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## Chapter 1 Introduction

*This chapter introduces the reader to my main thesis: when it comes to the economics of the Internet, wishful thinking has often masqueraded for careful analysis. This has led firms to choose the wrong strategies. In order for firms to be successful in their Internet businesses, they will need to understand the actual economic forces at work, not how they might work in some fictionalized world that doesn't obey the laws of our economic universe.*

This chapter starts out with a brief history of the Internet—how it came about and what it is currently used for. I then survey the uses to which the Internet is being put and the business models that are being built upon it. By referencing the meteoric rise of firms such as Amazon, Yahoo, eBay, Cisco and rise and (imminent) demise of firms such as PeaPod, CDNow, and Dr. Koop, I illustrate the current business landscape

Many of the prognostications about the internet—rapidly increasing number of users, rapidly increasing advertising revenues, rapidly increasing sales—have fertilized wildly optimistic prognostications for the performance of Internet firms, a virtual cornucopia of wealth streaming down upon investors in those companies. But even if the prognostications are true, does that insure the rosy financial scenario that so many investors and analysts anticipate? And what about the claims that the rewards are going to flow almost entirely to early-birds, with laggard lucky to get the scraps?

The answers to the questions posed in the last paragraph are ‘no’ and ‘no.’ What I hope to demonstrate in this book is that much of what passes for Internet wisdom is actually just wishful thinking. Even if all the rosy scenarios about the size, usage, and utility of the Internet are true, this doesn't *necessarily* translate into good news for investors or firms doing business on the Internet, as I explain in my discussion of myth number 1 in chapter 2.

Even though recent stock market jitters have brought forth a mini-resurgence of Internet skepticism, no one has put forward a logical framework to replace the current thinking about Internet business strategy. Firms still need to determine how to incorporate the Internet into their business models. Even if the first generation of Internet firms crash and burn, and even if the Internet stock market valuations go to zero, the Internet is going to be an important tool and business managers need to understand the economic forces at work in Internet based markets.

My book provides this understanding through an examination of nine myths that have been widely accepted as being true, at least until recently. Each of these myths has some elements of truth—without which they could not have been so widely accepted—but each also is flawed. The examination of these myths is the device allowing me to illuminate the methods by which firms can best take advantage of those opportunities offered by the Internet.

This first chapter then goes on to preview each of the myths made by Internet optimists, all starting with a correct premise, but following with incorrect conclusions.

?? The Internet is likely to change many lives and provide a great deal of new wealth to society—but that doesn't necessarily lead to above normal profits for those who invest in the Internet activities. Myth number 1 is the claim that large technological advances must be accompanied by above normal profits for firms wise enough to invest in these markets. The optimists correctly point to the large and rapidly growing demand in such markets. But they ignore the forthcoming supply, which is critical to truly understanding how the market will play out. Even the simplest exercise in supply and demand is sufficient to make this point, and I intend to treat the readers to a simple but cogent rendition of supply and demand in the next chapter. In the long run, free entry into Internet markets can be expected to keep profits down, and in the short run profits might be below average if there is overinvestment by firms hoping believing in the myth.

?? Myths number 2 and 3 are closely intertwined. Myth number 2 is the belief that Internet markets are winner-takes-all; myth 3 is the claim that being first is essential for success on the Internet. The key to seeing through these myths is based upon an understanding of network effects, economies of scale, and how they relate to business conducted on the Internet.

As I explain in Chapter 3, the often-cited 'network effects' will usually be minor for most business conducted on the Internet. Nor are economies of scale likely to be greatly enhanced for most e-commerce firms. Yet, without these preconditions, winner-takes-all will be no more likely for Internet incarnation of these industries than for the brick-and-mortar versions.

The idea that firms must achieve greater speed because Internet time moves so fast has been constantly repeated, but incessant repetition does not make it true. Everything else equal, being first usually does provide an advantage, whether we are talking about brick-and-mortar firms or Internet firms. But if markets are not winner-takes-all, then being first should impart no extra advantage relative to brick-and-mortar versions of these industries.

?? E-commerce firms do not need to expend resources on physical stores, providing them a cost advantage over brick-and-mortar stores. Myth number 4 takes this truth and concludes that Internet firms will be more profitable than their higher-priced brick-and-mortar counterparts. The problem with this claim is its implicit assertion that competition will largely occur between Internet firms on the one hand and brick-and-mortar firms on the other. In reality, Internet firms will largely compete with other Internet firms, and brick-and-mortar firms will largely compete with one another. Therefore, even if online retailers have lower costs than brick-and-mortar retailers, it is inappropriate to conclude that online retailers will be more profitable—in fact, we would expect their lower costs to cause them to earn lower margins than the brick-and-mortar retailers.

