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Facebook Fake News in the Post -Truth World

Our mission is to make the world more open and connected.

— Mark Zuckerberg[1]

Introduction

In January 2017, Mark Zuckerberg, founder and CEO of Facebook was surrounded by controversy. The election of Donald Trump as the next President of the United States on November 8, 2016 had triggered a national storm of protests, and many put the blame at the door of fake news stories served up on Facebook's Trending News Feed.[2] Facebook had launched the service in January 2014 to deliver news stories that might be of interest to Facebook users, in addition to the automatic News Feed that told them what was going on in their social network. Individuals could select items that they were interested in, but an algorithm served up news items that might appeal based on past reading habits and those of their close friends.[3] The argument against Facebook was that this process polarized public opinion, fueled prejudices and encouraged the bitter partisan character of the election campaign.[4] Some claimed that fake news, propagated through News Feed, supported the rise of anti-establishment sentiments amongst groups that felt left behind by the establishment elite.[5]

Zuckerberg was unapologetic. On November 10, 2016 he had commented, "Personally I think the idea that fake news on Facebook, which is a very small amount of the content, influenced the election in any way — I think is a pretty crazy idea."[6] He argued that fake stories were posted on both sides of the political spectrum. "Why would you think there would be fake news on one side and not the other?"[7] One technology critic wrote, "Confirmation bias doesn't begin to describe what Facebook offers partisans in both directions: a limitless, on-demand narrative fix, occasionally punctuated by articles grounded in actual world events, when those suit their preferences."[8]

The word that came to define this spread of misinformation was "post-truth", defined by Oxford Dictionaries as "relating to or denoting circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief: 'in this era of post-truth politics, it's easy to cherry-pick data and come to whatever conclusion you desire'..."[9] Post-truth became so widely used in 2016 that Oxford Dictionaries coined the term "word of the year."[10](See **Exhibit 1** for the frequency of use of "post-truth".)

Social media, including Facebook posts, began to play a significant role in world events. Social networking was widely believed to have contributed to the fall of several regimes in the Middle East.[11] These "Arab Springs" had generally been welcomed in the USA, but had also led to anarchy and chaos along with much personal suffering by their citizens. On June 23, 2016 the British public astonished the world by voting to leave the European Union (Brexit), the first "European Spring"[12] – and many feared more in upcoming elections in mainland Europe in 2017. The economic consequences for the UK were seen by most experts to be negative and the pain was most likely to fall on those disaffected citizens who voted for it. Claims of savings from Brexit by pro-Brexit campaigners appeared to be "scaremongering and the misuse of statistics"[13] -- repeated often enough to make them true; the post-truth world.

Now Donald Trump was President of the USA. Did he have Zuckerberg to thank? Facebook had sparked many controversies during its short lifespan. By 2017, it had grown into the biggest social networking group in the world, with 1.8 billion people.[14] (See **Exhibit 2**.) Was this just another challenge along the way, or were the issues more fundamental?

Social Networking[a]

The principles of social networking were as old as the human species, and helped to explain why humans dominated the planet. As the mammalian brain evolved, it added small group social coordination skills for groups of 5-20 which were usually family units. Group membership afforded greater protection from predators, more capacity to compete for food, and the ability to bring down bigger game, making these species stronger in the evolutionary chain. Exclusion from the group could mean death. Such skills were still clearly visible in many lesser mammals such as the wolf pack. The alpha male used raw physical power and simple emotions like fear and intimidation to control pack members. Members deferred to the leader with symbolic shows of submission to avoid too much costly and deadly fighting which would weaken the pack.[15]

Small group coordination skills evolved in the human brain to handle much larger groups, up to 150 people. The alpha still existed, but had many lieutenants; "fixers", effective at marshaling resources to get things done; "connectors" who brought the right people together; "visionaries" who generated and circulated ideas; "gatekeepers" who determined who was a member of the group and who was excluded; "truth tellers" who kept everybody honest; "enforcers" who made sure members obeyed the rules. These roles created a natural hierarchy in the group, extending the scope of the alpha to influence behavior amongst a larger group of individuals.[16]

Members derived their identity from the role they played within the social group. High performance in any one of these roles created a good reputation amongst all group members. A good reputation in the group was highly valued, more important than wealth.[17]

In large groups, raw power, fear and intimidation were too crude to be major instruments of social control. Instead, a much broader set of social emotions was employed to control behavior. These included sympathy, embarrassment, shame, guilt, pride, jealousy, envy, gratitude, admiration, indignation and contempt. Humans expressed these emotions through gesture, speech, and facial expression. Emotions were contagious; they spread quickly from one person to another. Sometimes one emotion triggered another emotion as a response (e.g. anger triggered fear). All this happened

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[a]Excerpted from John R. Wells, "Informal Architecture - Leveraging Social Mechanics," *Strategic IQ: Creating Smarter Corporations*, (San Francisco, CA: Jossey-Bass, 2012), pp. 169-190.

subconsciously via rapid signals to the Amygdala deep in human brains. In this way, humans controlled others and were controlled by them without consciously realizing it.[18]

A number of behaviors helped to facilitate group performance. Work collaboration allowed for larger projects to be tackled and labor to specialize, becoming more efficient. In the absence of monetary forms of exchange, reciprocity was essential, and this required trust. Gift exchange – common in so many societies - helped to build trust. So did exchange of favors, and it was remarkable how long a human being could remember who owed them a favor without even thinking about it. Introductions helped to spread trust, expanding the size of the group.[19]

People-watching was common – to seek out a worthy mate and to make sure everyone was contributing as agreed. Gossiping was widespread - the exchanging of secrets -- allowing rapid and effective communication. Indeed, it was remarkable how fast a gossiper spread a new piece of information to make sure that the news was fresh and they got full credit for it. It was also essential that the gossip was accurate if they were to retain their credibility and reputation as a source.

The rules for these social exchanges – the values that guided good behavior and risked sanction if not obeyed - were key to group effectiveness. Fairness, transparency, accountability, trust, and respect were essential to group performance. It was ironic that many firms tried to identify a unique set of values but were frustrated that they almost always ended up with the same ones as everyone else, worded slightly differently, but this was no surprise; they were programmed into everyone.

A group of 150 co-located people with a strong common sense of purpose was perfectly capable of self organizing and performing effectively without much formal bureaucracy. This was a fundamental building block of human society. The problems started when the group grew larger or was no longer co-located so transparency was lost.[20]

The danger of small group behavior was that it could degenerate into conflict,"functional silos", or tribalism. For groups to work effectively with each other, they required social bridging, the exchange of people, ideas, and goods to build mutual trust and dependence. Loyalty to a higher order and common purpose was also a powerful binder. In this way tribes transformed into nations.[21]

As a species human beings were highly effective social networkers, but they didn't even know it. Thus, the challenge of developing social networking software was to do a better job than human beings, as unconscious experts, already did; to enhance humans' capacity for social exchange, and to overcome "social failures" where the market for social exchange was failing. The potential for social networking software, if it could be achieved, was great. It could accelerate the capacity of the species to work more effectively together; expand the size of natural social components beyond the 150-200 person level; allow social components to operate more effectively across geographies and time-zones; allow people to operate effectively in many more social groups; and create an efficient platform for social components to work more effectively together in a network of networks.[22]

History of Social Networking on the World Wide Web

One of the earliest successes of social networking software on the Internet was HoTMail, a free email service launched in 1996.[23] The service claimed 9 million users by the time it was acquired by Microsoft at the end of 1997.[24] In 1999 Microsoft launched Microsoft Messenger.[25] Messenger was a simple, live messaging service that allowed users to express their feelings with emoticons. It also allowed people to hold conversations on screen while they were working on other tasks, and even to hold several conversations at once.[26] In 1999 the Shenzhen Tencent Computer System Company, Ltd. (Tencent) also

launched its own messenger service, OICQ, in China. By the end of 2000 OICQ claimed to have captured 95% of the mainland China market; in 2001 it changed its name to QQ.[27]

While Microsoft's early introductions were very successful, many start-ups' successes faded quickly, littering the landscape with failures. In 1997 technology entrepreneur Andrew Weinrich observed that "people were desperate for a sense of community and that most online sites brought strangers together without any basis for trust or connection."[28] He established one of the first social networking sites, sixdegrees, "to enable people to network with other people whom they knew and could trust."[29] Inspired by the idea that every person on the planet was just six social connections away from any other person,[30] sixdegrees empowered users to connect with friends, their friends' friends, and eventually their friends' friends' friends -- extending each person's social network by three degrees.[31] It built up a following of three million users before it was sold[32] and shut down in 2000.[33]

