Understanding Network Effects

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Note: this is an earlier version of the chapter. All chapters updated after July 2009 are now hosted (and still free) at http://www.flatworldknowledge.com. For details see the 'Courseware' section of http://gallaugher.com

LEARNING OBJECTIVE:
After studying this section you should be able to:

1. Define network effects.
2. Recognize products and services that are subject to network effects.
3. Understand the factors that add value to products and services subject to network effects.

1. INTRODUCTION

Network effects are sometimes referred to as *Metcalfe's Law*, or *Network Externalities*. But don't let the dull names fool you – this concept is rocket fuel for technology firms. Bill Gates leveraged network effects to turn Windows and Office into virtual monopolies, and in the process, became the wealthiest man in America. Mark Zuckerberg of Facebook, Pierre Omidiyar of eBay, Caterina Fake and Stewart Butterfield of Flickr, Kevin Rose of Digg, Chris DeWolfe and Tom Anderson– the MySpace guys - all of these entrepreneurs have built massive businesses by leveraging the concept. When network effects are present, *the value of a product or service increases as the number of users grows*. More simply, more users = more value. Of course, most products aren't subject to network effects – you probably don't care if someone wears the same socks, uses the same pancake syrup, or buys the same trash bags as you. But when network effects are present they're among *the most important* reasons you'll pick one product or service over another. You may care very much, for example, if others are part of your social network, if your video game console is popular, if the Wikipedia article you're referencing has had prior readers. And all those folks who bought HD-DVD players sure were bummed when the rest of the world declared Blu-ray the winner. In each of these examples, network effects are at work.

Not *That* Kind of Network

The term 'network' sometimes stumps people when first learning about network effects. In this context, a network doesn't refer to the physical wires or wireless systems that connect pieces of electronics. It just refers to a common user base that is able to communicate and share with one another. So Facebook users make up a network. So do owners of Blu-ray DVD players, traders that buy and sell stock over the NASDAQ, or the sum total of hardware and outlets that support the BS 1363 electrical standard.

Network effects are responsible for the dominance of many products and services that support some kind of exchange or connectivity. Examples include Windows, the New York Stock Exchange, the BS 1363 13 amp electrical standard, Blu-ray DVDs, eBay, and Facebook.

2. WHERE'S ALL THAT VALUE COME FROM?

LEARNING OBJECTIVE:
After studying this section you should be able to:

1. Identify the three primary sources of value for network effects.
2. Recognize factors that contribute to the staying power and complementary benefits of a product or service subject to network effects.
3. Understand how firms like Microsoft and Apple each benefit from strong network effects.

The value derived from network effects comes from three sources: exchange, staying power, and complementary benefits.

2.1 Exchange

Facebook for one person isn't much fun, and the first guy in the world with a fax machine doesn't have much more than a paperweight. But as each new Facebook friend or fax user comes online, a network becomes more valuable because its users can potentially communicate with more people. These examples show the importance of *exchange* in creating value. Every product or service subject to network effects fosters some kind of exchange. For firms leveraging technology, this might include anything you can represent in the ones and zeros of a data stream, such as movies, music, money, video games, and computer programs. And just about any standard that allows things to plug into one another, interconnect, or otherwise communicate will live or die based on its ability to snare network effects.

Exercise: Graph It

Some people refer to Network Effects by the name Metcalfe's Law. It got this name when, toward the start of the dot-com boom, Bob Metcalfe (the inventor of the Ethernet networking standard) wrote in a column in InfoWorld magazine stating that the value of a network equals its number of users squared. What do you think of this formula? Graph the law with vertical access labeled "value" and horizontal access labeled "users". Do you think the graph is an accurate representation of what's happening in network effects? If so, why? If not, what do you think the graph really looks like?

