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Facebook's evolution: development of a platform-as-infrastructure

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ABSTRACT

The purpose of this article is to operationalise an evolutionary perspective on the history of social media and to trace Facebook's evolution from a social networking site to a "platform-as-infrastructure". Social media platforms such as Facebook change constantly on the level of their platform architectures, interfaces, governance frameworks, and control mechanisms, all while responding to their larger environments. By examining the evolution of Facebook's programmability and corporate partnerships, we develop an empirical historical analysis of the platform's boundary dynamics that ultimately determine its operational scale and scope. Based on our analysis of a unique set of archived primary sources, we discern four main stages in Facebook's long-term evolution and discuss the interplay between ongoing processes of "platformisation" and "infrastructuralisation". We argue that these terms foreground complementary aspects of the platform's efforts in balancing its expansion and adaptability to changing user needs and other "environmental dynamics" without risking its integrations and embedding in other domains, such as advertising, marketing, and publishing. Ultimately, our contribution illustrates how empirical platform histories can denaturalise the current dominant position of social media platforms, such as Facebook, revealing over a decade of incremental evolution rather than revolution.

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Facebook; platform evolution; platform history; programmability; infrastructure; political economy

Introduction

The 2016 U.S. presidential elections marked the start of two years of negative coverage of Facebook (Vaidhyanathan, 2018). Somewhat surprisingly, the company did not see a decline in monthly active users, nor in its vast network of business partners. Indeed, over the past decade, numerous companies worldwide have aligned their business models and have integrated their technologies with Facebook. As of late 2018, Facebook hosted over 90 million businesses and 6 million active advertisers (FIR-2018). Despite collecting behavioural data of over 2.2 billion monthly active users, Facebook hides a highly opaque, digital marketing ecosystem that keeps its revenue motor

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humming. Collectively, these statistics point towards Facebook's entrenchment: its deep economic and infrastructural integration in the wider ecosystem of connective media (van Dijck, 2013) and, in particular, the digital advertising and marketing industries (Crain, 2019). This entrenchment raises the question of how to account for the platform's economic growth and technological expansion as it caters to multiple stakeholder groups (Helmond, Nieborg, & van der Vlist, 2017; Nieborg & Helmond, 2019).

In this article, we engage with Facebook's *evolution* as a platform company that is inherently unstable and subject to continuous change. We contribute to both popular and academic efforts to historicise the company's meteoric rise (Brügger, 2015; Goggin, 2014; Kirkpatrick, 2010; Vaidhyanathan, 2018) by analysing Facebook's ability to forge and dissolve corporate partnerships over time. We contend that to understand Facebook's growth, it should be seen as not only a social networking site but also a constantly changing platform that derives power from its ability to create institutional dependencies among its vast network of partners. It is easy to overlook this techno-economic dimension of platform power. Early popular and scholarly contributions on "Web 2.0" emphasised the supposed emancipatory and democratic potential of social media for users (van Dijck & Nieborg, 2009). Facebook's chief executive Mark Zuckerberg has been eager to maintain and broaden this framing by ceaselessly "describing users as empowered social and political actors" (Hoffmann, Proferes & Zimmer, 2018, p. 210). In this article, we focus on the process of Facebook positioning itself not to its billions of end-users but rather to the very large business organisations with which Facebook has partnered and that have been key drivers behind the platform's increased infrastructural power and presence.

Our empirical historical approach involves two complementary lines of enquiry. First, we consider the dynamics of Facebook's platform architecture and how its programmability evolved over the years to accommodate different stakeholder groups. We investigate platform programmability by analysing Facebook's evolving platform *boundaries*, or more precisely, the platform-architectural borders that afford technical and organisational interactions with external stakeholders, particularly corporate partners. To that end, we draw on the notion of technical "boundary resources" (Ghazawneh & Henfridsson, 2013), which include application programming interfaces (APIs), software development kits (SDKs), and reference documentation. These resources enable external developers and organisations to build applications and integrations with Facebook's data and extend its functionalities. Second, we consider another set of boundary resources: partnership programmes and related partner badges and certifications. Ultimately, a platform's control over this heterogeneous collection of resources raises significant political-economic questions. When platforms are in full control over (access to) their data infrastructure, individual platform-partnership relationships are inherently uneven and asymmetrical (Bechmann, 2013). In addition, when pursuing technological expansion and economic growth, platforms deploy partnership strategies to connect and integrate with organisations worldwide that are leading in other markets and industries. As a result, partnerships are an essential entry point for tracing a platform's evolution and its shifting boundaries.

These two complementary levels of analysis offer insights into the multiple forms of *boundary-work* that platforms and partners perform together to drive their expansion

and subsequent entrenchment, thereby gaining infrastructural properties and power. On the one hand, platforms conduct internal boundary-work when negotiating their “programmability” towards specific stakeholder groups (Mackenzie, 2018), which is reflected in the formalisation and stabilisation of their platform architectures over time. On the other hand, platforms conduct boundary-work with their partners. These tend to be market leaders who are strategically positioned in other domains, such as advertising, marketing, and publishing. Through these strategically forged corporate partnerships, platforms instil platform dependencies, become embedded, and gain power in other domains. Thus, we consider both internal and external boundary-work as the operationalisation of infrastructural power, both of which are necessary to establish connections with external partners.

By documenting Facebook’s shifting boundaries, especially in terms of its programmability and partnerships, we detail the platform’s constant, incremental reconfiguration, which culminated in an aggressive infrastructural posture. In this regard, the interplay between the processes of “platformisation” and “infrastructuralisation” captures how platforms expand their boundaries while simultaneously embedding themselves into other markets by strategically orienting their programmability towards developers and businesses (Constantinides, Henfridsson, & Parker, 2018; Gerlitz & Helmond, 2013; Helmond, 2015; Mackenzie, 2018; Plantin, et al. 2018). Consequently, we trace Facebook’s transformation from a social network into a “platform-as-infrastructure” (Plantin et al., 2018, p. 307).

Based on our publicly available unique data set of archived platform boundary resources, we discern four stages in Facebook’s long-term evolutionary dynamics and present these in the form of a periodisation, beginning in 2006. Our evolutionary perspective and methodological approach afford an empirical historical contribution to platform studies that is deeply sensitive to the interplay between platforms and their environments. In addition, we trace the incremental, minute modifications that, taken together, point towards platform evolution rather than platform revolution.