- ?? Online retailing provides convenience and benefits to consumers—it is fast, it is easy to search and compare prices, and you can shop from your living room. But not everything can be easily sold on the Internet. Myth number 5 is the belief that virtually anything can be successfully sold by virtual firms on the Internet—from dog food to potatoes. This ignores, among other things, the nature of the evolution of many industries to achieving greater efficiencies in such mundane matters as distribution. It also ignores the fact that for many products, perhaps most, consumers will prefer brick-and-mortar retailers with their dressing rooms, instant gratification, fast returns, and other characteristics that will never be imitated in the virtual world.
- ?? Myth number 6 concerns the ability of Internet sites to support themselves entirely by advertising revenues. Online advertising does allow very precise targeting of advertisements and immediate feedback on the impacts of the advertising, enhancing the ability of Internet sites to raise revenues. But, Internet advertising, for various reasons, will not generate sufficient dollars to support the many web sites that are hoping to pay for content with it.
- ?? Auctions have become very popular. Some of the darlings of Internet investors, firms such as eBay and Amazon are hosting auctions. Priceline has a form of auction for airline seats and hotel rooms, and has more recently moved into grocery items. Myth number 7 is that auctions are a better way of selling products than the more common take-it-or-leave-it pricing found in traditional retailing outlets. There are good economic reasons that retailing has evolved the way it has, and auctions because they are a step backward in that evolution, are not going to become the dominant form of pricing. Auctions only make sense for odd-lots, surplus, or one-of-a-kind items.
- ?? Myth number 8 regards stock market valuations for Internet companies. It has been proclaimed many times that traditional stock market valuation measures are irrelevant for Internet startups. This is nonsense. Although I am neither the first nor the only critic of this myth, I explain in the other chapters how to evaluate the prospects of Internet companies.

Internet stocks are not *sui generis*, although supporters of such stocks have had to make that claim to provide a justification of the lofty market capitalizations. Of course, the very recent performance of these stocks has bled a lot of this value, but market capitalizations are still high and many youngsters with Internet startups are still billionaires.

- ?? Finally, I close with a discussion of the overriding myth, number 9, that the laws of supply and demand do not apply to the Internet. These laws transcend changes in technology and apply to all markets, although care needs to be taken in their use. There is an important lesson here, and one that all of us should hope is imparted, because abandonment of economic principles in favor of faddish impulses has the potential to hurt the entire economy.

## Chapter 2: Basic Economics of the Internet

*This chapter introduces the reader to some basic economic concepts. First, the manner in which the Internet creates value is explored. Then several concepts often related to the Internet are examined. These are the concepts of winner-take-all, first-mover-wins, network effects, and instant scalability.*

### **A. How the Internet creates value.**

The Internet creates value by reducing the costs of transmitting information. That, in a nutshell is it. I put it this way not to belittle what the Internet accomplishes. After all, automobiles and airplanes merely lowered the costs of transportation, and language merely lowers the cost of communication but they are all monumental achievements. But it is important to strip away myth from reality. Information transmission is very important. The Internet is a terrific advance in lowering its cost. But, and this is most important, information transmission does not change the laws of economics.

Transmitting information is one of the most valuable functions in an economy. But it is a useful comparison to contrast the Internet with other technologies that have reduced the cost of transmitting information, namely, telephones and television.

Telephones allowed instantaneous voice communication, whereas the prior technologies allowed very slow written communications (the mail) or faster but limited communication via the telegraph and Morse code. Telegraph never made into private homes, so communication using telegraphs required delivery of telegrams, virtually eliminating the time to move the message from one city to another but still requiring a costly and time consuming local delivery.

The telephone, therefore, was a tremendous improvement over the previous technology, in large part because it was intended to be used in homes and businesses, eliminating any delivery costs whatsoever. It required a new and very costly infrastructure to be built up—the ubiquitous telephone lines that cover the landscape. This tremendous investment retarded its diffusion, but the value was so great that the diffusion became virtually complete and telephony completely transformed communication as it was then known.

Television, and radio before it, had a somewhat different impact. Television is an instance of one-way communication. Information, or in this case entertainment, is transmitted from broadcasting studios to consumers with television or radio receivers.

What were the precursors to radio and television? Live entertainment, theatrical releases of movies, and in the home a fledgling phonograph industry. Television and radio greatly enhanced the choices available to consumers. These technologies brought entertainment into the home and automobile. They greatly magnified the audience that could see any given performance, whether by a singer, comedian, or actor. They allowed the virtually instantaneous transmission of news and information.

How does the Internet compare? It is based largely on the same transmission mechanism as cable television and telephones, two prior technologies capable of going into people's homes and offices. The reception is largely confined to computers, which only needed minor modifications. Although broadband required serious new investment in infrastructure, much of the infrastructure was already in place and much of the new infrastructure can be thought of as more of an upgrade than a brand new investment. So the Internet is more evolutionary, in terms of infrastructure, than were radio and television, which required new transmitters, cameras, and receiving equipment.

As far as content, the Internet is also less revolutionary. It allows for two way communication, entertainment and information. So far, it doesn't sound like much of an advance, since television, radios and telephones, taken together, did the same things. What distinguished the Internet, however, from the prior technologies is its ability to quickly retrieve information stored on computers, something that telephones and television can't do. Television can't because it is a one-way medium. Telephones cannot because they are analog devices made for sound to come out the receiving end and users are not computers that can 'remember' information as it comes across the line and later manipulate it.<sup>1</sup>

By combining the two-way transmission mechanism of the telephone with the informational display of the television and the database capability of computers, the Internet does provide a new experience. Users can quickly find information and retrieve it for instantaneous or later use. Some of the uses are extraordinary, others are quite mundane.

In the extraordinary category would be the ability to participate in virtual worlds with other individuals who lose their true identities and can take on the identities they wish. Even so, it is difficult to think of anything truly revolutionary about the Internet. Information is available in unprecedented simplicity, unprecedented amounts, and unprecedented variety.

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<sup>1</sup> Of course, telephones can be hooked up to modems, but this is essentially a close cousin of the Internet, if not exactly the Internet itself.