2.2 Staying Power

Users don't want to buy a product or sign up for a service that's likely to go away, and a number of factors can halt the availability of an effort: a firm could go bankrupt, fail to attract a critical mass of user support, a rival may successfully invade its market and draw away current customers. Networks with greater numbers of users suggest a stronger *staying power*. The staying power, or long-term viability of a product or service, is particularly important for consumers of technology products. Consider that when someone buys a personal computer and makes a choice of Windows, Mac OS, or Linux, their investment over time usually greatly exceeds the initial price paid for the operating system. One invests in learning how to use a system, buying and installing software, entering preferences or other data, creating files – all of which mean that if a product isn't supported anymore, much of this investment is lost.

The concept of staying power (and the fear of being stranded in an unsupported product or service) is directly related to *switching costs*, and switching costs can strengthen the value of network effects as a strategic asset. The higher the value of the user's overall investment, the

more they're likely to consider the staying power of any offering before choosing to adopt it. Similarly, the more a user has invested in a product, the less likely they are to leave.

Switching costs also go by other names. You might hear the business press refer to products (particularly websites) as being 'sticky' or creating 'friction'. Others may refer to the concept of 'lock-in'. And the elite Boston Consulting Group is really talking about a firm's switching costs when it refers to how well a company can create customers who are "barnacles" (that are tightly anchored to the firm) and not "butterflies" (that flutter away to rivals). The stickier your product, the more friction available to prevent users from migrating to a rival, the greater the switching costs – the more your customers are welded to your product or service. And in a competitive market where rivals with new innovations show up all the time, that can be a very good thing!

How Important Are Switching Costs to Microsoft?

"*It is this switching cost that has given our customers the patience to stick with Windows through all our mistakes, our buggy drivers, our high TCO [total cost of ownership], our lack of a sexy vision at times, and many other difficulties […] Customers constantly evaluate other desktop platforms, [but] it would be so much work to move over that they hope we just improve Windows rather than force them to move. […] In short, without this exclusive franchise [meaning Windows] we would have been dead a long time ago.*"

- comments from a Microsoft General Manager in a memo to Bill Gates[1]

2.3 Complementary Benefits

Complementary benefits are those products or services that add additional value to the network. These might include 'how-to' books, software add-ons, even labor. You'll find more books on auctioning over eBay, more virtual storefronts in Second Life, and more accountants that know Excel, than on any of their rivals. Why? Book authors, Second Life partners, and accountants invest their time where they're likely to reach the biggest market and get the greatest benefit. In auctions, virtual worlds, and spreadsheet software, eBay, Second Life, and Excel each dwarf their respective competition.

Products and services that encourage others to offer complementary goods are sometimes called *platforms*[2]. Allowing other firms to contribute to your platform can be a brilliant strategy, because those firms will spend *their* time and money to enhance *your* offerings. Consider the billion-dollar hardware eco-system that Apple has cultivated around the iPod. There are over 90 brands selling some 280 models of iPod speaker systems[3]. Thirty-four auto manufacturers now trumpet their cars as being iPod-ready, many with in-car docking stations and steering wheel iPod navigation systems. And now with the App Store for the iPhone and iPod Touch, Apple is doing the same thing with software add-ons. Each add-on enhances the value of choosing an iPod over a rival like the Microsoft Zune.

The iPod Economy

[1] Parsons, 2004
[2] Eisenmann et al., 2006
[3] Hansell, 2008


Products built to work with the iPod range from automobiles to the iCarta toilet paper holder. Apple offers a certification programs, where developers of accessories for the iPod and iPhone that meet certain guidelines can use the logos above. Each of these third-party products potentially enhances the value of owning an Apple product, while each logo serves as an additional advertisement for Apple. Apple even receives a royalty from firms that use the "Made for iPod" logo in advertisements and on product packaging.

These three value-adding sources: *exchange*, *staying power*, and *complementary benefits*, often work together to reinforce one another in a way that makes the network effect even stronger. When users *exchanging* information attract more users, they can also attract firms offering *complementary* products. When developers of complementary products invest time writing software; and users install, learn, and customize these products; switching costs are created that enhance the *staying power* of a given network. From a strategist's perspective this can be great news for dominant firms in markets where network effects exist. The larger your network, the more difficult it becomes for rivals to challenge your leadership position.