Platform evolution and internet history

Similar to websites that are subject to “fluctuation” as they are editable and reproducible (Brügger & Finnemann, 2013), platforms change continuously. Typically, webmasters and platform operators do not systematically document changes, nor do they offer comprehensive archives of old materials, thereby posing serious challenges to writing internet histories. Consequently, a key challenge for platform historians is “to find useful sources that enable them to understand the evolutionary processes in the first place” (Bruns & Weller, 2016, p. 186). In media and communications studies, multiple approaches have been employed to write platform histories (Brügger, 2015; Burgess & Green, 2018; Elmer, 2017; Gerlitz & Helmond, 2013; Goggin, 2014; Hoffmann et al., 2018; van Dijck, 2013; Rogers, 2013a, b). These approaches typically focus on the evolution of a single platform and employ secondary sources, such as industry blog posts and screenshots, to chronicle its evolution. However, as others have argued, platforms evolve via a complex interplay among users, technologies, infrastructures,

organisational structures, and various social, cultural, and economic practices (van Dijck, 2013).

Our study differs from existing historical platform studies in four ways. First, we move from single platform histories to an ecosystem-level view, which considers the larger environments within which platforms operate. Second, our historical analysis draws from a unique set of primary historical sources: archived platform boundary resources made accessible by the Internet Archive Wayback Machine (cf. Helmond et al., 2017; Nieborg & Helmond, 2019). Third, our approach mimics the foci and language in the fields of information systems and organisation studies. In these fields, which are typically not part of platform studies, “platform evolution” is studied conjointly with the evolution of digital infrastructures and inter-organisational networks (Constantinides et al., 2018; de Reuver, Sørensen, & Basole, 2018). Similar to media and communication scholars, organisational scholars have adopted biological models and metaphors to conceptualise the dynamics of organisational structures (Mars & Bronstein, 2018). For example, as digital platforms transform, their architectures, integrations with partners, governance frameworks, and environmental contexts coevolve. Collectively, these dynamics determine platforms’ “evolutionary trajectories”, particularly in terms of “composability” and “malleability”, which are the two key short-term evolutionary dynamics in a platform’s programmability (Tiwana, Konsynski, & Bush, 2010). As we detail, these two features describe the incremental changes of a platform’s programmability and the ability of external developers and corporate partners to extend platform functionality without compromising the platform’s integration within the larger platform ecosystem. In short, they capture a platform’s technical adaptation to changing user needs, technological innovation, market competition, and other “environmental dynamics” (Tiwana et al., 2010).

Building on the notion of evolutionary trajectories, the fourth way we deviate from historical platform studies is our level of temporal granularity. In our analysis, we distinguish between long-term and short-term evolutionary dynamics. Most historical platform scholarship focuses on the former, offering broad-stroke histories based on key events and leadership decisions impacting a platform’s design and governance. These developments cover annual or multi-year periods. We complement such accounts by including short-term dynamics that take place on a monthly or quarterly basis. These include incremental, minute modifications in platform architecture or boundary resources that ultimately underpin long-term shifts (e.g. achieving corporate entrenchment, envelopment of competing platforms, derivative mutations such as dating or messaging platforms). Taken together, these dynamic adaptations are critical for understanding the evolving programmability of platforms insofar as they can facilitate external stakeholder groups, such as advertisers and publishers. In particular, these trajectories reveal how platforms, through technical and partner-oriented resources, govern and control platform boundaries.

Platform boundaries and platform extensions

Platform evolution, we argue, can only be observed over a sufficiently long period of time, which in the fast-paced platform economy means years, not decades. Therefore,

in our historical approach, we suggest including a platform's archived development resources to allow for a longitudinal investigation of changes in a platform's programmability. We build on the work by media studies scholars who examine the underlying mechanisms and logics that structure a platform's extensions into other domains and markets. Examples of such extensions include software plug-ins, "social buttons", and other API-based connections that expand platform boundaries by integrating platform data and features into third-party websites, software, and apps (Gerlitz & Helmond, 2013; Helmond, 2015).

Platform boundary resources, such as APIs, are important mechanisms to realise platform extensions as they provide "a set of interfaces" that enables external websites, platforms, and apps "to communicate, interact, and interoperate with the platform" (Tiwana, 2014, p. 6). Consequently, they allow third-party developers, such as marketing agencies, to build "on top of" a platform's core infrastructure, thereby extending its functionality. Relatedly, SDKs are important boundary resources that facilitate and streamline the app development process by providing developers with a set of software tools, developer libraries, APIs, documentation, code samples, and guides.

Platform boundary resources are an important way for platform companies to exercise power over their institutional relationships with third parties. On the one hand, platforms change continuously and evolve alongside external contributors who integrate platform functionality into their own software tools and products. On the other hand, there is an incentive for platforms to maintain stability and standardise their boundary resources for third-party development (Tiwana et al., 2010). The ability to define platform architecture and governance is indicative of an "economy of data intraoperability", in which platform operators enforce asymmetrical institutional relationships with their partners (Bechmann, 2013). Tracing the evolution of Facebook's boundary resources helps us grasp not only how a platform's architecture changes and how its functionality becomes embedded in other domains, but also the evolution of institutional dependency among corporate partners.

Corporate partnerships and exponential growth

Compared to more traditional companies in the information and communication industries, one of the defining economic and organisational properties of platform companies is their programmability. That is, they operate "multi-sided markets" by bringing together different "sides" or "users" (Gawer, 2014; Tiwana, 2014). In the context of multi-sided markets, users can be end-users (i.e. individuals) and a wide variety of organisations, including but not limited to non-profits, governments, businesses, content developers, and advertisers. A platform's ability to thrive within an ecosystem hinges on its ability to aggregate users (i.e. market sides) and facilitate seamless interactions and transactions among them.

Most of the multi-sided market research is rooted in the fields of economics and business studies (i.e. information technology and strategic management), which theorise how firms can gain a competitive advantage by leveraging the externalities associated with networked markets (de Reuver et al., 2018; McIntyre & Srinivasan, 2017).

Network externalities or “effects” describe how users accrue (or lose) value by other users joining (or leaving) a platform. From an economic perspective, platform businesses are able to grow exponentially if they can grow all sides in the market as this leads to cross-side externalities. For example, the more end-users join a market, the more plentiful and valuable the transactions become for other sides in the market. From a strategic management perspective, a platform’s “competitive advantage” hinges on its ability to entice users to join a platform. Growing the pool of end-users is typically an issue of scale: the bigger the pool, the higher the demand. Conversely, growing organisational sides introduces supply-side economies of scope: heterogeneous organisations that partner with platforms not only offer products or services to end-users, but also are positioned as “collaborative innovators” (Gawer, 2014, p. 1243). In this role, they can introduce a wider variety of platform functionalities and extend a platform’s core features. In the case of Facebook, this means that corporate partners, such as advertising and marketing companies, can contribute technology, data, or services that complement Facebook’s own products and services.