On a more mundane level, the Internet can be used to help organize our Saturday nights. If I want to listen to music, I can catch an Internet broadcast instead of an over-the-air broadcast. The same will eventually be true for video. If I want to know what movies are playing nearby, as well as starting times and reviews, I can go online. Newspapers provide some of the same services, but you are limited there to but a single review, or perhaps to a summary of reviews, since space limitations restrict the ability of the newspaper to provide the full set of previous reviews. The telephone can be used to find out what is playing, find out if the movie is sold out, and get the starting times and prices, but reviews are not available. Is this combination of newspaper and telephone that the Internet provides a big deal?

It certainly isn't earthshaking, but multiply this value by the thousand little ways that the Internet can provide more information faster, and you have a considerable improvement in people's lives.

In a similar vein, firms can keep track of customers' orders, their consumption habits, credit history, and so forth in a seamless and cohesive fashion. Marketers can have a field day. Paranoids can have more sleepless nights. Politicians can hold hearings.

But all is not necessarily good for the business firm. The reduction in transmission costs, while creating value, will reduce the ability of firms participating on the Internet to take advantage of what we would otherwise call 'locational' monopolies. Less clear is the impact on "brand name" loyalty. It is easier to explore new locations and it is easier to get feedback on the web locations. This should ease entry since incumbents would be thought hard pressed to take advantage of consumer ignorance and inertia. One might also think that it will be more difficult for price spreads to exist, and for firms to engage in differential pricing. If these assumptions turn out to be true, we can expect profitability of Internet firms to be affected—negatively.

## ***B. Special Economics of the Internet, or maybe not so special***

### **i. Network effects**

Many products and firms associated with the Internet are thought to have an economic property known as network effects. Some products actually do have network effects, but many products that were involved in some way with e-commerce did not have even the slightest trace of network effects although the business models applied to these products were often based on theories of network effects that were themselves poorly thought out. How much of the damage caused by the recent Internet meltdown can be laid at the doorstep of mistaken business strategies based on an incorrect

understanding of network effects can not be ascertained, but certainly a substantial portion of the damage can be attributed to it.

The technical definition of network effects is fairly straightforward. Network effects exist when a product becomes more useful to consumers the more other people there are using it. For example, the owner of a fax machine benefits from the fact that there are lots of other people with fax machines. If there were no other users of fax machines you couldn't send a fax to anyone, and it would best be used as a doorstop. Obviously, telephone and other *literal* networks where users are physically linked to one another exhibit network effects. Less obvious are what have been called *virtual* network, such as the network of WordPerfect users.<sup>2</sup> It might be that some, or even most, of the users of WordPerfect care about the number of other users. If WordPerfect users would pay more for their copy of WordPerfect as the number of other WordPerfect users increased, then WordPerfect would be said to embody network effects.

Note that there need not be anything particularly high-tech about network effects. Automobile owners benefit from having a ready supply of parts and mechanics that can fix their cars should they break down. The more units there are of a particular automobile model, the more likely that any single owner can find such repair facilities. Therefore, to the extent that consumers value the ease of repair, automobiles should have network effects. The same would be true for almost any product that might break.

Why is an overestimation of network effects so dangerous to the thinking of business managers? The answer has to do with business strategies that have been propounded based on network effects. These are theories that exhort firms to take advantage of network effects to lock-in winning positions. These are theories that suggest that getting to market first, and generating a large market share and installed base is of the utmost importance. These are theories that imply that losing money to gain sales and share is a worthwhile investment because firms that succeed in generating large sales will have easy sailing in the future with their customers locked in to their products. These are theories that make claims that are inconsistent with how markets have actually worked.

Before examining how those theories have been translated into business strategies, which forms the basis of 0 we need to examine several other economic concepts that are closely related and in many cases more important than network effects.

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<sup>2</sup> This terminology is based on Liebowitz and Margolis, 2001.



## **ii. Economies of Scale**

Economies of scale, a concept that has been taught in microeconomics classes for many generations, imply that average costs decrease as the firm sells more and gets larger. Note that we are talking about average costs. Average costs are simply the quotient of total costs divided by the number of units sold. Automobile companies experience significant economies of scale, which is one reason that a Rolls-Royce costs more to make than a Cadillac. There are large startup costs, more formally known fixed costs, in designing a new automobile and in creating all the dies and assembly facilities to produce a particular model of a car. Almost all manufacturing exhibits some economies of scale. But usually, at some point, these economies tend to run out and be superseded by other production components that raise the average cost of production as output increases.<sup>3</sup>

Many new high tech products are thought to have very significant economies of scale because they have very large startup costs. When a software product is developed, for example, the total cost of development is a fixed cost that does not depend on whether ten or ten million units are actually sold. The costs of duplicating, shipping, and servicing units that eventually land in the hands of consumers are often considered to be close to zero, a convenient though not necessarily accurate assumption.<sup>4</sup>

Still, it seems likely that software, microprocessors, and many other high tech products do have substantial economies of scale. Although this concept has been given a role in business strategies that is far inferior to that of network effects, economies of scale are likely to have very similar impacts to network effects, and are frequently going to be more significant than network effects. Their somewhat neglected role in recent economic literature is probably due to the fact that the concept of economies to scale is not new and doesn't seem as sexy to academics who always are looking for something new, even if it is just a new label on an old concept.<sup>5</sup>

## **iii. Winner take all**

Network effects and economies of scale have almost identical impacts. Each works to advantage large firms over small ones. Large networks, by

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<sup>3</sup> For a classic demonstration see Alchian...