A new social network, Friendster, was launched by Jonathan Abrams in March 2003 and quickly experienced "explosive, exponential growth".[34] Friendster mapped users' social connections to four degrees, giving members "a vivid sense of how they fit into their social groups as well as into the larger world"—up to hundreds of thousands of people.[35] The site spread "like wildfire"[36] to almost one million users in four months.[37] Friendster was called "a virtual hipster scene,"[38] "an instant pop sensation,"[39] and "incredibly addictive."[40] Google offered to buy it for $30 million but Abrams turned the offer down.[41] The network's rapid growth began to slow user activity and the technology struggled to keep up. "In theory, Abrams's intricate network was a beautiful thing....[but] these calculations had to happen on the fly—in what would eventually amount to trillions of rapid calculations...."[42] Friendster's reputation went "from hot to not"[43] as users became frustrated with long load times and bored with the same features.[44]

People turned to a flock of new social sites including MySpace, another 2003 social networking start-up. On MySpace they could be more creative with their profiles, and the site quickly gained a reputation as hip and cool among musicians, artists, and event promoters.[45] By March 2004, just one year after Friendster launched, MySpace overtook it in terms of page views,[46] but Friendster "refused to take [MySpace] seriously...."[47] By the end of 2005 Friendster was "nearly out of cash"[48] while MySpace appeared to soar, scoring 12 million unique visitors that June.[49] Rupert Murdoch's News Corporation (News Corp.) purchased the company in 2005 for $580 million, a move that Murdoch would later call a "huge mistake."[50] Under News Corp.'s management, users fled. ''MySpace was like a big party, and then the party moved on,'' one industry executive said.[51] From September 2009 to November 2010 the network dropped from 110.8 million unique users to 81.5 million.[52] News Corp. sold MySpace in June 2011 for $35 million.[53]

A small number of social networking start-ups in 2003 endured. Skype, a free video conferencing and messaging system, signed up 54 million users in two years.[54] It was acquired by eBay for $2.6 billion in 2005;[55] then partially divested by eBay in 2009,[56] and finally sold to Microsoft in 2011 for $8.5 billion.[57] LinkedIn was another successful network launched in 2003, this one exploiting five of the "six degrees" of connections between professionals.[58] The concept was that professionals would introduce each other, forming links up to five people long.[59] However, LinkedIn CEO Reid Hoffman was concerned that "real professionals don't want to give out their black books to other people..."[60] Instead LinkedIn gave professionals control over who could connect to them. A "user writes a note that first must pass through and get approved (or endorsed) by all mutual contacts before arriving at the intended person. If the message makes it through, it's called a "referral."[61] For a fee, companies or head hunters could search and get access to anyone on the site. This proved a boon to job hunters because "you don't have to come right out and declare that you want a new job...LinkedIn allow[s] you to prospect for job leads without tipping off your current employer about your intentions."[62] LinkedIn's

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efforts to foster trust by requiring recommendations to connect people appeared to spur its success. By January 2004, LinkedIn had 140,000 members versus its closest competitor, Ryze, which had 90,000 members and did not require recommendations to connect its members.[63] (Microsoft would later acquire LinkedIn for $26 billion, by which time it had built a database of over 400 million professional profiles.[64])

In January 2004 Google employee Orkut Buyukkokten launched an invitation-only social networking site called Orkut.[65] In February 2004, Harvard sophomore Mark Zuckerberg launched thefacebook.com for the Harvard University community. Yahoo would also try its hand at social networking in 2005 with an invitation-only network called Yahoo! 360 Degrees but it was eventually shuttered.[66] (See **Exhibit 3** for a list of early social networking sites.)

The Economic Lure of Social Networking

Social networking applications had strong economic allure because of the network effects involved. Network effects referred to the increasing value of as network as it added more users. For one-to-many broadcast networks, the value rose in line with the number of users (N); twice as many customers would make the network twice as valuable (2xN). One-to-one communications networks such as the telephone system became more valuable to every user the more users were added. This value increased at the square of the rate of the number of users; twice as many users were 4 times more valuable (N squared). The economic impact of network effects was "winner takes all"; no one wanted to join a network with no members. In the early days of telephony, telephone networks became monopolies and were, as a consequence, regulated. With social networks, the value of the network rose exponentially because individuals could now join lots of different groups of different sizes and communicate with each other. For each additional person that joined, the number of possible new combinations and permutations caused the value of the entire network to double (2 to the nth power, or simply 2^N).

The practical limits on the value of social network effects depended on how far they reached. Often, they were only valuable locally because users typically didn't interact with people from afar. Thus, a local monopoly might be limited to a town or a small region. The other limit was on how good the technology was. If a much better network was launched, it might be sufficient to attract enough users to sign up for the new version and create the next generation monopoly. The last consideration for social networking was the wide range of social exchanges human beings liked to engage in. This always left open opportunities for innovators to launch services to satisfy as yet unmet needs.

The economics of building and operating a social network did not vary much. The initial investment cost was modest, but as the number of users grew, the cost of hosting them rose too. Growing fast was the key to getting to the tipping point to preclude competition. The bigger challenge was finding a revenue model. Many new entrants found willing investors to fund the upfront costs before a revenue model had been identified, but the pressure to cover rising costs invariably forced attention onto the revenue side of the equation.

There were three main potential sources of revenues; customer subscriptions, advertising, and charges to suppliers. Start-ups were loath to charge subscriptions because this impeded growth –- better to build a large community and look to monetize it later. Thus, access was typically free, although many sites charged premiums for extra services.

Advertising was the most common source of revenues, both simple display advertising and performance-based, where the advertiser paid if the subscriber clicked on the advertisement. The

challenge of advertising was that it often impaired the user's experience. With limited display space, this was particularly true of mobile advertising.[67]

The level of take-up of premium services was often very small, often 1-2% of total subscribers, so one of the most popular revenue models, known as "freemium", combined advertising support with premium services.[68]

Levying charges on suppliers in return for access to the network was the third source of revenue. For instance, playing games on social networks was very popular, so social networks often provided access to their platforms, including the social connections (the "graph") in return for a share of revenues generated from the games.[69] Access to these games was, again, often free but users paid for extras to make the game more enjoyable.[70]

Facebook History

Facebook was born out of a college prank.[71] Just before Halloween in 2003, Harvard sophomore Mark Zuckerberg hacked into the campus housing websites to compile pictures of students into a website he called Facemash. This site displayed pictures of two students next to each other and asked users to choose the more attractive person. The votes were then tallied to identify the cutest top ten. It wasn't a new idea — at the time there was a site called HotorNot.com which was similar — but Facemash proved very popular, attracting 450 visitors and 22,000 votes within hours.[72] It also attracted the wrath of the University authorities who ordered him to take the site down.[73]

Facemash established Zuckerberg's reputation at Harvard for programming expertise. Three students, Tyler and Cameron Winkelvoss and Diva Narebdra, approached him to help finish the code for a social networking site they were developing called HarvardConnection. Zuckerberg began work on it in November 2003.[74]

Meanwhile, Zuckerberg discussed a separate idea to put Harvard's class directory, known as the "facebook", online with two roommates, Chris Hughes and Dustin Moskovitz. They liked the idea, so Zuckerberg spent ten days in January 2004 building the site. Anyone with a Harvard email address could join and create a profile, which consisted of a photo, biographical information and some personal information. They could also link their profiles to friends, a feature Zuckerberg modeled after the popular social networking site Friendster.[75] Zuckerberg launched his site, thefacebook.com, on February 4, 2004. Within 24 hours over 1,200 students had signed up; by the end of February, three quarters of Harvard's 6,500 undergraduates were registered.[76]

Soon students from other universities were asking to join. At the end of February 2004, Zuckerberg and Moskovitz launched thefacebook.com at Columbia, Yale and Stanford. By the end of June the service had reached 40 campuses and had 160,000 members.[77] Privacy was crucial to the whole Facebook concept. Zuckerberg explained the logic: "People have information they don't want to share with everyone. If you give people very tight control over what information they are sharing or who they are sharing it with, they will actually share more."[78] Only students from the same university could see the profiles, unless a student from another university gave his or her permission. Even within a college, privacy controls allowed individuals to decide who could their see their profiles. Facebook's restrictions contrasted sharply with the more open philosophy of MySpace, a fast growing social network without privacy controls and where anyone was free to join. On MySpace users could post lots of photos and tailor the look of their pages to their liking, whereas thefacebook.com required everyone to use the same, simple format.