The scholarship on corporate partnerships is closely related to questions about platform evolution and platform boundaries. Drawing from the fields of industrial organisation and information systems, scholars studying multi-sided markets emphasise the dynamic nature of platform design and how partners and technology are managed. They argue that platform operators are incentivised to facilitate organisational alignment and integration among the various sides of a platform. As we noted earlier, platform operators can accommodate corporate partners by offering a standardised, stable, core technology (Tiwana, 2014). The fact that this is not always the case demonstrates that the process of forging and sustaining organisational relationships is fraught with tension, risk, and uncertainty. Because of the inherent power asymmetry in platform ecosystems and the unbridled growth driven by network effects, the emergence of “platform capitalism” has drawn the attention of critical political economists (Bechmann, 2013; Nieborg & Poell, 2018; Srnicek, 2016). We align ourselves with these critical perspectives and concur that corporate partnerships are inevitably entwined with questions of power. Every additional corporate partnership solidifies a platform’s infrastructural position and is one step closer to a more dominant position not only in the platform ecosystem but also in broad and far-reaching markets and industries.

Tracing platform boundaries

To study Facebook’s evolving programmability and platform boundaries, we developed a methodological approach that uses archived platform materials to reconstruct platform history. We retrieved these materials from the Internet Archive Wayback Machine, which is the largest publicly-accessible web archive, containing over 344 billion “snapshots” from archived web pages since 1996. We also draw on Facebook’s blog archives and trade publications (Appendix). Our data set begins in 2006 with the launch of the Facebook Development Platform and ends in November 2018. In our analysis, we partitioned our data into 14 intervals (avg. = 1.4 intervals/year) to compare different materials and moments. These intervals are based on prior exploratory research (Helmond et al., 2017) that offered insights into key moments when changes

occurred in our platform materials (i.e. developer, business, partner materials). Additionally, to contextualise our historical analysis based on archived platform materials, we conducted semi-structured, 30–60-minute background interviews with a small number of Facebook’s marketing partners from 2013 to 2016. We interviewed founders and business development executives of leading partner organisations, such as App Annie, AppsFlyer, Fiksu, Grow Mobile, and TUNE, on-site or at industry events. We draw on these interview materials to contextualise our analysis by including partners’ perception of the role and dynamics of Facebook’s partnerships. Finally, we used information visualisations to present our historical reconstructions and the outcomes of our analysis. All figures use identical temporal axes and intervals to enable comparison. Monochrome gradient bars are used to demarcate the four stages of our periodisation, which we discuss after the analysis.

Our empirical analysis proceeds along two main lines of enquiry. First, we systematically retrieved archived snapshots of Facebook’s developer materials to trace the evolution of Facebook’s programmability and relationships with different kinds of developers. We then reconstructed changes in Facebook’s boundary resources, their retrospective versioning, and the conditions under which third-party development and external relations evolved. Second, we collected archived business and partner materials to trace the evolution of Facebook’s relationships with partner organisations. Using archived snapshots of partner programme directories which list all partnerships, we took stock of all partners’ names and details. Partner programmes signal integrations with officially approved or certified partner organisations who provide services or implement platform data or products that augment Facebook’s reach and scale. We then characterised these partnerships by examining their official partner badges and specialties, which have a longer history online and typically function to mark “authority, expertise, experience, and identity” (Halavais, 2012, pp. 356–357). In the case of Facebook, these badges detail the particular capabilities and expertise by which partners complement the platform (FB-2018a). We employed these materials to trace the changing composition of Facebook’s ecosystem of marketing partners who have been adjudicated on their “demonstrable expertise” and capacity to develop apps that complement and extend Facebook’s own tools, products, and services.

In short, these materials allow us to reconstruct Facebook’s embeddedness within larger technological, economic, and organisational structures. Our materials point to Facebook’s ability to leverage cross-side network effects to expand the scale, scope, and reach of its technical and business operations through strategic corporate partnerships. Neither boundary resources nor partner programmes are typically included in historical platform studies.

Development of Facebook platform

In our first line of enquiry, we traced the evolution of Facebook’s programmability and platform boundaries and visualised this over time (Figure 1). Launched in 2004 as a social networking site, Facebook became programmable when it started inviting third-party developers to integrate with Facebook: first with the beta launch of “Facebook Development Platform” (2006), followed by “Facebook Platform” (2007) (FNo-2006;

Facebook's platform, 2006–2018

Facebook Development Platform, Facebook API (Dev), Facebook Platform, Facebook Ads, Graph API, Ads API, Audience Network, Marketing API, News API, LiveKit Platform, LiveKit API, Instagram Platform, Instagram Graph API, Messenger Platform, Messenger Platform

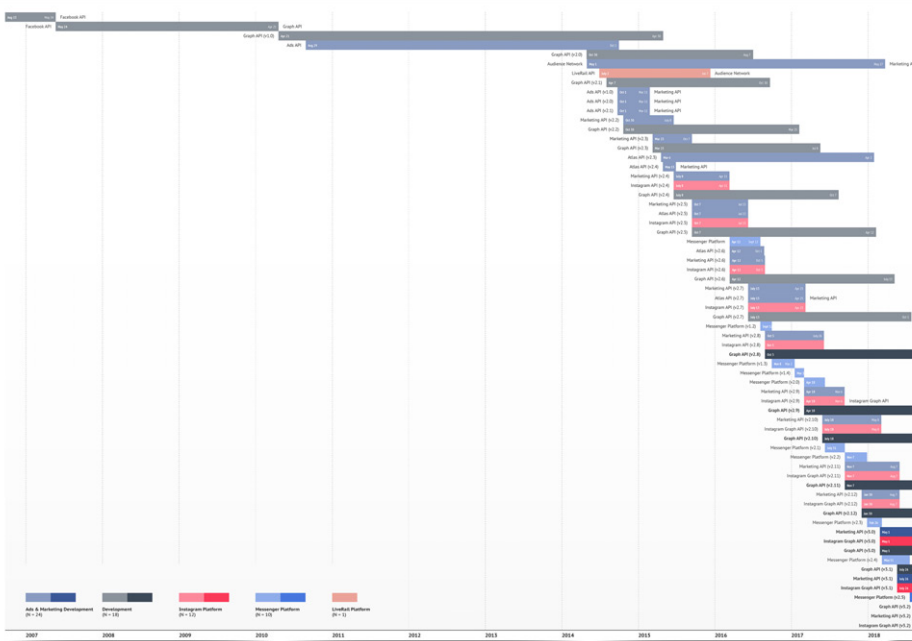


Figure 1. Evolution of Facebook's platform, 2006–2018. <https://doi.org/10.17605/osf.io/47zyc>.

FNe-2007). To facilitate third-party development, Facebook offered a set of boundary resources, which exposed the platform's architecture and offered developers guidance on how to access platform data and functionality to build their own applications.

In these formative years, Facebook Platform primarily focused on having third-party developers build “social apps” inside Facebook's domain and on top of its “social graph”, which represents “the network of connections and relationships between people” in the Facebook API (FNe-2007). At the F8 Developer Conference in 2010, Facebook announced the first major iteration of their developer platform, dubbed “v1.0”, which featured a new “Graph API”, formerly known as the “Facebook API.” Since then, the platform has employed API versioning and so-called versioning schedules to introduce regular updates and mark the deprecation of previous API versions (FD-2018e). The launches coincided with the introduction of several SDKs to help developers build mobile apps for Facebook, signalling its ambitions to expand into the emerging mobile ecosystem (FD-2010b).