LEARNING OBJECTIVE:
After studying this section you should be able to:

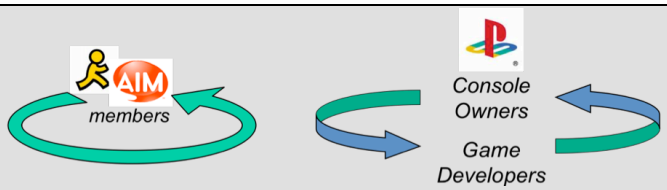
1. Recognize distinguish between one-sided and two-sided markets.
2. Understand same-side and cross-side exchange benefits.

3. ONE-SIDED OR TWO-SIDED MARKETS? Understanding Network Structure

To understand the key sources of network value, it's important to recognize the structure of the network. Some networks derive most of their value from a single class of users. An example of this is instant messaging (IM). While there might be some add-ons for the most popular IM tools, they don't influence most users' choice of an IM system. You pretty much choose one IM tool over another based on how many of your contacts you can reach. Economists would call IM a *one-sided market*, and the network effects derived from IM users attracting more IM users as being *same-side exchange benefits*.

But some markets are comprised of two distinct categories of network participant. Consider video games. People buy a video game console largely based on the number of really great games available for the system. Software developers write games based on their ability to reach the greatest number of paying customers, and so they're most likely to write for the most popular consoles, first. Economists would call this kind of network a *two-sided market*. When an increase in the number of users on one side of the market (say console owners) creates a rise in the other side (software developers), that's called a *cross-side exchange benefit*.

The Positive Feedback Loop of Network Effects



AIM is considered a one-sided market, where the value-creating, positive-feedback loop of network effects comes mostly from same-side benefits from a single group (AIM members who attract other AIM members who want to communicate with them). Video game consoles, however, are considered a two-sided network, where significant benefits come from two distinct classes of users that add value from cross-side benefits by attracting their opposite group. In the game console market, more users of a console attract more developers who write more software for that console, and that attracts more users. Game availability is the main reason the Sony Playstation 2 dominated over the original XBox. It is possible that a network may have both same-side and cross-side benefits. XBox 360 benefits from cross-side benefits, in that more users of that console attract more developers writing more software titles, and vice versa. However, the XBox Live network that allows users to play against each other has same-side benefits. If your buddies use XBox Live and you want to play against them, you're more likely to buy an XBox.

LEARNING OBJECTIVE:
After studying this section you should be able to:

1. Understand how competition in markets where network effects are present differ from competition in traditional markets.
2. Understand the reasons why it is so difficult for late-moving, incompatible rivals to compete in markets where a dominant, proprietary standard is present.

4. HOW ARE THESE MARKETS DIFFERENT?

When network effects play a starring role, competition in an industry can be fundamentally different than in conventional, non-network industries.

First, network markets experience *early, fierce competition*. This happens because of the positive-feedback loop inherent in network effects – the biggest networks become even bigger. Firms are very aggressive in the early stages of these industries because once a leader becomes clear, *bandwagons* form, and new adoptors begin to overwhelmingly favor the leading product over rivals, tipping the market in favor of one dominant firm or standard. This tipping can be remarkably swift. Once the majority of major studios and retailers began to back Blu-ray over HD-DVD, the latter effort folded within weeks.

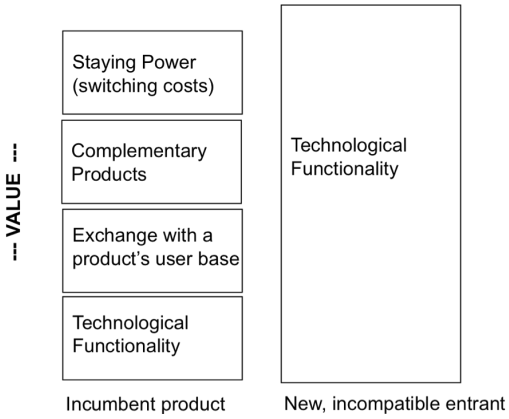
These markets are also often winner-take-all or winner-take-most, *exhibiting monopolistic tendencies* where one firm dominates all rivals. Look at all of the examples listed so far – in nearly every case the dominant player has a market share well ahead of all competitors. When, during the U.S. Microsoft anti-trust trial, Judge Thomas Penfield Jackson declared Microsoft to be a monopoly, the collective response should have been 'of course'. Why? The *natural state* of a market where network effects are present (and this includes operating systems and Office software) is for there to be one major player. Since bigger networks offer more value, they can charge customers more. Firms with a commanding network effects advantage may also enjoy substantial bargaining power over partners. For example, Apple, which controls over 75 percent of digital music sales, is able to dictate song pricing, despite the tremendous protests of