Zuckerberg and Moskovitz worked on thefacebook.com site during the summer of 2004 in Palo Alto, and in the fall decided not to return to Harvard. Instead, they decided to expand to many more universities and colleges.[79] They needed money for servers and Peter Thiel, cofounder of PayPal, invested $500,000 in return for a seat on the board and an option to buy more stock.[80] In September 2004, thefacebook.com launched the Wall where members could post messages to their friends. By December 2004, the network had one million active users.[81]

Meanwhile, HarvardConnnection had launched as ConnectU in May 2004 with similar features to thefacebook.[82] In September 2004, the founders of HarvardConnection sued Zuckerberg, alleging he had stolen their idea and delayed developing their site to get his own site out first.[83] The Harvard Crimson published an editorial saying in essence that neither website was original and that both had copied social networks such as Friendster that had come before.[84] After much back and forth, the case was settled and all litigation was finally dropped in 2011.[85]

The MySpace Challenge

In 2004 MySpace took off. Unlike thefacebook, there were no restrictions on who could join MySpace — anyone with an email account could do so - and there were no privacy controls. In August of 2004 thefacebook reportedly had 214,000 unique visitors;[86] MySpace had well over one million.[87] By the end of 2004 MySpace had reached 5.8 million unique monthly users.[88]

In February 2005, rumors circulated that MySpace had tried to buy thefacebook.com but was not prepared to pay Zuckerberg's asking price of $75 million.[89]

In April 2005, Zuckerberg raised $12.7 million from venture capitalist Accel Partners at a valuation of $100 million to support its 100 person payroll.[90] By the end of April, 800 colleges and universities were on thefacebook. (See **Exhibit 4** for the company's early history.) Almost 85% of students at these colleges signed up[91] and 60% of the members used the site every day.[92] Thefacebook had become "a twister sweeping college campuses" as students logged on to see what their friends were doing.[93]

On September 1, 2005, Zuckerberg opened a separate site to high schools.[94] After buying the Facebook.com domain name for $200,000,[95] thefacebook.com became Facebook.com on September 20, 2005.[96] In October Zuckerberg added photo sharing.[97] In October News Corp. acquired MySpace for $580 million.[98] By December 2005, Facebook had 6 million active users[99] and had generated $9 million in advertising revenues for the year (see **Exhibit 4)**. Despite Facebook's success, it was still dwarfed by MySpace which reached 32 million unique visitors at the end of 2005.[100]

In early 2006, Viacom offered $750 million for Facebook but Zuckerberg reportedly asked for $2 billion and no deal was done.[101] In April 2006 Facebook launched its mobile platform,[102] and Zuckerberg secured another $25 million round of financing.[103] In September 2006 Facebook added two features, News Feed and Mini-Feed, which republished recent extracts of what each user's friends had posted. A backlash followed; hundreds of thousands users protested against "automatic broadcasting of members' activities on the site to everyone in their social circles."[104] "We really messed this one up," Zuckerberg reportedly wrote in a Facebook post.[105] Two days later the company introduced sophisticated privacy controls to limit information dissemination.[106] Three weeks after News Feed was added, facebook.com became available to everyone.[107] By December 2006, Facebook had 12 million active users,[108] about one fifth of MySpace's 60 million.[109]

In March 2006, a social networking service called Twitter that enabled short broadcasts of 140 characters or less (called "Tweets") began operations.[110] By July 2006, MySpace had overtaken Google

in annual user growth, jumping from 16.2 million in July 2005 to 46 million unique visitors in July 2006.[111] However, MySpace was coming under mounting criticism from parents for its lack of privacy controls and for exposing young children to inappropriate content. News stories warned of sexual predators stalking young people on MySpace.[112] Online bullying was also an issue. In response, MySpace started banning certain types of content, upsetting some users.[113]

In May 2007, Zuckerberg launched the Facebook Platform, which allowed third party developers to develop applications on Facebook.[114] When a user installed such an application, the application supplier gained access to the user's profile, activities and friends. This proved a very effective form of viral marketing for popular applications (apps). Within three months of launch, 3,000 apps had been released.[115] "It's nothing short of a gold rush," Caroline McCarthy wrote of developers' enthusiasm for the platform on*CNETNews.com*.[116] Some of the most popular applications attracted 850,000 users within 72 hours of launching.[117]

Video sharing was added to the site in June 2007.[118] In October 2007, Microsoft invested $240 million for 1.6% of Facebook at a valuation of $15 billion, 10 times the company's sales for the year.[119] In the fall of 2007, Facebook launched support for corporate pages and for standard format display advertisements that could be fed to Facebook users based on demographic details and interests expressed in their profiles.[120] Facebook also added features that took advantage of social connections. For instance, if a user began playing a new game, the game supplier could pay to have this information sent to the user's friends. "Pushing your message out to people is no longer good enough.... You have to get your message out to the conversations," Zuckerberg said.[121] These types of advertisements proved more effective than standard advertisements.

In early 2008, 38-year old Sheryl Sandberg joined Facebook as COO, reporting to Zuckerberg. She had previously been vice president of global online sales and operations at Google.[122] Some viewed the defection as a significant event in the social networking space. "Sandberg's hiring represents a passing of the crown as Silicon Valley's hottest start-up from Google to Facebook, which has gained momentum over the past year," wrote Eric Auchard at *Reuters*.[123] Google's stock dropped 4.6% on the news.[124]

During the spring of 2008 Facebook continued to roll out new capabilities. In April Facebook added a real time chat feature.[125] In May it announced its second generation Platform called Facebook Connect. Users could now log on to external websites with their Facebook credentials, interact with their friends on sites that had adopted the new platform, and send details of their activities to their Facebook friends.[126] For instance, someone might rate the quality of a product and then be asked whether they would like to send this rating to their friends. Facebook also celebrated a significant milestone that May: it officially overtook MySpace in unique U.S. visitors, 70.278 to 70.237 million.[127]

The mobile market appeared to embrace social networking. Apple introduced a Facebook application for its iPhone in 2007, which was sold on the iTunes website. In July 2008 Facebook launched its own application on the iPhone.[128]

In June 2009, Zynga launched FarmVille on Facebook.[129] The game allowed players to build a virtual farm while interacting with their friends on Facebook, doing the same thing. In the process, they could help each other.[130] Players could enhance their enjoyment by buying virtual goods for their farms. The game proved hugely popular, spreading virally. Zynga followed it with a number of other popular games including CityVille. To generate revenues from developers, Facebook sold "Facebook Credits," a virtual currency that could be used in applications across the Platform. Facebook kept 30% of the sales of Facebook Credits.[131]

In 2009, Facebook introduced the "Like" button for members to positively flag posts and content.[132] Shortly afterward Facebook launched Open Stream which allowed developers to integrate Facebook information flows into their websites.[133] This revolutionized the Facebook "Like" button, which now appeared on third party websites.[134] When a user "liked" something on an external website, their friends could be informed and be given links to the same site. By 2012, Open Stream had been extended to Open Graph, giving developers the capability to inform a user's friends of what they were up to on a site.[135] By December 2009, Facebook had 360 million active users. Within a year it almost doubled, to 600 million users.[136]

New Challengers

While Facebook was growing its platform, other threats appeared. In November 2009 Brian Acton and Jan Koum, who had applied for jobs at Facebook but had been rejected, launched WhatsApp, an instant messaging service that allowed mobile phone users to send messages across the globe without incurring international phone charges.[137] By 2011, WhatsApp was one of the top 20 mobile applications in the U.S., and venture capitalists took notice. After an eight month courtship, Sequoia capital purchased 15% of the business in 2011 for an investment of $8 million.[138] Facebook soon announced its own mobile messaging app, Messenger, in August 2011.[139]

In October 2010 Kevin Systrom and Mike Krieger started Instagram, a mobile photo sharing app that allowed mobile phone users to take pictures and share them using creative filters. It was an "instant hit."[140] "Instagram makes even the most boring objects look interesting," reported the *Globe and Mail*.[141] Systrom explained, "The network really democratises attention: everyone from celebrities to a random guy in Japan taking pictures of his dog every day can get many thousands of followers. Taking images is the great equaliser."[142] Within two months Instagram had one million registered users.[143] Ten months later Facebook announced it would add photo filters to its own mobile apps. Facebook reportedly attempted to purchase Instagram in the summer of 2011 but was turned down.[144] By that time the start-up had a user base of eight million and had already raised $7 million from Benchmark Capital.[145]