<sup>4</sup> Pedagogically convenient if one wishes to illustrate the workings of average costs and economies of scale. Theoretically convenient if one wishes to characterize the software industry as a natural monopoly without going to the trouble of examining the actual costs of support, shipping, and duplicating.

<sup>5</sup> Of course, even network effects are not terribly new. A reader of current economic literature might be forgiven for thinking that the concept of network effects emerged de novo in the mid 1980s with the papers by Katz and Shapiro. In fact, these concepts had been around since at least the 1950s in a then influential paper by Harvey Leibenstein.

definition, have stronger network effects than do small networks, meaning that consumers should be willing to pay more to join a large network, everything else equal. This should enhance the profitability of the large network relative to the small network. Similarly, economies of scale imply that large firms have lower costs than do small firms, providing them with larger profits. In terms of outcomes, these two economic forces are virtually indistinguishable from one another since each advantages large firms and networks relative to their smaller rivals.

This advantage of large over small is sometimes referred to as increasing returns (to scale). Increasing returns was normally thought to lead to winner-take-all results, particularly when products from different vendors were considered to be identical, as they are modeled to be in basic economic theories. Some modern versions of this story, nodding to the reality that markets shares are almost never 100%, prefer the term “winner-take-most”. I see no need to mince words and will use the more exciting terminology.

Increasing returns, therefore, was inconsistent with the idea of many competitors, one of the fundamental assumptions in economists’ basic model of competition. It was also inconsistent with the observation that many industries had far more than a single firm. For these and other reasons the concept of increasing returns was relegated to a relatively obscure position in economic analysis.<sup>6</sup>

Whenever large firms enjoy cost advantages that smaller firms do not enjoy, this could contribute to a winner-take-all result. It need not, however, particularly if products are different from one another and appeal to different types of consumers. That is why the video format for camcorders (hi-8) has mainly been different than the format for VCRs (VHS). VHS was successful against Beta in large part due to its longer playing time afforded by its larger cassette. The large cassette proved to be a disadvantage in the camcorder market where portability was very important.\*\*

Of course, many firms with large market shares, such as Packard-Bell in computers or General Motors in automobile manufacturing, did not have such cost advantages over their rivals. But, for some reason, this was thought not to apply to Internet firms. Morgan Stanley, in a 1999 report opined:

Owing in part to economics of increasing returns, the revenue/ profit streams that accrue, in time, to the Internet leaders (defined as companies

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<sup>6</sup> Recently this concept has enjoyed a surge in popularity in several fields of economics. Our interest is in the usage found in the fields of Industrial Organization and Economic History, where Brian Arthur and Paul David have played important roles. See Paul Krugman’s writings in Slate, discussed in footnote 16 below, for more details.

with the most/stickiest customers) should be broad-based and recurring and the user reach supported by the leaders may be impressive (of Microsoftian and ATTian proportions, or higher).<sup>7</sup>

Nonetheless, there is yet one more factor that can also lead to winner-take-all results—instant scalability. Instant scalability is the ability of a firm to meet market demand in almost no time, tending to cause any favored product to get the lion's share of the market. Instant scalability arises when the production process requires non-specific inputs. For example, the production of copies of a piece of software such as Quicken or Word requires disk duplication machinery (or web servers for software downloads). The machines that make copies of CDs are the same no matter what is on the CD being copied. Thus a machine making copies of Word could almost instantaneously be converted to start making copies of Quicken. Therefore, if demand shifts to favor one product over another, the facilities exist to very quickly start making copies of the now popular product. Note that this is not the same as saying that the cost of duplication is near zero. It could cost a million dollars for each CD (if the materials in a CD were very expensive) but the concept would still be the same and instant scalability would still exist in the industry.

Unlike economies of scale and network effects, instant scalability does not necessarily lead to winner-take-all results. If consumers do not uniformly agree that one product in the market is superior to the others (in terms of bang for the buck) instant scalability will not lead to large market shares. For many information-based products, however, there will be fairly general agreement among consumers and large market shares will prevail. A common example of long standing can be found in the movie industry where in any given week one or two movies tend to take in a majority of box office receipts. Theatres, projectors, and movie duplication equipment are non-specialized, which has allowed these high shares to exist, even though they tend to be very short lived.

Whether firms have the characteristics of economies of scale, network effects, or instant scalability depends on the specifics of their products and the manner in which they do business. The exact manner in which they use or do not use the Internet also can alter the existence or non-existence of these economic characteristics. One has to examine each industry on a case-by-case basis to determine whether winner-take-all is a likely result. For our purposes here, however, the question is more specifically how using the Internet might alter these characteristics for businesses. I turn to that now.

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<sup>7</sup> Page 3, Morgan-Stanley 1999 overview.\*\*

### ***C. How the Internet Alters the likelihood of Winner-take-all.***

Many computer products, such as software and central processing chips, seem to have winner-take-all characteristics, so we find ourselves with one dominant operating system (Windows), one dominant spreadsheet (Excel), one dominant financial package (Quicken), one dominant chip maker (Intel), and so on.