supplying record labels[4]. In fact, Apple's stranglehold is so strong that it can dictate terms even though the Big Four record labels (Universal, Sony, EMI, and Warner) are themselves an *oligopoly* that together provide over 85 percent of music sold in the United States.

Finally, it's important to note that the best product or service doesn't always win. Playstation 2 dominated the video console market over the original XBox, despite the fact that nearly every review claimed the XBox was hands-down a more technically superior machine. Why were users willing to choose an inferior product (PS2) over a superior one (XBox)? The power of network effects! PS2 had more users, so that attracted more developers offering more games.

This last note is a critical point to any newcomer wishing to attack an established rival. Winning customers away from a dominant player in a network industry isn't as easy as offering a product or service that is better. Any product that is incompatible with the dominant network has to exceed the value of the technical features of the leading player, plus (since the newcomer likely starts without any users or third-party product complements) the value of the incumbent's exchange, switching cost, and complementary product benefit (see diagram below). And the incumbent must not be able to easily copy any of the newcomer's valuable new innovations; otherwise the dominant firm will quickly match any valuable improvements made by rivals. As such, *technological leap-frogging*, or competing by offering a superior generation of technology, can be really tough[5].

Battling a Leader with Network Effects is Tough[6]



Is This Good for Innovation?

Critics of firms that leverage proprietary standards for market dominance often complain that network effects are bad for innovation. But this statement isn't entirely true. While network effects limit competition *against* the dominant standard, innovation *within* a standard may actually blossom. Consider Windows. Microsoft has a huge advantage in the desktop operating system market, so few rivals try to compete with it. Apple and the open-source Linux are the firm's only credible rivals, and both have tiny market shares. But the dominance of Windows is a magnet for developers to innovate within the standard. Programmers with novel ideas are willing to make the

[4] Barnes, 2007
[5] Schilling 2003
[6] adapted from Gallaugher and Wang, 2008, extending Schilling 2003

investment in learning to write software for Windows because they're sure that a Windows version can be used by the overwhelming majority of computer users.

By contrast, look at the mess in the mobile phone market. With so many different handsets offering different screen sizes, running different software, having different key layouts, and working on different carrier networks, writing a game that's accessible by the majority of users is nearly impossible. Glu Mobile, a maker of online games, launched 56 re-engineered builds of Monopoly to satisfy the diverse requirements of just one telecom carrier[7]. As a result, entrepreneurs with great software ideas for the mobile market are deterred because writing, marketing, and maintaining multiple product versions is both costly and risky.

5. COMPETING WHEN NETWORK EFFECTS MATTER

LEARNING OBJECTIVE:
After studying this section you should be able to:

1. Plot strategies for competing in markets where network effects are present, both from the perspective of the incumbent firm and the new market entrant.
2. Give examples of how firms have leveraged these strategies to compete effectively.

Why do you care whether networks are one-sided, two-sided, or some sort of hybrid? Well, when crafting your plan for market dominance, it's critical to know if network effects exist, how strong they might be, where they come from, and how they might be harnessed to your benefit. Here's a quick rundown of the tools at your disposal when competing in the presence of network effects.