By the end of 2011, Facebook reported 845 monthly active users, generated revenues of nearly $3.7 billion for the year, and delivered operating profits of $1 billion. (See **Exhibits 5** and **6**.) The revenues were from advertising on its website; at the time the mobile version of Facebook did not carry advertisements. In January 2012 Facebook launched Timeline, a radical new structure for its profiles, which prompted users to fill in their life history.[146] While some users complained at first, it quickly became the new standard.[147]

In April 2012, with a user base of thirty million people,[148] Instagram raised another $50 million for a valuation of approximately $500 million.[149] One week later Facebook announced it would buy Instagram for $1 billion.[150] Instagram wasn't Facebook's first acquisition – indeed they had made many – but previous buys had been smaller and were integrated directly into Facebook. (See **Exhibit 7** for list of Facebook acquisitions.) In a departure, Zuckerberg announced that he was committed to allowing Instagram to grow independently.[151]

Facebook IPO

On May 18, 2012 Facebook completed a much-anticipated public offering. Only days before, General Motors had announced that it would stop advertising on Facebook, unnerving the markets.[152] There was also mounting concern about Facebook's ability to maintain revenue growth as Internet traffic switched rapidly from PCs to smart phones. As a result Facebook added several amendments to

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the risks section of the offer document between February and May.[153] Facebook completed its initial public offering despite technical issues that delayed the start of trading. The stock soared 13% but fell before closing 23 cents above the offer price of $38 per share, which valued the company at $105 billion.[154] Over the next few months the price fell further reaching a low of $17.73 on September 4, 2012, erasing $50 billion from the value of the company. (See **Exhibit 8**.) The social network nonetheless continued to grow, and by October 2012 more than one billion people were active on Facebook.[155]

By January 2013 over one-fifth of Facebook's advertisements appeared on mobile devices[156] and rumors began to circulate that Facebook would announce its own smartphone.[157] This did not occur but Facebook developed deep integration into Apple's IOS and Google's Android operating systems, cementing its seamless operation in smart phones. Facebook also formally entered the gaming industry by publishing its own games.[158] In late 2013, Instagram started including advertisements in its feed in the form of typical Instagram photos or videos.[159] Facebook's lackluster IPO seemed not to affect the stock's continued popularity, and by January 8, 2014, the stock price had risen to 50% above the IPO price (see **Exhibit 8**).

On January 16, 2014, Facebook introduced "Trending", an algorithm that pushed a list of popular topics that were deemed of interest across Facebook into users' News Feed. Members could select from a list of trending stories they might be interested in. "Our vision for news feed is to become your personal newspaper," said Chris Struhar, an engineering manager who worked on Trending, and the Facebook news feed. "We want to connect you with all the events in the world that you will want to know about."[160] On January 30, 2014, Facebook introduced "Paper", a mobile application for "storytelling and sharing." In addition to News Feed, the application supported panoramic pictures, videos, and "a rich mix of content from emerging voices and well-known publications."[161] Not everyone thought that Paper would captivate users. "The biggest barrier to entry lies in its ability to remain engaging," one reporter wrote, given that the new application contained everything Facebook members were already looking at in their News Feed.[162] "Maybe I have very boring contacts but my Facebook News Feed is generally populated by close-ups of food, ads from my subscribed likes, selfies, exasperated status updates about waiting, and blurry pictures of friends on nights out."[163] Both of these efforts appeared to be "part of Facebook's greater ambition to become the leading online hub for conversation about public events and news."[164]

In March 2014, Facebook launched video advertising capabilities for advertisers.[165] In June 2014, it launched Slingshot, a messaging app designed to compete with Snapchat, which allowed individuals to exchange messages with friends that were subsequently wiped clean. Popular with young users, Snapchat had refused a $3 billion cash offer from Facebook to buy them at the end of 2013.[166]

In July 2014, Facebook acquired Oculus VR, a virtual reality company. Virtual reality was considered to be the next big medium, and many leading technology companies were investing in it.[167] However, the biggest news of 2014 was Facebook's $22 billion acquisition of WhatsApp, which had become the world's largest mobile messaging app.[168]

In early 2015 rumors began to circulate that Facebook was in conversations with news organizations to integrate news stories into its News Feed alongside news from a user's social network and advertisements. In May 2015 Facebook introduced "Instant Articles", a way for news organizations to display their articles in users' News Feed on their mobile phones.[169] The articles looked identical to how they appeared in the publisher's website. If publishers sold ads that appeared within their articles, they kept 100% of the proceeds. If Facebook sold the ads, Facebook kept 30% and the publishers kept 70%. Furthermore, Instant Articles were integrated into web analytic programs such as comScore and the data shared out to the publishers.[170]

In August 2016, WhatsApp changed its privacy policies to allow companies to target advertisements using data drawn from the user's Facebook profile.[171] In this way, Facebook could offer advertisers targeted access to users on Facebook, Instagram and WhatsApp.[172] In November 2016, Facebook announced it was also going to offer ads on Facebook Messenger.[173]

In October 2016, Facebook launched Marketplace, which allowed users to buy and sell items in their local community. This pitted Facebook against the likes of Craigslist and eBay with the added advantage of being able to verify the seller through a social network. At the time eBay had 164 million active users compared to Facebook's 1.7 billion.[174] Facebook also launched Workplace, a version of Facebook that helped co-workers to stay in touch and exchange information. It was based on the system Facebook used internally; the company announced that companies like Danone and Starbucks were already using it.[175] The service cost $3 per active user per month for up to 1,000 users, $2 for the next 9000, and $1 thereafter.[176]

Facebook in 2016

Despite its size — the company employed 15,724 people as of September 30, 2016 — Facebook worked hard to preserve its entrepreneurial, hacker culture.[177] "The Hacker Way is an approach to building that involves continuous improvement and iteration," Zuckerberg wrote. "Hackers believe that something can always be better, and that nothing is ever complete.... Hacker culture is also extremely open and meritocratic. Hackers believe that the best idea and implementation should always win — not the person who is best at lobbying for an idea or the person who manages the most people."[178]

Office space – the head office in Menlo Park was located at 1 Hacker Way - was open plan. Conference rooms in the center had glass walls so everyone could see what was going on, and dress was casual. Zuckerberg and the other senior executives sat amongst their colleagues. The goal was to foster creative problem solving and rapid decision-making and everyone was encouraged to be bold and speak up.[179]

The space was designed to provide "little neighborhoods" and "groups of seats" where people might bump into each other.[180] To supplement physical networking, employees used an extended version of Facebook itself to communicate internally. "It's amazing how connected people feel, particularly to Mark (Zuckerberg, CEO) and Sheryl (Sandberg, COO)" commented Lori Goler, VP of people.[181]

Facebook relied on personal referrals where possible to find new recruits and new engineers were told to choose which team they wanted to work on based where they thought they could have most impact.[182] But first they had to go through eight weeks of "bootcamp," an introduction to the company's programming tools and processes, alongside a mentor who would help plug them into the organization. As part of the process, all new recruits had to complete the Clifton StrengthsFinder® test to identify hidden talents.[183] Mentors gained management experience and could develop additional management skills by attending brown bag lunches with more experienced managers. This was how Facebook developed management talent.[184]

The company was organized around discrete teams, such as Instagram, WhatsApp and Messenger but everyone was encouraged to spend a month working inside another team every 12 to 18 months. Approximately one third of those trying it transferred permanently.[185]

New product features were developed in small teams – for example, the "Like" button was developed by a team of three people – with rapid prototyping and frequent sharing of ideas. The innovation process was embodied in regular "hackathons", one to three days long, where people were tasked with working round the clock to come up with a new idea. They could work with anyone they chose, but the rule was that they were not allowed to work on what they were normally doing.[186] The best ideas were reviewed for five minutes each by CEO Zuckerberg, Chris Cox, the head of products, Jay Parikh, the head of engineering and Mike Shroepfer, the head of technology. Products like Chat, which evolved into Messenger, and Timeline emerged from this process.[187]

While Zuckerberg led the hacking half of Facebook, COO Sheryl Sandberg ran the business side. Sandberg's side of the organization was less casual and more organized than the engineering team, but both sides believed in hiring smart people regardless of job openings and then helping them to build on their strengths. As a way of integrating the culture, Sandberg held hackathons to improve business processes.

Media Regulation in 2017[188]

In many non-democratic countries, the media were typically highly regulated to ensure that citizens only heard what their governments approved. In democracies, however, free speech was an important part of the democratic process. While public policy on media varied significantly in western democracies, the underlying principles were similar; independence from government, business, or pressure groups; diversity of information and ideas; integrity of information with respect to accuracy and balance; and support for social order such that the norms of society were not offended or people incited to break laws, or a legitimate political process undermined. The level of media regulation in the United States varied significantly depending on the medium. Broadcasting (radio and TV) faced the strongest regulation while the press (print newspapers, magazines books) and common carriers (telephone and cable) enjoyed relatively low levels and the Internet virtually none.

