttons and the data-intensive web. *New Media & Society* 15(8): 1348–1365.
- Ghazawneh A and Henfridsson O (2013) Balancing platform control and external contribution in third-party development: the boundary resources model. *Information Systems Journal* 23(2): 173–192.
- Gillespie T (2010) The politics of 'platforms'. *New Media & Society* 12(3): 347–364.
- Goggin G (2014) Facebook's mobile career. *New Media & Society* 16(7): 1068–1086.
- Gray J, Bounegru L, Milan S, et al. (2016) Ways of seeing data: toward a critical literacy for data visualizations as research objects and research devices In: Kubitschko S and Kaun A (eds) *Innovative Methods in Media and Communication Research*. New York: Springer International Publishing, pp. 227–251.

- Haucap J and Heimeshoff U (2014) Google, Facebook, Amazon, eBay: is the Internet driving competition or market monopolization? *International Economics and Economic Policy* 11(1–2): 49–61.
- Helmond A (2015) The platformization of the web: making web data platform ready. *Social Media + Society* 1(2): 1–11.
- Helmond A, Nieborg DB and van der Vlist FN (2017) The political economy of social data: a historical analysis of platform-industry partnerships. In: *Proceedings of the 8th international conference on social media & society*, Toronto, ON, Canada, 28–30 July, pp. 38:1–38:5. New York: ACM.
- Hoffmann AL, Proferes N and Zimmer M (2018) ‘Making the world more open and connected’: Mark Zuckerberg and the discursive construction of Facebook and its users. *New Media & Society* 20(1): 199–218.
- Langlois G and Elmer G (2013) The research politics of social media platforms. *Culture Machine* 14: 1–17.
- McIntyre DP and Srinivasan A (2017) Networks, platforms, and strategy: emerging views and next steps. *Strategic Management Journal* 38(1): 141–160.
- Messerschmitt DG and Szyperski C (2005) *Software Ecosystem: Understanding an Indispensable Technology and Industry*. Cambridge, MA: The MIT Press.
- Mosco V (2009) *The Political Economy of Communication*, 2nd edn. Los Angeles, CA: Sage.
- Mosco V (2017) *Becoming Digital: Toward a Post-Internet Society*. Bingley: Emerald Publishing.
- Nechushtai E (2018). Could digital platforms capture the media through infrastructure? *Journalism* 19(8): 1043–1058.
- Nieborg DB (2015) Crushing candy: the free-to-play game in its connective commodity form. *Social Media + Society* 1(2): 1–12.
- Nieborg DB (2016) Free-to-play games and app advertising: the rise of the player commodity. In: Hamilton JF, Bodle R and Korin E (eds) *Explorations in Critical Studies of Advertising*. New York: Routledge, pp. 28–41.
- Nieborg DB and Poell T (2018) The platformization of cultural production: theorizing the contingent cultural commodity. *New Media & Society* 20(11): 4275–4292.
- Plantin J-C, Lagoze C, Edwards PN, et al. (2018) Infrastructure studies meet platform studies in the age of Google and Facebook. *New Media & Society* 20(1): 293–310.
- Rochet J-C and Tirole J (2003) Platform competition in two-sided markets. *Journal of the European Economic Association* 1(4): 990–1029.
- Srnicek N (2016) *Platform Capitalism*. Cambridge: Polity Press.
- Stoycheff E, Liu J, Wibowo KA, et al. (2017) What have we learned about social media by studying Facebook? A decade in review. *New Media & Society* 19(6): 968–980.
- Tiwana A (2014) *Platform Ecosystems: Aligning Architecture, Governance, and Strategy*. Amsterdam: Morgan Kaufmann.
- Vaidhyanathan S (2018) *Antisocial Media: How Facebook Disconnects Us and Undermines Democracy*. Oxford: Oxford University Press.
- Van Dijck J (2013) *The Culture of Connectivity: A Critical History of Social Media*. Oxford: Oxford University Press.
- Wilson RE, Gosling SD and Graham LT (2012) A review of Facebook research in the social sciences. *Perspectives on Psychological Science* 7(3): 203–220.
- Zittrain J (2009) *The Future of the Internet-And How to Stop It*. New Haven, CT: Yale University Press.