Strategies for Competing in Markets with Network Effects (examples in parentheses)

- Move early (Yahoo! Auctions in Japan)
- Subsidize product adoption (PayPal)
- Leverage viral promotion (Skype; Facebook feeds)
- Expand by redefining the market to bring in new categories of users (Nintendo Wii) or through convergence (iPhone).
- Alliances and partnerships (NYCE vs. Citibank)
- Distribution channels (Java with Netscape; Microsoft bundling Media Player with Windows)
- Seed the market with complements (Blu-ray; Nintendo)
- Encourage the development of complementary goods – this can include offering resources, subsidies, reduced fees, market research, development kits, venture capital (Facebook fbFund).
- Maintain backward compatibility (Apple's Mac OS X & switch to Intel)
- Rivals: be compatible with larger networks (Apple's move to Intel; Live Search Maps)
- Incumbents: constantly innovate to create a moving target and block rival efforts to access your network (Apple's efforts to block access to its own systems)
- Large, well-known followers: preannouncements (Microsoft)

5.1 Move Early

In the world of network effects, this is a biggie. Being first allows your firm to start the network effects snowball rolling in your direction. In Japan, worldwide auction leader eBay showed up just five months after Yahoo, but was never able to mount a credible threat and ended up pulling out of the market. Being just five months late cost eBay billions in lost sales (see the eBay case). Sony's Playstation 2 enjoyed an 18-month lead over the technically superior XBox (as well as

[7] Hutheesing, 2006

Nintendo's Game Cube). That time lead helped to create what for years was the single most profitable division at Sony. By contrast, the technically superior PS3 showed up months after XBox 360 and at roughly the same time as the Nintendo Wii, and has struggled, racking up multi-billion dollar losses for Sony[8].

What if Microsoft Threw a Party and No One Showed Up?

Microsoft launched the Zune media player with features that should be subject to network effects – the ability to share photos and music by wirelessly 'squirting' content to other Zune users. The firm even promoted Zune with the tagline "Welcome to the Social". Problem was, the Zune Social was a party no one wanted to attend. The late-arriving Zune garnered a market share of just three percent, and users are hard pressed to find buddies to leverage these neat social features[9]. A cool idea does not make a network effect happen.

5.2 Subsidize Adoption

Starting a network effect can be tough – there's little incentive to join a network if there's no one in the system to communicate with. In one admittedly risky strategy, firms may offer to subsidize initial adoption in hopes that network effects might kick in shortly after. Subsidies to adopters might include a price reduction, rebate, or other give-aways. PayPal, a service that allows users to pay one another using credit cards, gave users a modest rebate as a sign-up incentive (in one early promotion, users got back $15 when spending their first $30) to encourage adoption of its new effort. This brief subsidy paid to early adopters paid off handsomely. eBay later tried to enter the market with a rival effort, but as a late mover, its effort was never able to overcome PayPal's momentum. PayPal was eventually purchased by eBay for $1.5 billion, and the business unit is now considered one of eBay's key drivers of growth and profit.

5.3 Leverage Viral Promotion

Since all products and services foster some sort of exchange, it's often possible to leverage a firm's customers to promote the product or service. Internet calling service Skype has over 300 million registered users, yet has spent almost nothing on advertising. Most Skype users were recruited by others who shared the word on free and low-cost Internet calls. Within Facebook, feeds help activities to spread virally. Feeds blast updates on user activities on the site, acting as a catalyst for friends to join groups and load applications that their buddies have already signed up for.

5.4 Expand by Redefining the Market

If a big market attracts more users (and in two-sided markets, more complements), why not re-define the space to bring in more users? Nintendo did this when launching the Wii. While Sony and Microsoft focused on the graphics and raw processing power favored by hard-core male gamers, Nintendo chose to develop a machine to appeal to families, women, and age groups that normally shunned alien shoot 'em ups. By going after a bigger, re-defined market, Nintendo was able to rack up sales that exceeded the XBox 360, even though it followed the system by twelve months[10].