Once under the control of church and state, the press had fought hard for its freedom and was considered essential to the effective working of democracy. Press freedom was seen as the key goal of public policy. However, there were other public policy goals; maintaining diversity; protecting the public from the abuse of press power; ensuring high standards of integrity in news reporting; and ensuring the press made an effective contribution to the democratic process. However, any regulation to achieve these ends was in danger of being labeled a suppression of press freedom. This suggested different concepts of press freedom ranging from the laissez faire to the proactive. The laissez faire ruled out any action on the part of government in press affairs – as reflected in the First Amendment of the US Constitution ("Congress shall make no law…abridging freedom of speech, or press…") while the proactive was more concerned with the practical achievement of the public policy goals cited above. The goal of any regulation was "to promote the free flow of diverse ideas and public debate by removing and guarding against barriers to that flow." This involved anything from putting limits on the concentration of press ownership, or restrictions on the cross ownership of different media to providing tax concessions (e.g. no value added tax levied in the UK) to encourage a free and diverse press.

While the press may have been free, in most democracies there were limits on press content and conduct in a number of key areas; maintenance of law and order - the press were not allowed to incite people to break the law; morals, decency or pubic offence (e.g. racism, sexism); invasion of privacy; plagiarism of the work of others; and deliberately telling lies. These limitations were enacted through statute (e.g. laws on ownership concentration, obscenity, libel, copyright, racism, slander) and voluntary constraint (e.g. press codes of conduct, press ombudsman, voluntary codes of ethics).

Broadcasting had long been more regulated both nationally and internationally partly because there was limited bandwidth, requiring a licensing process that ensured the airwaves were not monopolized by the few. The Federal Communications Commission regulated broadcasting in the USA, and for many years had enforced strict rules on the number of radio or TV stations a single entity could own and restricted cross ownership with the press. It also regulated content, and could impose fines for violating public decency standards or even revoke a license. The FCC also established rules for political campaigns; the **equal time** rule for all candidates for a particular office; the **right of rebuttal** rule to allow candidates to respond to criticism; and the **fairness** doctrine which required broadcasters to provide airtime for opposing views when they aired controversial programs.[189] In the mid 1980s much of the regulation of broadcasting was unwound and multi-station ownership allowed. This led to rapid consolidation in the industry and increasingly partisan reporting.

Public policy on mail, telephone and telegraph typically focused more on industry structure and infrastructure than content because it was not for open distribution. There were a number of important goals, including universal service which required that customers in densely populated areas were effectively required to subsidize those in more remote regions; the supervision of monopoly operators, since the strong networks effects of telephony quickly resulted in monopoly under normal competitive conditions; access to allow small players to compete using the networks of incumbents and thereby encourage competition; privacy for those exchanging information; limits on the services that an operator might be allowed to provide in competition with other media; and limits on the content that could be exchanged (e.g. child pornography, acts of terrorism) which raised the thorny issue of how private information exchanges could be policed.

Unlike its predecessors, the Internet medium provided multi-functionality: telephony, email, broadcasting, advertising, and even more with the capacity for groups to coalesce around issues in confidence. Moreover, strong network effects provided huge advantages to large players, even on a global scale. Hence, it came with all the public policy challenges of previous media and virtually no regulatory framework. It was this in context that Zuckerberg found himself embroiled in controversy in 2016.

Facebook News Controversy

In May 2016, during the heat of the primaries as both Democrats and Republicans sought to select their candidate for the U.S. presidency, Facebook suddenly found itself being attacked for partisan reporting. Tech Blog Gizmodo, quoting an unnamed former Facebook employee, alleged that Facebook's news curators were altering its Trending Stories to suppress conservative viewpoints.[190] This drew widespread criticism, especially from Republicans. "Facebook must answer for conservative censorship," tweeted Republican National Chairman Reince Priebus.[191] Republican Senator John Thune commented, "We want to know, to just clarify, whether you are using an objective algorithm to determine what your trending topics are, then just fine and show us that's the case," he said. "If their message to the American people is, 'We are this objective news organization that doesn't apply editorial discretion to those decisions,' that policy ought to be followed."[192]

In August 2016, Facebook found itself in trouble again. This time it was accused of press censorship for deleting posts of a famous Vietnam War photo depicting a naked girl running from a napalm attack. Promising to allow the photo, a spokeswoman for Facebook said, "An image of a naked child would normally be presumed to violate our community standards, and in some countries might even qualify as child pornography…. In this case, we recognize the history and global importance of this image in documenting a particular moment in time."[193]

Facebook published clear standards on the content permissible on its platform, and used both software and human review to enforce its policies. Increasingly users, civil rights groups and media publishers expressed the view that these standards were being applied too aggressively. This was a source of concern because, according to Pew Research Center, two-thirds of Facebook users were relying on Facebook as their primary news source.[194] Zuckerberg's view was that "we are a technology company, not a media company. We build tools. We do not produce content."[195]

In October 2016, it was revealed that Facebook employees had been debating for some time whether a number of Republican presidential candidate Donald Trump's posts to Facebook violated the company's rules. For instance, some argued that comments about banning Muslims from entering the USA were racist and violated Facebook's code on race or religion.[196] The issue went all the way up to Zuckerberg who decided that censoring Trump would be inappropriate. The response across the company was that Zuckerberg was bending the rules for Trump, and some content reviewers threatened to leave.[197]

On November 8, 2016, Donald Trump was elected the next President of the United States. A surprise to millions of voters, the outcome triggered a range of protests. Many complained that Facebook played a role in electing Donald Trump.[198] The argument was that Facebook had harmed the election process by publishing falsified news articles that appeared in users' News Feed. During the election campaign, numerous news stories appeared from what looked like genuine publications that subsequently turned out to be fake. However, the phony news was so newsworthy that it spread rapidly on Facebook, creating significant profits for its anonymous publishers as avid readers were exposed to the advertisements the stories carried.[199] The BBC reported that Veles, Macedonia was a major source of such content with 200 fake news sites. Residents, including some high school students, had earned thousands of Euros writing fake articles supporting Donald Trump.[200]

On November 10 Zuckerberg questioned how such a small volume of fake news could have affected the outcome of the election and said that it was aimed at both candidates.[201] On November 11 he said that fake news accounted for less than one percent of global content on Facebook.[202] In contrast, a BuzzFeed analysis of 1,000 posts on six hyper partisan Facebook pages, three left-wing and three right-wing, found that 38% of the right-wing posts and 19% of the left-wing posts were "either a mixture of true and false or mostly false."[203] BuzzFeed also found that the least accurate pages generated the most shares, reactions and comments — far more than the three mainstream political pages they analyzed.[204]

Some believed that Facebook's algorithms amplified this effect even further. "Facebook's news feed creates filter bubbles -- its technology learns the kind of content you like and shows you more of it, pushing opposing opinions lower in your feed or not showing them to you at all."[205] In November Facebook purchased CrowdTangle, a web analytics company already being used by major news platforms to track their stories on social media, to better understand how stories spread throughout its network.[206]

On November 14, 2016, Facebook banned fake news sites from using the company's advertising network to make money. Such sites were added to the category of "misleading, illegal and deceptive sites" that were already barred from using the Facebook Audience Network.[207] Zuckerberg also posted plans to "improve misinformation detection, make flagging fake news easier, use third party fact checking, and potentially label stories as false."[208]

In February 2017 Zuckerberg published a 14-page open letter to Facebook users called "Building Global Community" in which he laid out a new strategy for the company.[209] In the letter, he asked the question, "...are we building the world we all want?" He concluded that, "the most important thing we at Facebook can do is develop the social infrastructure to give people the power to build a global