In mid-2010, the development platform was firmly in place, which paved the way for the platform's orientation towards businesses and advertising technology companies. The introduction of Facebook's “Ads API” meant that developers could build their own advertising technologies on top of Facebook's programmable platform. The Ads API was available to selected “tools vendors” and marketing agencies to create and manage their “ads on Facebook programmatically” (FD-2010a). It offered partners deeper levels of technology integration by enabling them to connect their own tools with Facebook's advertising products, allowing partners to

automate and manage ads on Facebook. As such, the rollout of the Ads API demonstrates an important transition and expansion of Facebook's development platform by accommodating advertisers not only as customers, but also as a new group of development partners.

In 2013–2015, flush with momentum and capital from its initial public offering (IPO) in 2012, Facebook made a number of high-profile acquisitions to expand its user base and advertising development platform. This is reflected by the increasing number of boundary resources and the growing pace of API updates. In 2013 and 2014, Facebook acquired Atlas, a programmatic advertising platform, and LiveRail, a video advertising platform (FNe-2013; FNe-2014). Although both services were eventually discontinued, certain aspects of these platforms, such as the Atlas API, were integrated into Facebook's core advertising platform. Furthermore, Facebook expanded its focus on mobile advertising by launching "Facebook Audience Network" (2014), which included a set of boundary resources that enabled "advertisers to extend the scale of their Facebook campaigns beyond Facebook and into other mobile apps" (FB-2014), allowing advertisers to find and target audiences beyond the platform's boundaries. These acquisitions and the subsequent integration of external boundary resources indicate how Facebook followed broader developments in digital marketing as the company oriented itself towards programmatic advertising, video, and mobile advertising (Crain, 2019).

In 2015, Facebook officially rebranded the Ads API into the "Marketing API" (MAPI), which can be seen as an effort to further broaden the scope of Facebook's advertising ambitions by explicitly hailing it as a platform for marketing development. In this context, marketing refers to a broader set of corporate activities centred on promoting and selling services, and typically includes market research and advertising. Together with Facebook's Audience Network for mobile advertising, foregrounding the MAPI's development marked a key moment in Facebook's evolving programmability as it enabled the development and integration of marketing apps. Finally, in 2018, Facebook again redesigned and consolidated its technical boundary resources for businesses and marketing developers by integrating the platform resources of two of its most popular apps, Instagram and Messenger, into its core platform.

Accrual of corporate partnerships

In our second line of enquiry, we examined how Facebook followed a multi-sided market strategy and accrued corporate partnerships through 1) partner programmes and 2) their certification mechanisms (i.e. specialties and badges). This analysis set us up for a third step: tracing the changing composition of Facebook's marketing partner ecosystem. While APIs and reference documentation are primarily aimed at developers, these programmes and certifications are aimed at businesses and partners who build the integrations that connect Facebook with adjacent markets and industries. We reconstructed the evolution of Facebook's partner programmes since 2007 and observed a shift in orientation from partnering with developers, and then to advertising and marketing developers to media and content partners more broadly (Figure 2).

Partner programmes

One of the earliest partner programmes, fbFund (2007–2009), awarded grants to developers to build “their businesses on Facebook Platform” with “innovative and engaging” apps (FD-2007). Additionally, the “Application Verification Program” and “Great Apps Program” (2008–2009) were launched to create a “robust” and “thriving” app ecosystem, pushing partners to build “meaningful”, “trustworthy”, and “well-designed” apps. In return, verified app developers would obtain deeper platform integrations, early access to new features, and support from Facebook’s growing partner management team (FD-2008). The subsequent “Preferred Developer Consultant” (PDC) programme (2009–2012) was aimed at connecting businesses with development partners who were experienced in using Facebook products and technologies and had “a long track record of providing Facebook-centric services to large Fortune 500 businesses” (FD-2009).

The next set of Facebook’s programmes focused on building and expanding its advertising and marketing partnerships. The “Ads API Tools Vendors” programme (2009–2011), later renamed the “Marketing API Program” (2011–2012), listed third-party tools that were built by selected partners on top of the Ads API. The programme aimed at connecting partners with access to the Ads API to major companies and agencies to create and manage large Facebook advertising campaigns via these third-party partner tools (FD-2009). Later, these programmes merged with the Preferred Developer Consultant programme into the “Preferred Marketing Developer” (PMD) programme (2012–2015), which was intended to find developers with the ability to build comprehensive “solutions to Facebook marketing and business operations” (FNo-2011; FD-2012a) and to create a “community of best-in-class developers focused on making social marketing easier and more effective” (FPMDC-2013). The successive “Facebook Marketing Partners” (FMP) programme (2015–present), and related marketing

Facebook’s partner programmes, 2007–2018

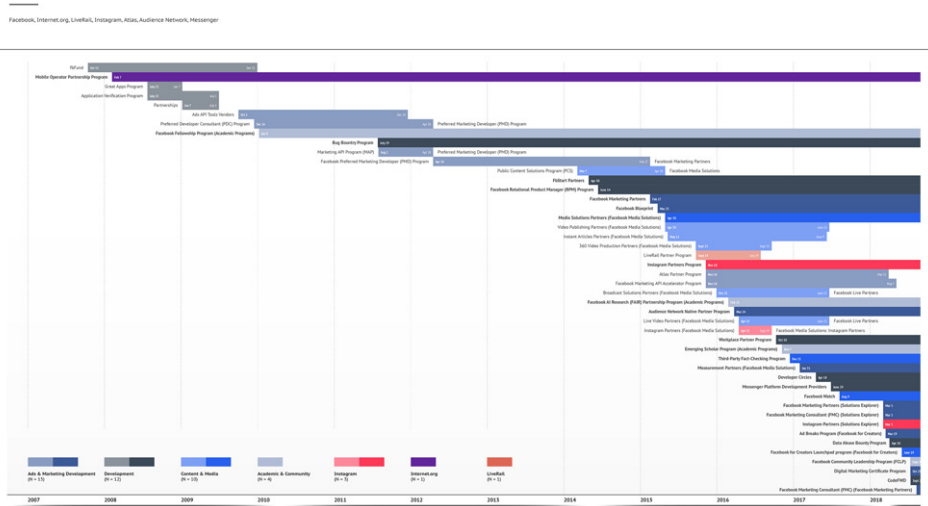


Figure 2. Evolution of Facebook’s partner programmes, 2007–2018. <https://doi.org/10.17605/osf.io/47zyc>.

programmes such as the “Instagram Partners” programme (2015–present) and “Atlas Partners” programme (2015–2017), further emphasised the development of marketing technologies.