[8] Null, 2008
[9] Walker, 2008
[10] Sanchanta, 2007

Market expansion sometimes puts rivals who previously did not compete on a collision course as markets *converge*. Consider the market for portable electronic devices. Separate product categories for media players, cameras, gaming devices, phones, and GPS are all starting to merge. Rather than cede its dominance as a media player, Apple leveraged a strategy known as *envelopment*, where a firm seeks to make an existing market a subset of its product offering. Apple deftly morphed the iPod into the iPhone, a device which captures all of these product categories in one device. But the firm went further, the iPhone is WiFi-capable, offers browsing, e-mail, and an application platform based on a scaled-down version of the same OS X operating system used in Macintosh computers. As a Pocket Mac, the appeal of the device broadened beyond just the phone or music player markets, and within two quarters of launch, iPhone become the second leading smart phone in North America – outpacing Palm, Microsoft, Motorola and every other rival, except RIM's Blackberry[11].

5.5 Alliances and Partnerships

Firms can also use partnerships to grow market share for a network. Sometimes these efforts bring rivals together to take out a leader. In a classic example, consider ATM networks. Citibank was the first major bank in New York City to offer a large ATM network. But the Citi network was initially proprietary, meaning customers of other banks couldn't take advantage of Citi ATMs. Citi's innovation was wildly popular and being a pioneer in rolling out cash machines helped the firm grow deposits four-fold in just a few years. Competitors responded with a partnership. Instead of each rival bank offering another incompatible network destined to trail Citi's lead, competing banks agreed to share their ATM operations through NYCE (New York Cash Exchange). While Citi's network was initially the biggest, after the NYCE launch a Chase bank customer could use ATMs at a host of other banks that covered a geography far greater than Citi offered alone. Network effects in ATMs shifted to the rival bank alliance, Citi eventually joined NYCE and today, nearly every ATM in the United States carries a NYCE sticker.

Google has often pushed an approach to encourage rivals to cooperate to challenge a leader. Its Open Social standard for social networking (endorsed by MySpace, LinkedIn, Bebo, Yahoo, and others) is targeted at offering a larger alternative to Facebook's more closed efforts (see the Facebook case), while its Android open-source mobile phone operating system has gained commitments from many handset makers that collectively compete with Apple's iPhone.

Share or Stay Proprietary?

Defensive moves like the ones above are often meant to diffuse the threat of a proprietary rival. Sometimes firms decide from the start to band together to create a new, more open standard, realizing that collective support is more likely to jumpstart a network than if one firm tried to act with a closed, proprietary offering. Examples of this include the coalitions of firms that have worked together to advance standards like Bluetooth and WiFi. While no single member firm gains a direct profit from the sale of devices using these standards, the standard's backers benefit when the market for devices expands as products become more useful because they are more interoperable.

5.6 Leverage Distribution Channels

[11] Kim, 2007

Firms can also think about novel ways to distribute a product or service to consumers. Sun faced a challenge when launching the Java programming language – no computers could run it. In order for Java to work, computers need a little interpreter program called the Java Virtual Machine. Most users weren't willing to download the JVM if there were no applications written in Java, and no developers were willing to write in Java if no one could run their code. Sun broke the log jam when it *bundled* the JVM with Netscape's browser. When millions of users downloaded Netscape, Sun's software snuck in, almost instantly creating a platform of millions for would-be Java developers. Today, even though Netscape has failed, Sun's Java remains one of the world's most popular programming languages.

As mentioned in the 'Strategy and Technology' chapter, Microsoft is in a particularly strong position to leverage this approach. The firm often bundles its new products into its operating systems, Office suite, Internet Explorer browser, and other offerings. The firm used this tactic to transform once market-leader Real Networks into an also-ran in streaming audio. Within a few years of bundling Windows Media Player with its other products, WMP grabbed the majority of the market, while Real's share had fallen to below ten percent[12]. Caution is advised, however. Some international regulatory efforts consider product bundling by dominant firms to be anti-competitive. European regulators have forced Microsoft to unbundle Windows Media Player from its operating system.

AntiTrust: Real vs. Microsoft

From October 2001 to March 2003, Microsoft's bundling of Windows Media Player in versions of its operating system ensured that the software came preinstalled on nearly all of the estimated 207 million new PCs shipped during that period. By contrast, Real Networks' digital media player was preinstalled on less than two percent of PCs. But here's the kicker that got to regulators (and Real): Microsoft's standard contract with PC manufacturers "prevented them not only from removing the Windows Media Player, but even [from] providing a desktop icon for Real Networks"[13]. While network effects create monopolies, governments may balk at allowing a firm to leverage its advantages in ways that are designed to deliberately keep rivals from the market.