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community that works for all of us. For the past decade, Facebook has focused on connecting friends and families. With that foundation, our next focus will be developing the social infrastructure for community -- for supporting us, for keeping us safe, for informing us, for civic engagement and for inclusion of all." He went on, "Our job at Facebook is to help people make the greatest positive impact while mitigating areas where technology and social media can contribute to divisiveness and isolation."[210]
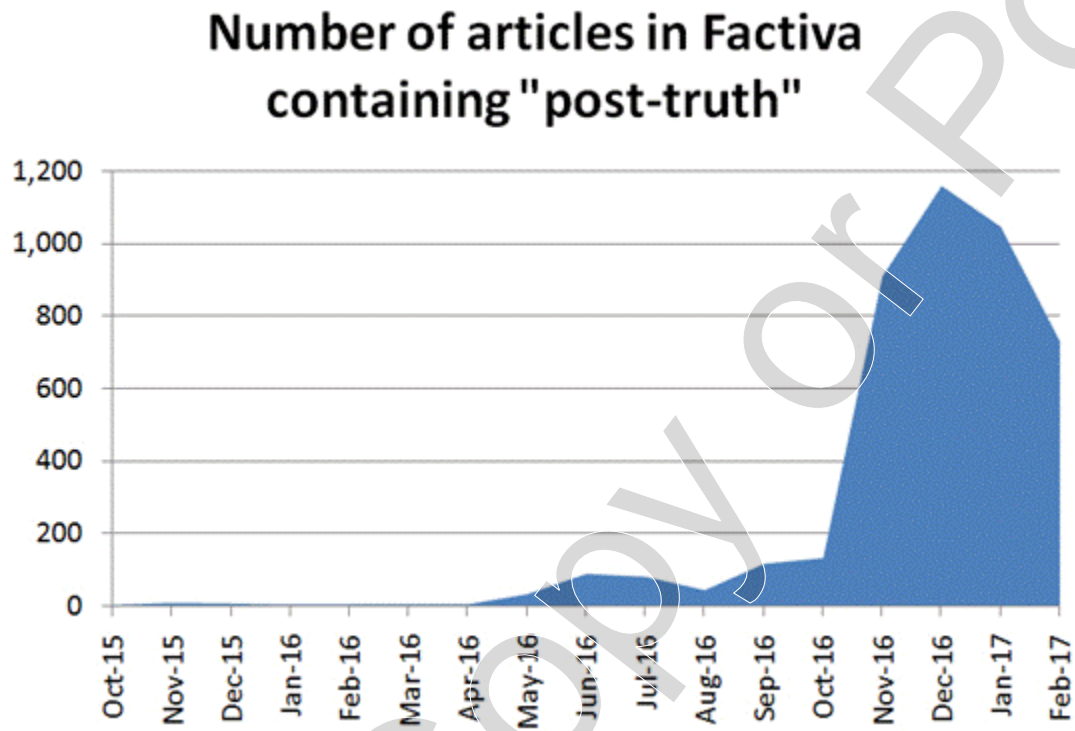
Nevertheless, the controversy around Facebook continued. In the run up to the first round of the French Presidential election in April 2017, research suggested that up to a quarter of links shared on social media about the election pointed to fake news.[211] It also indicated that 50% of fake news was linked to Russian websites.[212] There were fears in France that this might help populist, right wing candidate Marine Le Pen to win in the first round of the vote on April 23. U.S. intelligence agencies had concluded that the Russian government had interfered in the U.S. election to help Donald Trump and that the same thing was happening in France. In response Facebook suspended 30,000 French accounts.[213]

After an internal investigation, Facebook revealed in September 2017 that it had identified $100,000 worth of divisive advertisements on issues such as race, gay rights, immigration and gun control that had been funded during the US presidential campaign by a Russian company linked to the Kremlin. Facebook shared its findings with the Senate and House intelligence committees, which were investigating the Russian intervention in the American election. The company said it was also cooperating with Special Prosecutor Robert S. Mueller III's investigation into whether the Trump campaign had colluded with Russia to influence the outcome of the election.[214]

Meanwhile, throughout 2016 and 2017 Facebook worked to expand its presence in China, potentially inviting another political controversy. On November 22, 2016, the *New York Times* reported that Facebook had been developing censorship tools to prevent certain content from being published in certain geographic areas, especially in China where the company had been banned in 2009.[215] Although Facebook did not intend to use the tools itself, but planned to offer them to a third party, many were critical of the move and some employees left the company over the issue.[216] In August 2017 the *New York Times* reported that Facebook had launched a Chinese version of its Moments photo sharing application, called Colorful Balloons, under a Chinese company name with no indication to the public that it was connected to Facebook. "The stealthy and anonymous release of an app by a major foreign technology company in China is unprecedented....coming just ahead of a key meeting of the Chinese Communist Party this autumn, the secretive release of Colorful Balloons could also undermine trust between the company and the Chinese government."[217]

The events of 2017 demonstrated Facebook's considerable power to connect and influence across the globe. As of September 2017 Zuckerberg had a number of efforts underway to stop fake news from spreading on its network. What responsibility, if any, did Facebook bear for its impact on world events? Was there a path forward for Zuckerberg in China to address both sides of the censorship debate? And what impact did Facebook want to have on global society in the future?

Exhibit 1   Relative frequency of word use "post-truth" October 2015 - February 2017

Number of articles in Factiva
containing "post-truth"

Source: https://www.dowjones.com/products/factiva/, accessed March 2017.

Exhibit 2   Leading Social Networks as of January 2017
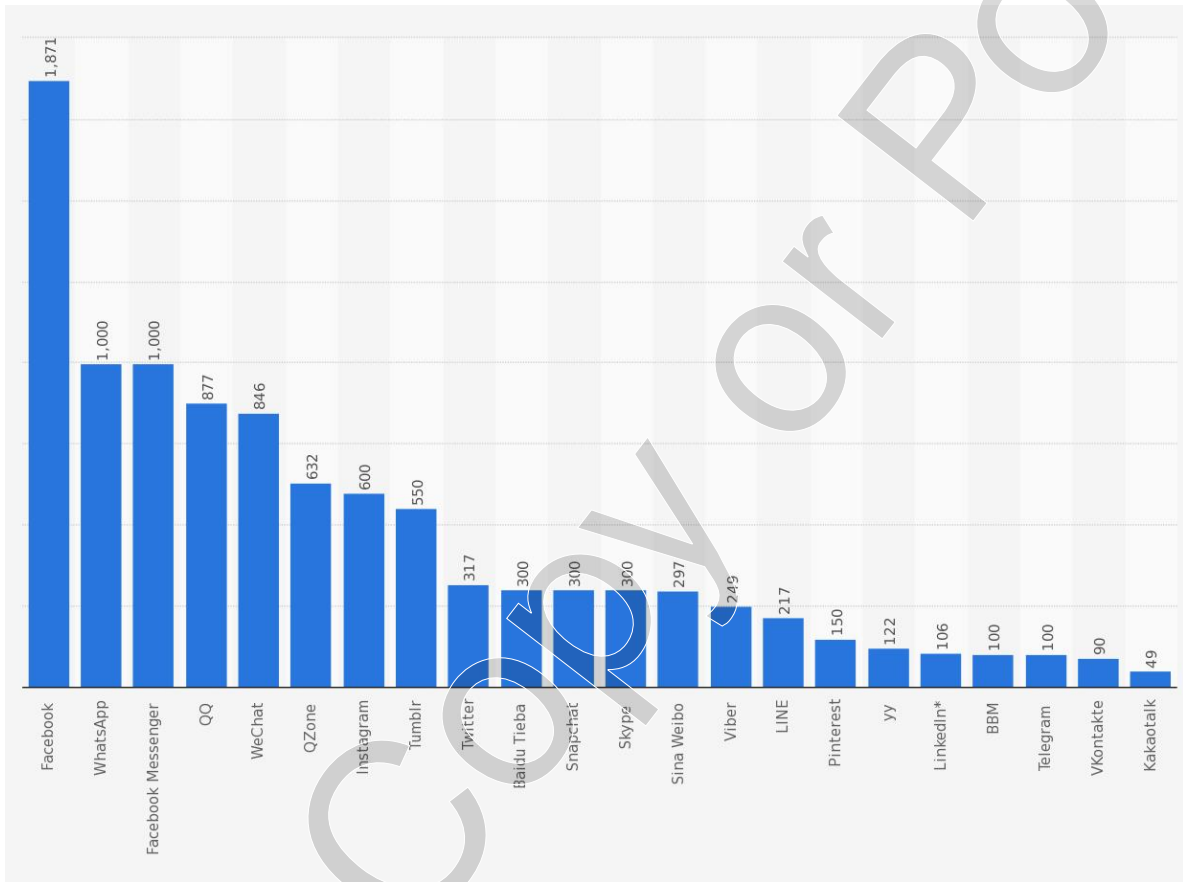
Source: http://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users/, accessed March 2017.