Appendix I

Code	Title	URL	(IA) date	Purpose
APP2014	App Annie Index: 2013 Retrospective – The Top Trends of 2013	https://web.archive.org/web/20140708173734/http://blog.appannie.com/app-annie-index-retrospective-2013/	8 July 2014	App Statistics
APP2015	App Annie Index: 2014 Retrospective – The Top App Trends of 2014	https://www.appannie.com/en/insights/market-data/app-annie-index-retrospective-2014/	28 January 2015	App Statistics
APP2016	App Annie 2015 Retrospective – Monetization Opens New Frontiers	http://blog.appannie.com/app-annie-2015-retrospective/	20 January 2016	App Statistics
APP2017	App Annie 2016 Retrospective – Mobile's Continued Momentum	https://www.appannie.com/en/insights/market-data/app-annie-2016-retrospective/	17 January 2017	App Statistics
APP2018a	2017 Retrospective: A Monumental Year for the App Economy	https://www.appannie.com/en/insights/market-data/app-annie-2017-retrospective/	17 January 2018	App Statistics
APP2018b	Facebook: Published Apps	https://www.appannie.com/company/1000200000000034/	8 March 2018	App Statistics
FB2017a	Building Global Community	https://www.facebook.com/notes/mark-zuckerberg/building-global-community/10154544292806634/	16 February 2017	FB
FBP2006a	Facebook Development Platform (beta)	https://web.archive.org/web/20060820131607/http://developers.facebook.com/	20 August 2006	FB Platform, historical
FBP2007a	Facebook Developers Documentation	https://web.archive.org/web/20070613034218/http://developers.facebook.com/documentation.php	13 June 2007	FB Platform, historical
FBP2007b	Facebook Developers	https://web.archive.org/web/20070613033529/http://developers.facebook.com/	13 June 2007	FB Platform, historical
FBP2007c	Facebook Platform Launches	https://web.archive.org/web/20070706002021/http://developers.facebook.com/news.php?blog=1&story=21	27 May 2007	FB Platform, historical
FBP2007d	Facebook Developers Platform High-Level Specification	https://web.archive.org/web/20080513214804/http://developers.facebook.com/specification.php	13 May 2008	FB Platform, historical
FBN2007a	Facebook Unveils Platform for Developers of Social Applications	https://newsroom.fb.com/news/2007/05/facebook-unveils-platform-for-developers-of-social-applications/	24 May 2007	FB Platform, historical
FBN2007b	Facebook Unveils Facebook Ads	https://newsroom.fb.com/news/2007/11/facebook-unveils-facebook-ads/	6 November 2007	FB Business, historical
FBM2008	Facebook for iPhone	https://web.archive.org/web/20080906134944/http://blog.facebook.com/blog.php?post=22389032130	10 July 2008	Messenger, historical

Appendix I. (Continued)

Code	Title	URL	(IA) date	Purpose
FBM2011	A Faster Way to Message on Mobile	https://www.facebook.com/notes/facebook/a-faster-way-to-message-on-mobile/10150249543542131	9 August 2011	Messenger, historical
FBM2015a	Introducing Messenger Platform and Businesses on Messenger	https://developers.facebook.com/blog/post/2015/03/25/introducing-messenger-platform-and-businesses-on-messenger/	25 March 2015	Messenger Platform, historical
FBM2015b	Facebook Developers, Docs, Messenger Platform	https://web.archive.org/web/20150419005100/https://developers.facebook.com/docs/messenger	19 April 2015	Messenger Platform, historical
FBM2015c	Messenger Platform	https://web.archive.org/web/20150331032832/https://messenger.com/platform	31 March 2015	Messenger Platform, historical
FBM2015d	Businesses on Messenger	https://web.archive.org/web/20150330065510/https://messenger.com/business	30 March 2015	Messenger Business, historical
FBM2016a	Messenger Platform	https://web.archive.org/web/20160412233847/https://messengerplatform.fb.com/	12 April 2016	Messenger Platform, historical
FBM2016b	Messenger Platform at F8	https://newsroom.fb.com/news/2016/04/messenger-platform-at-f8/	12 April 2016	Messenger Platform
FBM2016c	How To Build Bots for Messenger	https://developers.facebook.com/blog/post/2016/04/12/bots-for-messenger/	12 April 2016	Messenger Platform
FBM2016d	Bots for Messenger: Adding Analytics Support and FBStart Membership Opportunities	https://analytics.facebook.com/blog/bots-for-messenger-adding-analytics-and-fbstart-program/	14 November 2016	Messenger Platform
FBM2016e	Instant Games	https://developers.facebook.com/blog/post/2016/11/30/instant-games-closed-beta/	30 November 2016	Messenger Platform
FBM2017a	Messenger adverts are going global	https://www.facebook.com/business/news/messenger-ads-are-going-global	11 July 2017	Messenger Platform
FBM2017b	Facebook Messenger for Business	https://www.facebook.com/business/products/messenger-for-business	1 October 2017	Messenger Platform