It is sometimes thought that all technology companies, usually defined to include Internet based firms, have this characteristic. A typical view is the following:

Because technology is such a dynamic area, tech companies' fortunes -- and the market's assessments of those fortunes -- change rapidly, and none faster than in the Internet area. "Most of these are winner-take-most or winner-take-all markets," says Michael Mauboussin, chief investment strategist at Credit Suisse First Boston.<sup>8</sup>

Other industries seem somewhat less prone to winner-take-all. The leading brand of television, computer, hotdog, or grocery store usually has a market share of less than 50%, even though those shares may be quite large. Firms in these latter industries are usually thought to exhibit decreasing returns, meaning that at some point getting larger starts disadvantaging the firm relative to its competitors. Although the leading firms in these industries may have quite large market shares, they are not thought to exhibit economies of scale, or network effects.

Could use of the Internet, or the transformation of a business model from brick-and-mortar to Internet based, turn an industry that was not previously winner-takes-all into one that was? This is really the central question in trying to understand how the embrace of the Internet will alter results in industries not previously thought to have increasing returns. What might be the expected impacts of converting a brick-and-mortar firm into one that uses the Internet to do business?

The creation of the web site is a fixed cost, so that this component of cost might produce an economy of scale effect. But if the cost of web site creation is small relative to other costs such as warehousing, shipping, production, sales, customer relations and so forth, then the fixed cost of web site creation is unlikely to result in much of a scale economy and thus unlikely to result in winner-takes-all.

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<sup>8</sup> Nasdaq Swings Are Unprecedented But Consumers Are Not Spooked By GREG IP and E.S. BROWNING Staff Reporters of THE WALL STREET JOURNAL

It is commonly thought that most firms operating on the Internet have network effects because the Internet is a network, and that most e-commerce will be winner-takes-all.

This view is mistaken, at least for a great number of firms classified as Internet firms, and is due to a misunderstanding of network effects. Many Internet companies, when properly analyzed, are seen to have few if any network effects—Amazon, Etoys, PeaPod, Priceline, and *most* other Internet retailers have (or had, since these firms are disappearing like flies) no network effects to speak of. Others, such as Ebay with its online auctions of used products, and the various Internet Messaging services by the likes of AOL, Yahoo and Microsoft, have strong network effects, but this seems to be more the exception than the rule for Internet companies.

Buyers will tend to flock to auction markets, such as Ebay, which have the largest number of items for sale, since sites with many items being auctioned increases the likelihood that a consumer will find what he is looking for, especially for used and obscure items. Similarly, sellers will prefer to have the broadest possible exposure to buyers. Since information is the key to these markets, there is every reason to believe that Internet sellers of used items will come to dominate the market, besting the classifieds found in most newspapers.

Of course, the auction component is largely irrelevant to this network effect. The auction offers an aura of excitement and automates what is often an unpleasant bargaining experience, but if everyone on Ebay were to just offer list prices and provide telephone numbers, Ebay would likely still have done very well. We will return to the role of auctions in Chapter 8: Auctions – Back to the Bazaar?

Markets where interaction among consumers is important are also likely candidates for strong network effects, sites such as GeoCities with its virtual communities. In these cases, users of these services want to have a variety of topics and people with whom to talk, thus their valuation depends on the number of other users. These are circumstances where strong network effects might in turn lend themselves to winner-take-all outcomes. Instant messaging such as AOL Instant Messaging, or Microsoft or Yahoo Messaging, has strong literal network effects, and without interoperability will likely evolve into a winner-take-all result. Of course, consumers will prefer interoperability and it is likely that AOL, which has been trying to prevent interoperability, will have to cave in to the will of its consumers if its rivals can establish a large enough beachhead to cause AOL's customers to seriously value their reduced ability to communicate.

But the majority of Internet firms do not have strong network effects. Certainly this is true for almost all online retailing. Whether we are talking about selling sirloin steaks, Furbys, or recordings of Elvis, the value of the retailing services to individual consumers bears no relationship to the number of consumers serviced by the online sellers.

What is noteworthy in all this is that there are important branches of e-commerce, perhaps the majority of e-commerce activities, that do not exhibit much in the way of network effects. Take the case of someone shopping for toys on the Internet. That consumer is likely to have very little interest in the number of other toy shoppers that will patronize a particular web e-tailer. Why should they? They want to buy the most appropriate products at the best price. Very little of that decision will depend on the number of other consumers patronizing a particular retailer. One exception to this, but I believe a minor exception, would be product reviews listed on the website. One of the clever features of Amazon is its listing of product reviews conveniently accessible to users contemplating purchase of a product. Go compare the number of reviews on Amazon versus that on Barnes and Noble's web site. Amazon seems to understand better that reviews are one of the few network features it can provide its customers.

But even this is a weak network effect, since consumers can go shopping at Amazon to get the product reviews and then go to another site that might have lower prices to make the actual purchase. In other words, other websites can 'free-ride' off of Amazon's product reviews, limiting the value of reviews as network effects. Consumers cannot free-ride on real network effects, such as AOL's Instant Messenger. If you want to have access to the many individuals who use the AOL product, you can only do so using the AOL product. AOL has fought hard to limit interoperability that would allow users of other instant messaging programs access to the large AOL Messaging subscriber base in order to keep the network effects for itself.

The interests of a majority of e-tailers interests will be the same general factors that control the brick-and-mortar market—price, return policy, whether the item is in stock, and the firm's reputation for reliability. The fact that business is taking place on the Internet does not introduce winner-takes-all characteristics into this market. There is no reason to think that the biggest toy e-tailer would have a more significant advantage over other Internet toy store than large brick-and-mortar toy stores have over their smaller competitors.