The Facebook Marketing Partner programme promised businesses to help find partners who offer “innovative technology” and “custom-tailored solutions” to “supercharge” their marketing efforts on and off Facebook (FMP-2015). The related “Facebook Marketing API Accelerator Program” (2015) provided a “path to serious API skills and support” to help marketing developers learn about the MAPI and Facebook marketing (FD-2015). Such accelerator programmes, including fbFund (2007–2009) and FbStart Partners (2014–present), provide developers with technical, educational, and financial support to stimulate and facilitate the development of Facebook-integrated business apps and marketing solutions, thereby contributing to the platform’s expansion and embedding it further in the digital marketing ecosystem. The recent redesign of Facebook Marketing Partners’ directory into “Solutions Explorer” (2018) was accompanied by the introduction of the “Facebook Marketing Consultants” (FMC) programme (FD-2018a). These consultants are not fully vetted partners but individuals who help smaller advertisers with their on-demand advertising and marketing needs which “aren’t always addressed by our traditional partner ecosystem” (FD-2018d).

The latest phase of Facebook’s partner programmes shows an orientation towards media partners, including broadcasters, publishers, and content providers, with programmes such as “Facebook Media Solutions” (2015–present) (Rein & Venturini, 2018). Additionally, there are general public-oriented partner programmes such as the “Data Abuse Bounty Program” and “Third-Party Fact-Checking Program”, which emerged in response to recent critiques of Facebook concerning Cambridge Analytica and the spread of misinformation, together with a programme that foregrounds the company’s renewed focus on community building with the “Facebook Community Leadership Program” (2018–present). These public programmes signal another phase in the evolution of the platform and its relations and responsibilities to end-users and external stakeholders. The multiple types of partner programmes illustrate how Facebook interacts with various stakeholder groups and how the platform truly became a multi-sided platform, connecting app developers, advertisers, marketers, content producers, media, and local communities.

Marketing partners’ specialties, badges, and certifications

An important aspect of the marketing partner programmes’ structure is the use of certifications. Here, we reconstructed how partners’ specialties and official badges evolved over the years to determine the role of partners in Facebook’s expansion (Figure 3). Changes in specialties and badges indicate how and when Facebook shifted its orientation from platform-centric advertising services to business solutions that are familiar to a broader set of digital advertisers and marketers.

In 2010, Facebook offered a single Preferred Developer Consultant badge that partners could put on their websites to indicate a sanctioned relationship with the platform. Partners only had three “Areas of Expertise” (i.e. “Connect”, “Applications on Facebook.com”, and “Pages”), which were intended to build “deeply integrated social

“built enough value around their product that people need it and because of that they set their own rules”. This partner concluded that platforms such as Facebook “want to control the entire environment for app developers” (I-2015b). Thus, while partnerships are generally considered mutually beneficial, platform–partner relations are inherently asymmetric.

In 2015, the Facebook Marketing Partners programme introduced a single “Marketing Partner” badge to represent multiple “Specialties”, which no longer referred directly to platform-centric business products but instead employed common professional marketing terminology (e.g. “Ad Technology”, “Content Marketing”, “Media Buying (US Only)”). This updated terminology indicates how Facebook seeks to integrate the distinct tools, products, and services of its platforms into a single, unified marketing platform accessible to partners, using general marketing terminology. In this period, specialties such as “Audience Onboarding” and “Audience Data Providers” arose to enable marketers to find existing customers on Facebook using a marketer’s own data and to create new audience profiles on Facebook with the help of third-party data partners. With the growth of its mobile app products, Instagram’s marketing partner specialties were aligned with Facebook’s, by employing the same specialties and badges. Notably, in early 2018, as a response to the Facebook–Cambridge Analytica data scandal, the “Audience Data Providers” specialty was removed.

Finally, official partner badges also signal certifications in knowledge and learning (cf. Halavais, 2012, p. 369), such as Facebook Blueprint’s “Certification Badges” (2015–present). Blueprint is an “education program that trains agencies, partners and marketers on how to use Facebook” to create “better campaigns” through online courses and exams (FB-2015). However, it is not merely a training programme because some Marketing Partner specialties require the completion of Blueprint courses (FB-2018b).

Marketing partner ecosystem

In addition to examining partner programmes and certification mechanisms, we also traced changes in the composition of Facebook’s marketing partner ecosystem. We used archived partner materials to reconstruct the evolution and dynamics of partnerships in the partner ecosystem (Figure 4). In total, we found 3,129 partner names over the period 2009–2018 (1,033 unique partners). The number of partners increased most between 2009–2013, with the largest number of additions and removals between 2012–2013. Increases in partnerships correspond with major changes to the development platform and newly launched partner programmes, suggesting that they are used to attract developers, businesses, content producers, and publishers to adopt newly launched platform tools and products. Between 2014–2018, the total number of partners remained more constant, although in 2018 there are many new partners with the introduction of the Facebook Marketing Consultants programme as part of the Facebook Marketing Partners programme.

While there are partnership additions and removals at every interval, as many as 42 of our partners appear more than 10 times across our 14 intervals (avg. length = 7.1 years). These long-term partners are leading digital advertising and marketing