Exhibit 3   Selected early social networking sites

| URL	Year Launched	Description
classmates.com	1995	Users could reconnect with old classmates using online yearbooks.
match.com	1996	Social networking site focused on dating.
sixdegrees.com	1997	Social networking site based on the six degrees of separation theory.
emode.com (Tickle)	1999	Social networking website.
evite.com	1999	Event-based social organizing and invitation website.
notornot.com	2000	Originally launched in 2000 as www.amihotornot.com, it changed simply to www.hotornot.com in 2001. The attractiveness rating site started an electronic introduction service called "Meet Me" in 2001.
ryze.com	2001	Social and business networking site that allowed people to mark their identities by membership in tribes, or affinity groups.
friendster.com	2002	Social networking site that mapped users' connections to four degrees. Served as inspiration for Facebook.
everyonesconnected.com	2002	Social networking site.
spoke.com	2002	Professional networking site.
secondlife.com	2002	Allowed users to create and interact in three dimensional virtual reality lives.
linkedin.com	2003	Professional networking site where users could connect through mutual contacts out to four degrees, provided each contact in between agreed to pass along the request.
tribe.net	2003	Social networking site that encouraged identification through group membership, including brands.
hi5	2003	Social networking site popular in Latin American countries, Mongolia, Tunisia and Romania.
zerodegrees.com	2003	Professional networking site.
myspace.com	2003	Expressive, free-form social networking site favored by musicians and artists.
inwyk.com or itsnotwhatyouknow.com	2003	Social networking site launched in 2003 for dating, professional networking and finding old friends
yafro.com	2004	Social networking site for sharing photos, created by the founders of hotornot.com.
thefacebook.com	2004	University-based social networking site.
eurekster.com	2004	Social search engine that ranked results according to the interests that users and their friends had shown through past searches.
orkut.com	2004	Invitation-only social networking site launched by a Google employee.
smallplanet.net	2004	A collective bargaining social networking site that allowed users to come together to purchase health insurance, cell phone rates, etc.
universe.icq.com	2004	Invitation-only social networking site launched by American Online.

Source: Compiled by case writer from multiple news reports.

Exhibit 4 Facebook history 2004-2012
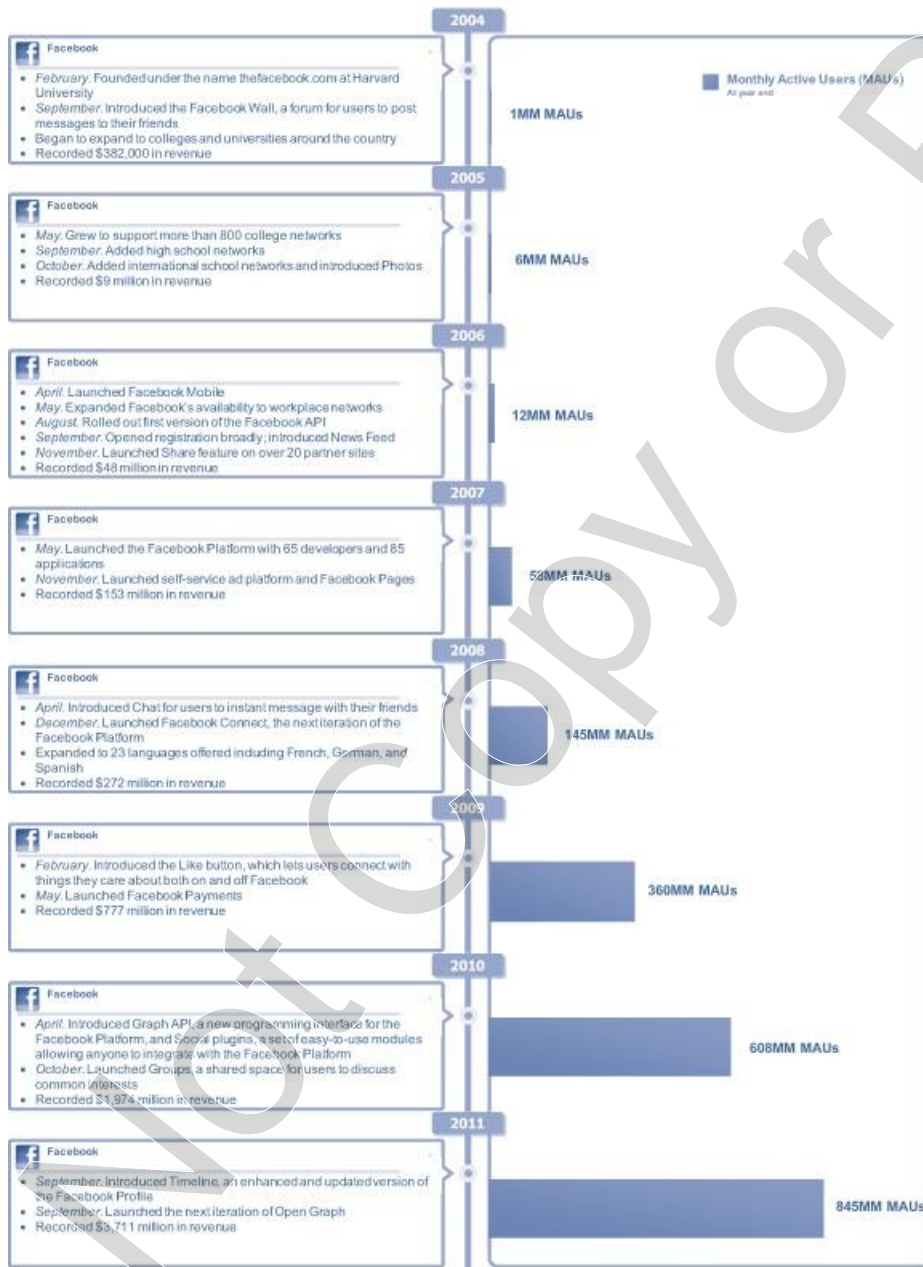
Source: Facebook Inc., May 2012 prospectus for 180,000,000 shares of Class A common stock, p. 47, www.thomsonone.com, accessed February 2017.

Exhibit 5 Facebook Financial Performance, 2007 –2016

For the year ended December 31	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Income ($ millions)										
Revenue	153	272	777	1,974	3,711	5,089	7,872	12,466	17,928	27,638
Cost of Sales	41	124	223	493	860	1,364	1,875	2,153	2,867	3789
Gross margin	112	148	554	1,481	2,851	3,725	5,997	10,313	15,061	23,849
Research and Development	81	47	87	144	388	1,399	1,415	2,666	4,816	5,919
Marketing and Sales	32	76	115	184	427	896	997	1,680	2,725	3,772
General administration	123	80	90	121	280	892	781	973	1,295	1,731
Operating profit	-124	-55	262	1,032	1,756	538	2,804	4,994	6,225	12,427
Net Income	-138	-56	229	606	1,000	53	1,500	2,940	3,688	10,217
Balance Sheet ($ millions)										
Cash, equiv., marketable securities	305	297	633	1,785	3,908	9,626	11,449	11,199	18,434	29,449
Total current assets	366	374	961	2,246	4,604	11,267	13,070	13,670	21,652	34,401
Property and equipment				574	1,475	2,391	2,882	3,967	5,687	8,591
Goodwill and intangible assets				96	162	1,388	1,722	21,910	21,272	20,657
Other assets				74	90	57	221	637	796	1,312
Total fixed assets	82	131	148	744	1,727	3,836	4,825	26,514	27,755	30,560
Total assets	448	505	1,109	2,990	6,331	15,103	17,895	40,184	49,407	64,961
Current liabilities	116	95	258	389	899	1,052	1,100	1,424	1,925	2,875
Long term liabilities	58	75	-17	439	533	2,296	1,325	2,664	3,264	2,892
Total equity	273	335	868	2,162	4,899	11,755	15,470	36,096	44,218	59,194
Total liabilities plus equity	447	505	1,109	2,990	6,331	15,103	17,895	40,184	49,407	64,961
Working capital	250	279	703	1,857	3,705	10,215	11,970	12,246	19,727	31,526
Capital employed	332	410	851	2,601	5,432	14,051	16,795	38,760	47,482	62,086
Cash Flow ($ millions)										
Cash from operations	11	8	155	698	1,549	1,612	4,222	5,457	8,599	16,108
Cash flows from investing activities			-62	-324	-3,023	-7,024	-2,624	-5,913	-9,434	-11,739
Cash flows from financing activities			243.0	781.0	1,198.0	6,283	-667	1,571	1,582	-310
Forex effect			0	(3.0)	0	1	8	-123	-155	-63
Net cash flows			336	1,152	-276	872	939	992	592	3,996

Source: Facebook Inc., May 2012 prospectus for 180,000,000 shares of Class A common stock, 2012-2016 Facebook 10-K filings, www.thomsonone.com, accessed February 2017.