5.7 Seed the Market

When Sony launched the PS3, it subsidized the sale of each console by an estimated $300 per unit[14]. Subsidizing consoles is a common practice in the video game industry – game player manufacturers usually make most of their money through royalties paid by game developers. But Sony's subsidy had an additional benefit for the firm – it helped sneak a Blu-ray DVD player into every home buying a PS3. Since Sony is also a movie studio and manufacturer of DVD players and other consumer electronics, it had a particularly strong stake in encouraging the adoption of Blu-ray over rival HD-DVD.

Giving away products for one-half of a two-sided market is an extreme example of this kind of behavior, but it's often used. Adobe gives away the Acrobat reader to build a market for the sale of software that creates Acrobat files. Firms with Yellow Page directories give away countless copies of their products, delivered straight to your home, in order to create a market for selling advertising.

[12] Business Wire, 2006 and Eisenmann, et al. 2006
[13] Hansen and Becker, 2003 and Eisenmann, et al. 2006
[14] Null, 2008

5.8 Encourage the Development of Complementary Goods

There are several ways to motivate others to create complementary goods for your network. These efforts often involve some form of developer subsidy, or other free or discounted service. A firm may charge lower royalties or offer a period of royalty-free licensing. It can also offer free software development kits (SDKs), training programs, co-marketing dollars, or even startup capital to potential suppliers. Microsoft and Apple both allow developers to sell their products online through XBox Live Marketplace and iTunes, respectively. This lowers developer costs by eliminating costs associated with selling physical inventory in brick and mortar stores, and can provide a free way to reach millions of potential consumers without significant promotional spending.

Venture funds can also prompt firms to create complementary goods. Facebook announced it would spur development for the site in part by administering the fbFund, which initially pledged $10 million in startup funding (in allotments of up to $250,000 each) to firms writing applications for its platform.

5.9 Leverage Backward Compatibility

Those firms that control a standard would also be wise to ensure that new products are *backward compatible* with earlier offerings. If not, they re-enter a market at installed-base zero and give up a major source of advantage - the switching costs built up by prior customers. For example, when Nintendo introduced its 16-bit SNES system, it was incompatible with the firm's highly successful prior generation 8-bit model. Rival Sega, which had entered the 16 bit market two years prior to Nintendo, had already built up a large library of 16 bit games for its system. Nintendo entered with only its debut titles, and no ability to play games owned by customers of its previous system, so there was little incentive for existing Nintendo fans to stick with the firm.

Backward compatibility was the centerpiece of Apple's strategy to revitalize the Macintosh through its move to the Intel microprocessor. Intel chips aren't compatible with the instruction set used by the Power PC processor used in earlier Mac models. Think of this as two incomprehensible languages – Intel speaks French, Power PC speaks Urdu. To ease the transition, Apple included a free software-based adaptor that automatically emulated the functionality of the old chip on all new Macs (a sort of Urdu to French translator). By doing so, all new Intel Macs could use the base of existing software written for the old chip, owners of Power PC Macs were able to upgrade while preserving their investment in old software, and software firms could still sell older programs while they rewrote applications for new Intel-based Macs.

Even more significant, since Intel is the same standard used by Windows, Apple developed a free software adaptor called Boot Camp that allowed Windows to be installed on Macs. Boot Camp (and similar solutions by other vendors) dramatically lowered the cost for Windows users to switch to Macs. Within two years of making the switch, Mac sales skyrocketed to record levels. Apple now boasts a commanding lead in notebook sales to the education market[15] and a

[15] Seitz, 2008

2008 survey by Yankee Group found that 87 percent of corporations were now using at least some Macintosh computers, up from 48% just two years earlier[16].