Facebook's marketing partner ecosystem, 2009–2018

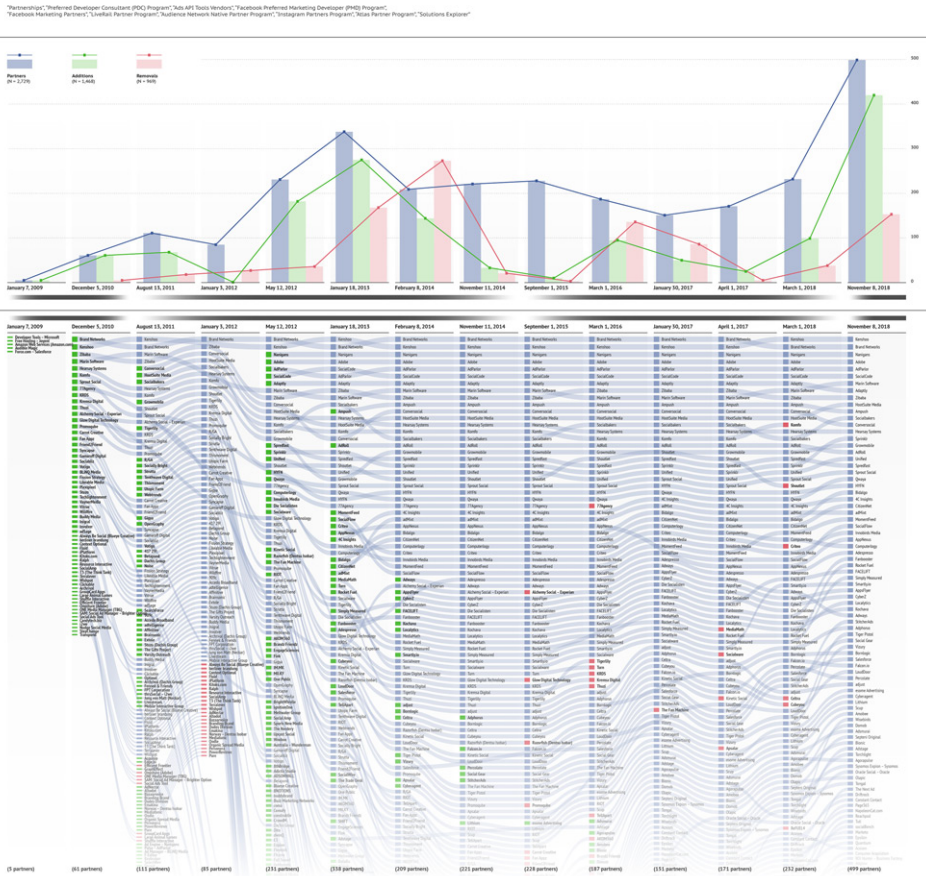


Figure 4. Evolution of Facebook’s marketing partner ecosystem, 2009–2018. <https://doi.org/10.17605/osf.io/47zyc>.

technology firms such as Brand Networks, Kenshoo, Nanigans, Adobe, SocialCode, AdParlor, Adaptly, Marin Software, and Salesforce, all of which have integrated their own platforms with Facebook. These kinds of partnerships indicate how Facebook is entangled both computationally and organisationally with the global network of leading advertising and marketing technology companies. One of the mobile advertising companies we interviewed has been a long-term partner since 2011 and is technically integrated with over 130 distinct advertising networks and major traffic sources such as Facebook. It describes itself as helping advertisers to “navigate through a really messy ecosystem” of interconnected platforms, each of which performs a specific task. For smaller firms such as these, of which there are many, a partnership with Facebook is not only strategic but also deemed essential (I-2016).

By tracing the changing composition of Facebook’s partner ecosystem and describing partners’ categories, we gained insights into Facebook’s larger embedding in digital advertising and marketing technologies, other markets, industries, and countries. We matched our entire list of partners to the annual marketing technology data

set released on chiefmartec.com, a reputable market research blog since 2011 (Brinker, 2018). The 2018 data set lists 6,829 distinct marketing technology solutions and their categories, which we employed to characterise Facebook's partnerships and understand their embedding in the marketing technology industry landscape (Figure 5).

Partners were mostly specialised in the categories of "Advertising & Promotion" (598), "Social and Relationships" (375), "Data" (294), and "Content & Experience" (267), while "Commerce & Sales" (95) and "Management" (36) did not have a significant presence. Notably, "Advertising & Promotion" and "Data" rose in prominence between 2012–2014, reflecting Facebook's orientation towards advertising technology and its growing prominence as a data platform within the industry. "Content & Experience" has been steadily growing since 2009, pointing to Facebook's key role in the platformisation of cultural production (cf. Nieborg & Poell, 2018).

On a sub-category level, we observed the rise of "Search & Social Advertising" (297) and "Display & Programmatic Advertising" (205), especially between 2012–2016. Display and programmatic partnerships declined since 2016 due to the shutdown of Facebook Exchange (2015), its ad exchange. The growth of mobile-oriented partnerships (e.g. "Mobile & Web Analytics", "Mobile Marketing") reflects Facebook's mobile orientation since the mid-2010s (Goggin, 2014), as well as a larger industry-level shift towards "mobile-first". First in 2012, then in 2015, there was an increase in partners engaging in "Social Media Marketing & Monitoring" (238), reflecting the popularity of tools for online brand presence and community management on Facebook. Also, since 2012, Facebook has accrued many data-oriented partnerships in "Audience/Marketing Data & Data Enhancement" (86) and "DMP" (60) – or Data Management Platforms, which combine the collection, organisation, analysis, and activation of data for targeting and analytics purposes. We further found a long tail of more widely-oriented partnerships across all categories.

Periodisation of Facebook's evolution

Surveying Facebook's decade-long deployment of boundary resources provides the basis for a periodisation of its evolution. We discern four stages that together characterise key moments in Facebook's programmability and expansion of its boundaries. The purpose is not to discretise the historical developments as clear-cut periods but rather to characterise some long-term developments in Facebook's evolution and thereby offer analytical handles for understanding the historical precedents of its transformation into a "platform-as-infrastructure" (Plantin et al., 2018, p. 307). In our periodisation, particular development efforts introduced in earlier stages are built upon, extended, and integrated, or alternatively, discontinued and deprecated in subsequent stages.

Stage one in Facebook's evolution (2006–2010) concerns the expansion of its social networking site, with the launch of the Facebook Development Platform. Facebook started attracting third-party developers by offering boundary resources and financial and technical support to accelerate "good" app development (e.g. fbFund and Great Apps Program), thereby embedding itself into the developer community. The Preferred Developer Consultant programme helped brands and businesses to grow a

Facebook's embedding in the marketing technology landscape, 2009–2018

"Teamwork" "Preferred Developer Consultant (PDC) Program" "Ads API Tools Vendors" "Facebook Preferred Marketing Developer (PFMD) Program" "Facebook Marketing Partners" "Lifestail Partner Program" "Audience Network Native Partner Program" "Instagram Partners Program" "Atlas Partner Program" "Solutions Explorer"



Figure 5. Evolution of Facebook's embedding in the marketing technology landscape, 2009–2018. Categories: 2018 Marketing Technology Landscape Supergraphic (Brinker, 2018). <https://doi.org/10.17605/osf.io/47zyc>.

Facebook presence, build apps, and accommodate the enrolment of high-profile partner organisations. Additionally, the Ads API and tools vendors programme were key initiatives to explore and extend the programmability of Facebook's platform towards a new stakeholder group of advertising developers. Despite being only available to a select few, these resources mark the early onset of Facebook's advertising development platform.

Stage two (2010–2014) surrounds Facebook's IPO in May 2012. Already, we can observe Facebook's infrastructural ambitions based on the maturation of its advertising development platform alongside its development platform. In both cases, Facebook's embedding was achieved through the development of apps and integrations. During this period, the Ads API morphed into the MAPI, which signalled an

ambition to grow the business side of the platform beyond advertising to include other marketing products and services such as programmatic advertising, analytics, and insights. The accompanying partner programme enrolled partners capable of implementing Facebook's marketing products into their own software platforms, thereby further expanding Facebook's platform boundaries, its capabilities, and the reach of its technical and business operations. Through engaging in strategic partnerships with leading firms, Facebook legitimised itself not only as a viable advertising platform but also as a one-stop-shop marketing platform. This is also reflected in the merging of several partner programmes into a single Preferred Marketing Developer programme to accommodate and attract new marketing developers. Facebook's partners became vital in this effort by slotting themselves into Facebook-specific specialties conceived around its core platform-centric business products at the time (i.e. Ads, Apps, Pages, Insights). Furthermore, by adopting official partner badges, these partnerships legitimised Facebook's prominent position as a core player in digital advertising and marketing.