(Continued)

Appendix I. (Continued)

Code	Title	URL	(IA) date	Purpose
FBM2017c	Buy Button (BETA)	https://developers.facebook.com/docs/messenger-platform/send-messages/buttons/buy	1 October 2017	Messenger Platform
FBM2017d	Apply for our beta program	https://www.facebook.com/messenger_platform/payments_requestaccess	1 October 2017	Messenger Platform
FBM2017e	Monetization for Developers Coming to Instant Games on Messenger	https://messenger.fb.com/newroom/monetization-for-developers-coming-to-instant-games-on-messenger/	19 October 2017	Messenger Platform
FBM2017f	Messenger's 2017 Year in Review	https://newsroom.fb.com/news/2017/12/messengers-2017-year-in-review/	13 December 2017	Messenger
FBM2017g	Messenger Platform 2.2 Recap	https://blog.messengerdevelopers.com/messenger-platform-2-2-recap-a7ca1cafbff4	17 November 2017	Messenger Platform
FBM2017i	More Ways to Grow Your Business on Messenger	https://www.facebook.com/business/news/more-ways-to-grow-your-business-on-messenger	3 November 2017	Messenger Platform
FBM2017h	New Resources Launching to Help Businesses and Developers Thrive on Messenger	https://messenger.fb.com/newroom/new-resources-launching-to-help-businesses-and-developers-thrive-on-messenger/	29 June 2017	Messenger Platform
FBM2018a	Messenger Platform Changelog	https://developers.facebook.com/docs/messenger-platform/changelog	10 July 1905	Messenger Platform
FBM2018b	F8 2018: New Tools for Businesses and People to Deepen Connections in Messenger	https://newsroom.fb.com/news/2018/05/f8-2018-new-tools-for-businesses-and-people-to-deepen-connections-in-messenger/	1 May 2018	Messenger Platform
FBE2012	Facebook Q3 2012 Earnings Call Transcript	https://seekingalpha.com/article/944281-facebook-ceo-discusses-q3-2012-earnings-results-earnings-call-transcript	23 October 2012	Business updates
FBE2013	Facebook Q4 2013 Earnings Call Transcript	https://seekingalpha.com/article/1978461-facebook-ceo-discusses-q4-2013-results-earnings-call-transcript	29 January 2014	Business updates
FBE2014	Facebook Q4 2014 Earnings Call Transcript	https://seekingalpha.com/article/2860966-facebook-ceo-mark-zuckerberg-on-q4-2014-results-earnings-call-transcript	28 January 2015	Business updates

Appendix I. (Continued)

Code	Title	URL	(IA) date	Purpose
FBE2015a	Facebook Q1 2015 Earnings Call Transcript	https://seekingalpha.com/article/3092666-facebook-fb-mark-elliott-zuckerberg-on-q1-2015-results-earnings-call-transcript	22 April 2015	Business updates
FBE2015b	Facebook Q4 2015 Earnings Call Transcript	https://seekingalpha.com/article/3840926-facebook-fb-ceo-mark-zuckerberg-q4-2015-results-earnings-call-transcript	27 January 2016	Business updates
FBE2016a	Facebook Q1 2016 Earnings Call Transcript	https://seekingalpha.com/article/3968783-facebook-fb-mark-elliott-zuckerberg-q1-2016-results-earnings-call-transcript	27 April 2016	Business updates
FBE2016b	Facebook Q2 2016 Earnings Call Transcript	https://s21.q4cdn.com/399680738/files/doc_financials/2016/q2/FB-Q216-Earnings-Transcript.pdf	27 July 2016	Business updates
FBE2016c	Facebook Q3 2016 Earnings Call Transcript	https://s21.q4cdn.com/399680738/files/doc_financials/2016/q3/FB-Q316-Earnings-Transcript.pdf	2 November 2016	Business updates
FBE2017	Facebook Q3 2017 Earnings Call Transcript	https://s21.q4cdn.com/399680738/files/doc_financials/2017/q3/Q3-17-Earnings-call-transcript.pdf	1 November 2017	Business updates
FBE2018	Facebook 2017 Annual Report	https://d18rn0p25nwr6d.cloudfront.net/CIK-0001326801/c826def3-c1dc-47b9-99d9-76c89d6f8e6d.pdf	1 February 2018	Business updates