5.10 Rivals: Be Compatible with the Leading Network

Companies will want to consider making new products compatible with the leading standard. Microsoft's Live Maps and Virtual Earth 3D arrived late to the Internet mapping game. Users had already put in countless hours building resources that meshed with Google Maps and Google Earth. But by adopting the same KML standard used by Google, Microsoft could, as TechCrunch put it, "drink from Google's milkshake". Any work done by users for Google in KML could be used by Microsoft. Voilà, an instant base of add-on content!

5.11 Incumbents: Close Off Rival Access and Constantly Innovate

Oftentimes firms that control dominant networks will make compatibility difficult for rivals who try to connect with their systems. America Online has been reluctant to open up its instant messaging tool to rivals, and Skype is similarly closed to non-Skype clients.

Firms that constantly innovate make it particularly difficult for competitors to become compatible. Again, we can look to Apple as an example of these concepts in action. While Macs run Windows, Windows computers can't run Mac programs. Apple has embedded key software in Mac hardware, making it tough for rivals to write a software emulator like Boot Camp that would let Windows PCs drink from the Mac milkshake. The firm also modifies software on other products like the iPhone and iTunes each time wily hackers tap into closed aspects of its systems. Even if firms create adaptors that emulate a standard, a firm that constantly innovates creates a moving target that's tough for others to keep up with. Apple has been far more aggressive than Microsoft in introducing new versions of its software. Since the firm never stays still, would-be clone makers never get enough time to create an emulator that runs the latest Apple software.

5.12 Large, well-known followers: Pre-announcements

Large firms that find new markets attractive, but don't yet have products ready for delivery might *pre-announce* efforts in order to cause potential adaptors to sit on the fence, delaying a purchasing decision until the new effort rolls out. Pre-announcements only work if a firm is large enough to pose a credible threat to current market participants. Microsoft, for example, can cause potential customers to hold off on selecting a rival, because users see that the firm has the resources to beat most players (suggesting staying power). Statements from startups however often lack credibility to delay user purchases. There's a tech industry acronym for the impact firms try to impart on markets through pre-announcements: *FUD* for fear, uncertainty, and doubt.

[16] Burrows, 2008

The Osborne Effect

Pre-announcers beware. Announce an effort too early and a firm may fall victim to what's known as *The Osborne Effect*. Legend has it that portable computer manufacturer Osborne Computer announced new models too early. Customers opted to wait for the new models, so sales of the firm's current offerings plummeted. While evidence suggests that Osborne's decline had more to do with rivals offering better products, the negative impact of pre-announcements has hurt a host of other firms[17]. Among these, Sega, which exited the video game console market entirely after pre-announcements of a next-generation system killed enthusiasm for its Saturn console[18].

Too Much of a Good Thing?

When network effects are present, more users attract more users. That's a good thing as long as a firm can earn money from this virtuous cycle. But sometimes a network effect attracts too many users and a service can be so overwhelmed it becomes unusable. These so-called c*ongestion effects* occur when increasing numbers of users lower the value of a product or service. This most often happens when a key resource become increasingly scarce. Users of the game Ultima were disappointed in an early online version that launched without enough monsters to fight, or server power to handle the crush of fans. Facebook users with a large number of friends may also find their attention is a limited resource, as feeds push so much content that it becomes difficult to separate interesting information from the noise of friend actions.

And while network effects can attract positive complementary products, a dominant standard may also be the first place where virus writers and malicious hackers choose to strike.

Feel confident! Now you've got a solid grounding in network effects, the key resource leveraged by some of the most dominant firms in technology. And these concepts apply beyond the realm of tech, too. Network effects can explain phenomenon ranging from why some stock markets are more popular than others to why English is so widely spoken, even among groups of non-native speakers. On top of that, the strategies explored in the last half of the chapter show how to use these principles to sniff out, create, and protect this key strategic asset. Go forth, tech pioneer – opportunity awaits!

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[17] Orlowski, 2005
[18] Schilling, 2003

Gallaugher's forthcoming book "Information Systems: A Manager's Guide to Harnessing Technology", to published (in both free online and low-cost print version) by Flat World Knowledge (FlatWorldKnowledge.com). Thanks!

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