## Chapter 3: Racing to be first: Might the Tortoise Win?

*Firms were told to race to get a presence on the Internet. If these markets had first-mover-wins characteristics, it might have been a worthwhile investment to forgo short term profits for short-term market share increases, since this would later be converted into long term profit gains. Where did this idea come from that technology industries had the characteristic of first-mover-wins? What was the underpinning of this belief? Most importantly, was it correct? As this chapter demonstrates, these ideas were based on faulty analysis.*

The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influence, are usually the slaves of some defunct economist.

John Maynard Keynes

It is often asserted that being first is of paramount importance in the Internet age, far more important, say, than for brick-and-mortar industries. For example, the famed Morgan Stanley stock-market analyst closely associated with the Nasdaq and Internet stock run-ups, Mary Meeker, said in a 1997 report

“Our Internet team thinks first-mover advantage for Web retailers may be important. The retail group, by contrast, doesn’t think being first matters much, since barriers to entry will likely remain low on the Web.”<sup>9</sup>

In fact, stock-market analysts rarely create their own theories. Instead, as Keynes indicated, they take the ideas from some academic. The idea of first-mover-wins fits in neatly with a strain of economic thought that arose in the late 1980s. That is the subject of the next few sections.

### ***A. From Winner-take-all to First-Mover-Wins***

**Myth number 1.** If the market is going to become dominated by a small number of firms, perhaps as few as one, how does a firm get to be in that top dog? The typical answer has been: “Get established first. At any cost.”

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<sup>9</sup> “The Internet Retailing Report”, page 3.1. Morgan Stanley, May 28, 1997: Internet Mary Meeker, Retail Sharon Pearson. This thinking was repeated in a June 1999 slide show, page 63, *The Internet Company Handbook*, Morgan Stanley Dean Witter, with a bullet point “First Mover Advantage is Key -- whoever signs up the buyers and suppliers first will have good potential to keep them”

This is the truly pernicious bit of faux wisdom. This idea has helped firms madly throw themselves off a cliff like lemmings, and to do so thinking they were bound for glory.

Typical of this view is Jay Adelson, founder and chief technology officer of Equinix quoted in the March 1 2000 issue of the Wall Street Journal stating, "Our biggest competitor is time—being the first to market with this product."<sup>10</sup>

The generality of this claim is nicely illustrated in a column in eCompany, (each of the companies mentioned in the quote soon went belly-up):

"We have the first-mover advantage," Women.com CEO Marleen McDaniel told CNBC in June 1999. "They have the first-mover advantage," a Zona Research analyst told a reporter, explaining why eToys's stock was a steal. "Eve.com is an outstanding e-commerce opportunity with a first-mover advantage," Idealab founder Bill Gross bragged in a press release. As Draper Fisher Jurvetson partner Tim Draper told USA Today in October 1999, the first-mover is "usually the (company) that's going to win it."<sup>11</sup>

Or this from Shapiro and Varian, in other respects one of the most reasonable books of advice for the information economy (page 169):

First-Mover advantages can be powerful and long lasting in lock-in markets, especially those in information industries where scale economies are substantial. If you can establish an installed base before the competition arrives on the scene, you may make it difficult for later entrants to achieve the scale economies necessary to compete.

Of course, as proper academics, Shapiro and Varian are circumspect about overstating the advantages of being first. They do not say that being first ensures an advantage, only that it might. Still, for a business audience that finds sufficiently deep meaning in books such as 'Who Moved My Cheese' to keep it on top of the best seller list for years, these nuances are likely to be unnoticed. Furthermore, in the 'Lessons' section of Shapiro and Varian's chapter 6, which is where many busy readers are likely to gain their insights, we find the less circumspect: "Be prepared to invest to build an installed base through promotions and by offering up-front discounts. You can't succeed in

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<sup>10</sup> The Wall Street Journal, March 1, 2000, page B1 "Dot-Com Boom Gives Builder Bechtel a Lift" By Jim Carlton

<sup>11</sup> "Last Guys Finish First" David Freedman, eCompany Now: May 2001. <http://www.ecompany.com/articles/mag/0,1640,11229,FF.html>. But do not think that Freedman doesn't buy most of the lock-in story, because he basically does. He reports that second or third mover may be the important starting position. See footnote 19



competitive lock-in markets without making these investments.” Perhaps an overzealous editor put “can’t” where “might not” had originally been, so as to put a little more punch in the statement, but to a typical business reader it would certainly appear that one *needs* to initially lose money to build an installed base.

More exuberant still is Kevin Kelly in his book *New Rules for a New Economy*. Not only should you discount your product to get market share, Kelly tells businessmen, but you *need* to actually give it away. He has ten cutely named rules (chapters) in his book, the fourth of which is “Follow the Free.” Here is a sampling:

As crackpot as it sounds, in the distant future nearly everything we make will (at least for a short while) be given away free—refrigerators, skis, laser projectors, clothes, you name it.<sup>12</sup>

Talk of generosity, of information that wants to be free, and of virtual communities is often dismissed by businesspeople as youthful new age idealism. It may be idealistic but it is also the only sane way to launch a commercial economy in the emerging space.<sup>13</sup>

At least he understood that giving nearly everything away sounded like a crackpot idea. The problem was that he didn’t seem to understand that what he was putting forward was a crackpot idea. Sometimes giving a product away may make sense. Free samples have been around forever. Talk of information wanting to be anything, free or otherwise, is nonsense. And the idea that refrigerators and clothing will be given away, as if the network effects could be large indicates a serious misunderstanding of the importance of network effects (even if chips were sewn in every pocket). Kelly’s advice is grossly overstated at best and has since been proven wrong when the result is to produce astronomical losses on the balance sheet with no chance of making enough profit down the road to provide a normal return

Last, but not least, we have Brian Arthur, the pied piper of lock-in. Arthur has received near-universal adoration from the media for his articulation of lock-in and his claims to having reinvented increasing returns (concepts I will discuss in the next section).<sup>14</sup> Arthur tells business

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<sup>12</sup> Keven Kelly, *New Rules for the New Economy*, Viking, NY, 1998. Page 58.