Stage three (2014–2018) revolves around the solidification and continued professionalisation of Facebook's marketing development platform and its integrations in other global markets and industries. Facebook's two main development platforms adopted a "core and extended versioning model" with regular API releases and scheduled deprecation dates (FD-2018e). These communicative standards enable the growing developer and marketing developer communities to anticipate the maintenance work required to ensure their apps and integrations, upon which their businesses increasingly depend, will continue to work. Additionally, Facebook made a number of high-profile acquisitions, including Instagram (already in 2012), WhatsApp (2014), Oculus VR (2014), and LiveRail (2014). Their acquired development platforms and boundary resources were gradually streamlined into the Marketing API and Facebook Marketing Partners programme. The MAPI Accelerator Program provided developers with additional resources to work with Facebook's APIs to facilitate the platform's integration in other markets and industries, which enabled its technical and business operations to reach even further. Furthermore, Blueprint was launched to offer marketers and agencies training and certifications for Facebook's marketing tools and products. This coincided with another round of partner programmes by which Facebook addressed new stakeholder groups in media and publishing, content production, and local (developer) communities. As media and content partners gained visibility, Facebook further grew from a user-generated content site into a site for professional content producers and media publishers.

Stage four (2018–present) marks Facebook's current efforts to address criticism about its market dominance and shortcomings with new programmes to combat data abuse and misinformation by offering new programmes and governance mechanisms for Facebook's boundary resources (FD-2018b). This is accompanied by a major redesign and restructuring of Facebook's developer pages, business pages, and partner pages as part of Facebook's larger effort to "reexamine our platform" for building end-user and developer trust (FD-2018c). These changes occurred with the v3.0 release of Facebook's platform APIs, which fully incorporates all Facebook products, including

the Instagram Graph API. This is also reflected in the new unified Solutions Explorer with marketing partner programmes that cover Facebook’s “family of apps” – Facebook, Instagram, WhatsApp, and Messenger – and services. Finally, the new Facebook Marketing Consultants programme introduces individual consultants who can establish Facebook marketing technologies for smaller advertisers and businesses not addressed by the partner ecosystem.

These four periods summarise Facebook’s long-term evolutionary trajectory as shaped by the complex interplay between its platform architecture and the dynamics of its technical and organisational environment. We contend that tracing the evolution of Facebook’s programmability and corporate partnerships is key to understanding these dynamics and the gradual accumulation of influence and power through the processes of platformisation and infrastructuralisation. On the one hand, the composability and malleability of Facebook’s platform architecture enable partners to deploy Facebook’s data and functionalities with relative ease while simultaneously enabling Facebook to govern and control the conditions under which these can be reconfigured (cf. Tiwana et al., 2010). On the other hand, Facebook’s corporate partnerships, particularly with market-leading, global firms, facilitate its rapid entry into new markets, thereby generating and solidifying asymmetrical platform growth and dependencies. Although such developments are often conceived in terms of innovation and disruption, they are in many ways better characterised as ongoing boundary-work with incremental, short-term effects that may (or may not) result in long-term transformations.

Conclusion: evolution of a platform-as-infrastructure

To advance historical platform studies, we operationalised an empirical evolutionary perspective on platforms and platforms-as-infrastructure. We examined how social media platforms, such as Facebook, evolve as programmable architectures and, via integrations with corporate partners, as businesses. By drawing on a unique set of primary historical sources, we offered a methodological approach to chronicle these evolutionary trajectories. Facebook’s archived platform boundary resources enabled us to trace the platform’s shifting boundaries and the boundary-work that underpin its exponential growth and embedding in other domains, especially advertising and marketing. In particular, we traced the articulation of Facebook’s platform boundaries through two complementary lines of enquiry. On the one hand, we reconstructed the evolution of its programmability as facilitated and governed by APIs, SDKs, and related boundary resources. On the other hand, we reconstructed the evolution of its corporate partnerships, which were especially important in developing the apps and integrations that connected Facebook with adjacent markets and industries, thereby extending the platform’s power. As such, we contribute to platform studies by providing an infrastructural perspective on Facebook’s growth by highlighting the role of partnerships. Yet, although many of Facebook’s partnerships are publicly listed, recent revelations suggest that there are also non-public partnerships with organisations that have been “whitelisted” for special API access (Collins,

2018). Further research could determine the implications of these non-public partnerships.

Our findings indicate that social networks such as Facebook were not infrastructural at launch, but rather gained infrastructural properties over time by accumulating external dependencies through computational and organisational platform integrations. First, in terms of evolving platform boundaries, Facebook has been steadily growing by accommodating various strategic stakeholder groups through its architectural design and programmability. In particular, its programmability has facilitated multiple developer communities to embed Facebook's platform and operations in various other domains, including software development, advertising, marketing, content production, and media publishing. Thus, the platform changed from a social networking site into a multi-sided platform for "social" app development, advertising development, and marketing development. It did so through internal boundary-work concerning the programmability of its platforms and through cooperative boundary-work with partner organisations, mediated through domain-specific developer communities. Second, in terms of its evolving embedding, Facebook has accumulated external dependencies by routing additional technical and business operations and stakeholder interactions through its platform. As an organisation, Facebook moved from a stand-alone technology company to a public holding company with stakeholders and shareholders. Today, it operates a single unified data infrastructure that gives way to a number of "platform instances", such as Messenger and Instagram, each of which contributes to the platform's boundary-work (Nieborg & Helmond, 2019). Lastly, Facebook developed from a small online advertising business into a leading data-driven advertising and marketing platform, as well as a content monetisation platform for creators and publishers (Nieborg & Poell, 2018).

The interplay between the processes of platformisation and infrastructuralisation thus foregrounds different aspects of Facebook's economic growth and technological expansion. While platformisation speaks to Facebook's growing capabilities to mediate the interactions between multiple stakeholder groups and their diverging needs and interests, infrastructuralisation speaks to Facebook's growing ubiquity by embedding itself in other markets and industries to render technical and business operations more widely and immediately available. Indeed, infrastructure is not simply an analytical concept; becoming infrastructural is an effective platform strategy to "survive in the long run" (de Reuver et al., 2018). Thus, platform power is as much economic, operationalised by access to finance capital (Elmer, 2017), as it is relational through Facebook's ability to mandate organisational alignment among its stakeholders. Therefore, both processes highlight different aspects of the boundary-work that Facebook and its partners perform, as well as the political-economic stakes and consequences of such work. This cooperative boundary-work embeds the platform in other domains and removes barriers to entry, while at the same time avoids sectoral liability and responsibility (van Dijck, Poell, & de Waal, 2018). In particular, what we contribute to platform studies is a way to analyse how both short- and long-term developments constitute platform power. Furthermore, since most leading social media platforms follow similar development trajectories – they also operate partner programmes, development platforms, and advertising and marketing platforms whose materials have

been archived – there are ample opportunities for comparative historical platform research.