Exhibit 6 Facebook Performance Metrics, 2007 -2016

| For the year ended December 31 (*in millions*)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Revenues										
United States			518	1,223	2,067	2,578	3,613	5,649	8,513	12,579
Rest of The World			259	751	1,644	2,511	4,259	6,817	9,415	15,059
Total Revenues			777	1,974	3,711	5,089	7,872	12,466	17,928	27,638
U.S. Share of Total Revenues			66.7%	62.0%	55.7%	50.7%	45.9%	45.3%	47.5%	45.5%
Full Time Employees at year end			1,218	2,127	3,200	4,619	6,337	9,199	12,691	17,048
Average employees				1,673	2,664	3,910	5,478	7,768	10,945	14,870
Sales per employee ($'000)				$1,180	$1,393	$1,302	$1,437	$1,605	$1,638	$1,859
Monthly Active Users (MAU) in December	58	145	360	608	845	1,056	1,228	1,393	1,591	1,860
Average MAU	35	102	253	484	727	951	1,142	1,311	1,492	1,726
Revenue per MAU	$4.37	$2.68	$3.08	$4.08	$5.11	$6.35	$6.89	$9.51	$12.02	$16.02
Daily active users (DAU) in December			185	293	483	618	757	890	1,038	1,230
Average DAU			93	239	388	551	688	824	964	1,134
Rev per DAU			$8.40	$8.26	$9.56	$9.24	$11.45	$15.14	$18.60	$24.37
Mobile MAU in December			101	245	432	680	556	745	934	1,230
Mobile DAU in December						374	556	745	934	1,082

Source: Facebook Inc., May 2012 prospectus for 180,000,000 shares of Class A common stock,, 2012-2016 Facebook 10-K filings, www.thomsonone.com, accessed February 2017.

Exhibit 7   Facebook acquisitions 2007-2016

Announce Date	Close Date	Target	Size ($mm)	Announce Date	Close Date	Target	Size ($mm)
7/19/2007	7/19/2007	Parakey, Inc.	-	8/24/2012	8/24/2012	Threadsy, Inc.	-
8/10/2009	8/10/2009	FriendFeed, Inc.	-	2/28/2013	4/26/2013	Atlas DMT, LLC	-
2/19/2010	2/12/2010	Octazen Solutions	-	3/8/2013	3/8/2013	Mixtent, Inc.	-
4/2/2010	4/2/2010	Divvyshot, Inc.	-	3/14/2013	3/14/2013	Hot Studio Inc.	-
5/26/2010	5/26/2010	Sharegrove Inc.	-	4/10/2013	3/31/2013	osmeta Inc.	-
7/8/2010	7/8/2010	nextstop.com, Inc.	-	4/25/2013	4/30/2013	Parse LLC	-
8/15/2010	8/15/2010	Chai Labs, Inc.	10	7/18/2013	-	Monoidics Limited	-
8/20/2010	8/20/2010	Hot Potato	-	8/12/2013	9/23/2013	Mobile Technologies, LLC	-
10/29/2010	-	Drop.io, Inc.	-	10/13/2013	10/31/2013	Onavo Mobile Ltd.	150
11/16/2010	11/16/2010	Walletin, Inc.	-	12/17/2013	12/17/2013	SportStream, Inc.	-
1/25/2011	-	rel8tion, LLC	-	1/7/2014	1/7/2014	Little Eye Software Labs Pvt Ltd.	14.45
3/1/2011	2/28/2011	Beluga Inc.	-	1/13/2014	1/13/2014	Branch Media, Inc.	15
3/20/2011	3/30/2011	Snaptu Ltd.	70	2/19/2014	10/6/2014	WhatsApp Inc.	19,696.74
3/31/2011	3/31/2011	Recres Image Conversion	-	3/25/2014	7/21/2014	Oculus VR, LLC	2,160.71
4/27/2011	4/27/2011	Daytum Inc.	-	3/27/2014	3/27/2014	Ascenta (UK) Limited	20
6/9/2011	6/9/2011	Sofa Payments B.V.	-	4/24/2014	4/24/2014	ProtoGeo Oy	-
8/2/2011	8/2/2011	Push Pop Press, Inc.	-	6/3/2014	6/3/2014	Pryte Ltd.	-
10/10/2011	10/7/2011	Somo Enterprises, Inc.	-	7/2/2014	7/31/2014	LiveRail Inc.	500
11/7/2011	11/7/2011	Digital Staircase Inc.	-	8/7/2014	8/7/2014	PrivateCore Inc.	-
11/8/2011	11/8/2011	Strobe Inc.	-	1/5/2015	1/6/2015	Wit.AI, Inc.	-
11/15/2011	11/15/2011	Mailrank	-	1/8/2015	1/8/2015	Quickfire Networks Corporation	-
11/23/2011	11/15/2011	WhoGlue LLC	-	2/6/2015	2/6/2015	Menlo Science & Technology Park	-
12/5/2011	12/5/2011	Gowalla, Inc.	-	3/13/2015	4/1/2015	TheFind, Inc.	-
2/29/2012	2/29/2012	Caffeinated Mind, Inc.	-	5/19/2015	5/19/2015	Tugboat Yards Inc.	-
4/9/2012	8/31/2012	Instagram, Inc.	1,010.45	12/17/2015	-	Innovi	-
4/12/2012	4/12/2012	Tagtile	-	3/9/2016	3/9/2016	Masquerade Technologies, Inc.	-
5/4/2012	5/4/2012	Glancee, Inc.	-	5/23/2016	5/23/2016	Two Big Ears Ltd.	-
5/18/2012	5/18/2012	Karma Science, Inc.	-	9/19/2016	9/19/2016	Nascent Objects, Inc.	-
5/21/2012	5/21/2012	Bolt Peters, Inc.	-	11/11/2016	11/11/2016	CrowdTangle, Inc.	-
6/18/2012	6/18/2012	Face.com	60	11/16/2016	11/16/2016	FacioMetrics LLC	-
7/20/2012	7/20/2012	Acrylic Software	-				

Source: Capital IQ, www.capitaliq.com, accessed November 2016.

Exhibit 8 Facebook (FB) closing stock price May 18, 2012 to March 2, 2017
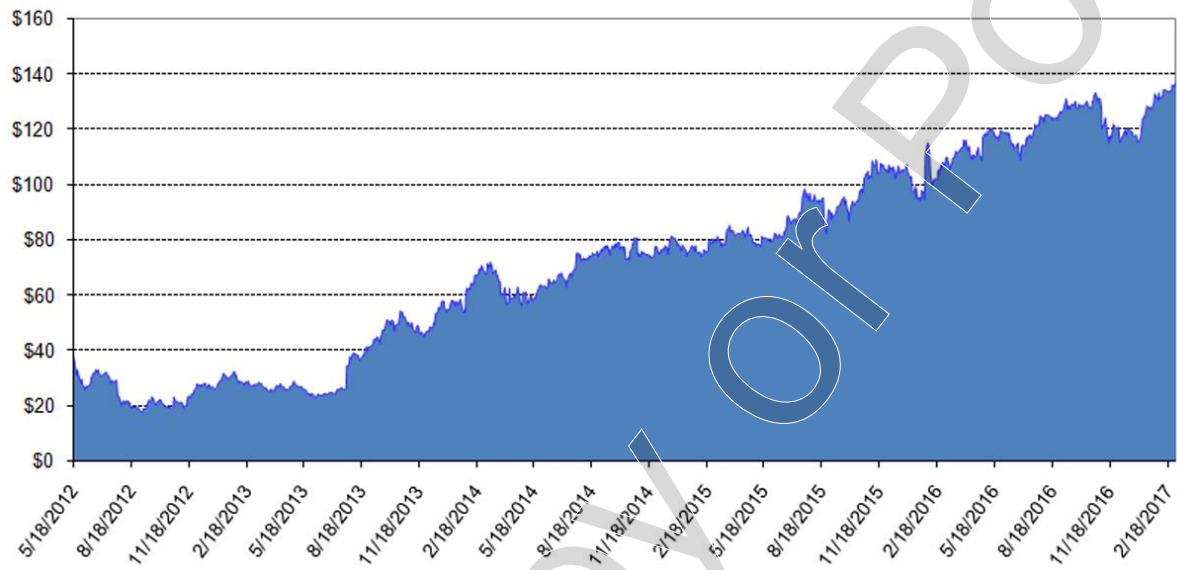
Source: Capital IQ, www.capitaliq.com, accessed March 2017.

Endnotes

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