<sup>13</sup> Page 60.

<sup>14</sup> Arthur has been the subject of adoring stories in *Fortune* (“The Theory That Made Microsoft: It’s Called ‘Increasing Returns,’ And It’s One Of The Hottest And Most Important Ideas In Economics Today.” James Aley and Lenore Schiff, 04/29/96, Page 65), *The New Yorker* (“The Force of an Idea” Jan 12, 1998), *New York Times Magazine* (May 5, 1996, “Why the Best Doesn’t Always Win” Peter Passell), *Boston Globe* (“Sitting alone at his table by the bar ...”, David Warsh, 7/3/94 page 65 of the Business section), *Britain’s Observer* (March 8, 1998 Pg. 17 “Arthur’s big idea: The prophet of profit; In the hi-tech future, punters like Bill Gates are poised to win the whole casino.” Ed Vulliamy), a chapter in Mitchell Waldrop’s

strategists, in a 1998 Harvard Business Review article: “Two maxims are widely accepted in knowledge-based markets: it pays to hit the market first, and it pays to have superb technology.” Yet that same year he discards even the importance of having good technology in an interview with Booze-Allen & Hamilton:

If you are in a technically based industry, then it's not sufficient to think in terms of lowering your cost, improving your quality, keeping products moving out the door. That's the traditional challenge for what I call the bulk manufacturing economy. But in high tech, that's no longer sufficient. If these markets are unstable, they can lock in to something and become dominated.

In that case, business strategy has to go far beyond the usual adages about costs down, quality up, core competency. High tech adds a new layer of complication. You have to allow that you are playing games where the winner can walk off with a great deal of the market and the losers are left with practically nothing, even if their products are technically brilliant, and the cost is right. So basically the strategies are very much the strategies you would apply in presidential primaries. You want to build up market share, you want to build up user base. If you do, you can lock in that market.<sup>15</sup>

So there you have it. Technical brilliance, low prices and high quality are insufficiently important. So much for Emerson and building better mousetraps. Instead, the winner might have mundane products, so-so quality and high prices. But this second-rate firm wins because it got to the starting line first, at least as Arthur tells it.

Arthur has not been shy about claiming that that traditional economic concepts were not relevant to high technology markets.<sup>16</sup> Other economists, however, were less willing to throw out the old, even as they brought in the new.<sup>17</sup>

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book (*Complexity*, Touchstone Books, 1992). In addition, he has had interviews with *Wired Magazine*, *Booze-Allen Hamilton's magazine*, and a somewhat more difficult interview in *Pretext Magazine*.

<sup>15</sup> Interview with Brian Arthur by Joel Kurtzman, Booze-Allen & Hamilton, *Strategy + Business*; second quarter, 1998. <http://www.strategy-business.com/thoughtleaders/98209/>.

<sup>16</sup> There is an interesting debate about the novelty of the ideas that Arthur put forward and the putative intolerance of the economics profession to his ideas. See Paul Krugman “The Legend of Arthur: A tale of gullibility at The New Yorker,” *Slate Magazine*, January 14, 1998 [<http://slate.msn.com/Dismal/98-01-14/Dismal.asp>]. There were several interesting responses, including John Cassidy, the author of the flattering *New Yorker* piece about Arthur that stuck in Krugman's craw and Mitchell Waldrop, the author of a well-known popularization of chaos theory [*Complexity*, Touchstone Books, 1992] who devoted a chapter of that book to Arthur [<http://slate.msn.com/Features/Krugman/Krugman.asp>] ..

<sup>17</sup> Shapiro and Varian certainly do not claim that traditional economics does not hold. In fact, they claim quite the opposite, that traditional economics with a few tweaks, such as lock-in, works just fine in explaining these markets.

Although first-mover-wins ideas gained most of the attention, there also was also some skepticism expressed, even if it had trouble being heard over the heated roar of the “Be First” chorus. For example George Mannes stated in January of 1999:<sup>18</sup>

When you're building a business on the Internet, what's it worth to be first? Maybe not as much as you think.

That may be a problem for Internet investors, because many assume that the first company to set up shop, whether it's a bookstore, auction house or Net broadcaster, will benefit hugely. The notion of "first-mover advantage" is gaining currency quickly and, in turn, influencing companies' chances for success.

The idea of first-mover advantage seems to have become fashionable only recently. In a Dow Jones database search, the term appears 156 times in publications since the beginning of 1998, but only 28 times in the six years from 1988 through 1993. Much of its usage, before the rise of the Internet, was in overseas business publications and academic journals.

Now I do not wish to split hairs over the *first* mover versus say a *second* mover a week later.<sup>19</sup> It is really the idea that early movers have a *large* lead over later movers that deserves a good part of the blame for appearing to give credence to these misguided business plans of the ecommerce firms.