Finally, there is a critical need for additional historical platform and platform-as-infrastructure research to denaturalise the present market dominance of platform companies such as Facebook. Because power and influence are relational concepts, critical platform histories should consider the platform not only as an ensemble of technical elements, but also as the relational intersection of multiple stakeholders that are embedded in various domains, regions, and markets. Although social media platforms, at first glance, pose challenges for internet history due to their constant updates, their archived platform materials afford new kinds of detailed, empirical histories. These materials can be used to trace the short-term, minor, and incremental changes that platforms undergo, thereby countering popular myths of ensuing radical innovation and platform revolution.

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Data availability

The data that support the findings of this study are openly available in Open Science Framework (OSF) at <https://doi.org/10.17605/osf.io/47zyc>.

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Appendix

Table A-1. References to original sources, sorted by type and date.

In-text citation	Type	Reference
FB-2014	<i>Business</i>	(2014, October 7). The Audience Network is now available to more marketers worldwide. Retrieved from https://www.facebook.com/business/news/audience-network-launch
FB-2015	<i>Business</i>	(2015, March 24). New resources for Facebook marketers. Retrieved from https://www.facebook.com/business/news/education-resources-for-marketers
FB-2018a	<i>Business</i>	(2018a, November 8). Become a Facebook Marketing Partner. Retrieved from https://www.facebook.com/business/marketing-partners/become-a-partner
FB-2018b	<i>Business</i>	(2018b, November 8). Facebook Ad Technology Specialty Requirements. Retrieved from https://www.facebook.com/business/marketing-partners/adtech-specialty-requirements
FD-2007	<i>Developers</i>	Vora, A. (2007, October 15). fbFund info and submission process. Retrieved from https://web.archive.org/web/20090618172234/http://developers.facebook.com/news.php?blog=1&story=38
FD-2008	<i>Developers</i>	Ling, B. (2008, July 25). New ways for us to partner together. Retrieved from https://web.archive.org/web/20090618161116/http://developers.facebook.com/news.php?blog=1&story=144
FD-2009	<i>Developers</i>	Thayer, K. (2009, December 16). Introducing the Preferred Developer Consultant program. Retrieved from https://developers.facebook.com/blog/post/346/
FD-2010a	<i>Developers</i>	(2010a, December 5). Ads API. Retrieved from http://web.archive.org/web/20101205131945/http://developers.facebook.com/docs/adsapi
FD-2010b	<i>Developers</i>	(2010b, December 5). Mobile applications. Retrieved from https://web.archive.org/web/20101205131421/http://developers.facebook.com/docs/guides/mobile/
FD-2012a	<i>Developers</i>	Yi, J. (2012a, April 18). The New Preferred Marketing Developer Program. Retrieved from https://developers.facebook.com/blog/post/2012/04/18/the-new-preferred-marketing-developer-program/
FD-2012b	<i>Developers</i>	(2012b, May 1). How to get the badge. Retrieved from https://web.archive.org/web/20120501084120/https://developers.facebook.com/preferred-marketingdevelopers/get_badge/
FD-2015	<i>Developers</i>	Lu, C. (2015, November 11). Announcing the Marketing API Accelerator and Virtual Hack. Retrieved from https://developers.facebook.com/ads/blog/post/2015/11/11/announcing-accelerator-and-virtual-hack/
FD-2018a	<i>Developers</i>	Ho, C. (2018a, March 5). New directory tool for Facebook Marketing Partners. Retrieved from https://developers.facebook.com/ads/blog/post/2018/03/05/solutions-explorer-directory/
FD-2018b	<i>Developers</i>	Archibong, I. (2018b, April 4). API and Other Platform Product Changes. Retrieved from https://developers.facebook.com/blog/post/2018/04/04/facebook-api-platform-product-changes/
FD-2018c	<i>Developers</i>	Archibong, I. (2018c, May 1). Investing in the Facebook Developer Community. Retrieved from https://developers.facebook.com/blog/post/2018/05/01/investing-in-facebook-developer-community/
FD-2018d	<i>Developers</i>	White, S. (2018d, October 29). Introducing the Facebook Marketing Consultants program. Retrieved from https://developers.facebook.com/ads/blog/post/2018/10/29/introducing-fmc-program/
FD-2018e	<i>Developers</i>	(2018e, November 8). Versioning - Marketing API - Documentation. Retrieved from https://developers.facebook.com/docs/marketing-api/versions/
FIR-2018	<i>Investor Relations</i>	(2018, October 30). Facebook Q3 2018 earnings. Retrieved from https://investor.fb.com/investor-events/event-details/2018/Facebook-Q3-2018-Earnings/default.aspx
FMP-2015	<i>Marketing Partners</i>	(2015, February 22). Facebook Marketing Partners. Retrieved from https://web.archive.org/web/20150222032351/http://facebookmarketingpartners.com/

(continued)

Table A-1. Continued.

In-text citation	Type	Reference
FNe-2007	<i>Newsroom</i>	(2007, May 24). Facebook Platform launches with 65 developer partners and over 85 applications for Facebook. Retrieved from https://newsroom.fb.com/news/2007/05/facebook-platform-launches-with-65-developer-partners-and-over-85-applications-for-facebook/
FNe-2013	<i>Newsroom</i>	Boland, B. (2013, February 28). Facebook to acquire Atlas from Microsoft. Retrieved from https://newsroom.fb.com/news/2013/02/facebook-to-acquire-atlas-from-microsoft/
FNe-2014	<i>Newsroom</i>	Boland, B. (2014, July 2). Facebook to acquire LiveRail. Retrieved from https://newsroom.fb.com/news/2014/07/facebook-to-acquire-liverail/
FNo-2006	<i>Notes</i>	Fetterman, D. (2006, August 15). Facebook Development Platform launches . . . Retrieved from https://www.facebook.com/notes/2207512130
FNo-2011	<i>Notes</i>	(2011, November 14). Preferred Developer Consultant Program. Retrieved from https://www.facebook.com/notes/facebook/preferred-developer-consultant-program/281113178594498/
FPMDC-2013	<i>PMD Center</i>	(2013, January 18). PMD Center. Retrieved from http://web.archive.org/web/20130118122604/http://www.facebook-pmdcenter.com:80/
FS-2012	<i>Studio</i>	(2012, September 21). Announcing a new Designation for top marketing developers. Retrieved from https://web.archive.org/web/20120923004937/http://www.facebook-studio.com/news/item/announcing-a-new-designation-for-top-marketing-developers
I-2015a	<i>Interviews</i>	(2015, February 4). Mobile Measurement Qualified Company.
I-2015b	<i>Interviews</i>	(2015, February 4). Mobile Measurement Qualified Company.
I-2016	<i>Interviews</i>	(2016, February 13). Facebook Marketing Partner.