Where are the intellectual underpinnings for this notion of the benefits of early entry? The answer, I think, has to do with the concept of lock-in, a relatively new concept in the thinking of economists. Certainly it played an important role in the thinking of academics such as Arthur, David, and Shapiro and Varian. Technology writers, such as Kevin Kelly, then ran with the idea.

### ***B. The Concept of Lock-In***

I cannot say with certainty where the nonacademic preachers of first-mover-wins advice obtained their ideas. But most likely, they were slavishly following the writings of some popular academics, altering somewhat the famous quote on this subject by Keynes.

The idea that I suspect has captured the first-mover-wins advocates is that of “lock-in”. This is a claim made by some economic theorists that

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<sup>18</sup> The Street.com “First-Mover Advantage: What's It Really Worth?” George Mannes 1/26/99 7:00 AM ET. <http://www.thestreet.com/tech/internet/682198.html>.

<sup>19</sup> There is a literature attacking the ‘first mover’ doctrine, but wishing to replace it with the second mover or third mover doctrine. See, for example, “Last Guys Finish First” David Freedman, eCompany: May 2001. <http://www.ecompany.com/articles/mag/0,1640,11229,FF.html>

consumers in many technology markets will become locked-in to a single seller or product. In this view of markets, if the initial entrant gets the largest market share, lock-in will then work to keep the firm's customers entrenched in this position. This is supposed to be true even if later firms have a superior product.<sup>20</sup>

This is not the same as winner-take-all. Even in winner-take-all markets, it is possible that there will be swift leadership changes whenever a better challenger enters the market. The idea of lock-in, however, suggests otherwise.

Whenever consumers attempt to determine which brand or type of product to buy, they must go through (consciously or not) several internal calculations. First, a consumer would compare the price and quality of the products. This is all the consumer would need to examine if he didn't interact with any other users and had no history with this type of product

The fact is, of course, that users often do have histories with products and often do interact with others. It is because of this that consumers can in principle get locked-in to a product, seemingly unable to switch to something better. How that might work in theory is the subject of numerous economic papers. How it worked in the real world is the subject of a far smaller, and as we shall see, notably faulty, literature.

Lock-in costs can themselves be classified into two different types. First, there are the costs involved with just changing to another brand or version of a product, such as relearning old habits, i.e., becoming familiar with the new product, and also possibly being able to use the new product with old work-products, such as using a new word-processor to read your old documents. These are costs of being compatible with one's self. Second, there are costs involved in possibly losing compatibility with others. This might be exemplified by someone wishing to switch from VHS to Beta and finding a dearth of pre-recorded Beta movies available at the video store, or someone switching to Lotus WordPro and finding they have trouble exchanging documents with their colleagues who use Microsoft Word.

These two different factors, being compatible with one's self and being compatible with others, play an important role in understanding how lock-in works. And these two factors are essential in delineating the crucial

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<sup>20</sup> There are numerous inconsistent definitions of lock-in that can be found in the economics literature. Liebowitz and Margolis (1995) attempt to put some order to this chaos by defining three different types of path dependence or lock-in. Here I have simplified it down to two types where the information possessed by consumers about the future is complete. In the terminology of Liebowitz and Margolis, these two types reflect first degree (weak) and third degree (strong) path dependence.

distinction between *weak* and *strong* forms of lock-in. The strong form of lock-in supports the concept of first-mover-wins. The weak form does not.

### **C. Weak and Strong Forms of Lock-In**

It is possible to imagine a situation where a newcomer firm produces a better product than an incumbent. A better product is defined as a product that the consumer would choose if they were starting from scratch and there was no concern with compatibility, either with oneself, or with others.

#### **i. Strong Lock-In**

A *strong* form of lock-in exists when this better product is not adopted even though the superiority of the product can overcome any self-compatibility issues for consumers. In such a case, the switch would occur if consumers didn't care about compatibility with others. Note, also, that if the new technology is not sufficiently better to make it worthwhile for consumers to switch because of learning costs and/or inability to use old work-product, then it would be inefficient for the new technology to take over. These costs are real costs.

Most importantly, if strong lock-in exists, it would be wise to try to get that large market share even if the costs are very high. That is because challengers, even those with superior products, may not be able to overcome your lead.

But potential incompatibility with other users can prevent a superior challenger from vanquishing an incumbent, at least in principle. With this strong form of lock-in, even though all consumers would like to switch if everyone else would, a coordination failure among users prevents consumers from actually switching. In other words, we all would like to switch, say, from VHS to Beta, but because we fear that others will not switch and thus too few movies will be available on Beta, we all stick with VHS. We would all be better off making the change, but we do not.

That is the story, and it has beguiled many an economist. It is not just a story of incompatibility with others, however. At its core, this strong lock-in story contains an assumption that each user believes that others will continue to use the inferior product even though everyone knows that the challenger product is superior.

At the time the challenger enters the market, the two types of compatibility would appear to completely favor the incumbent. Compatibility with one's old behavior imposes costs on a change. And the incumbent has a larger market share, by definition. However, economists understand that

when consumers go through a calculation about the value of switching, they try to project what the future will look like. It is the *expectations* of the size of network effects that actually matters. If consumers believe the challenger will do well in the market, then the market shares at the time of purchase will not be relevant—instead the expected market shares of the two competing products over the ownership period of the product are key.

So in fact, the importance of compatibility with others does not necessarily favor the incumbent. Challengers, who are able to demonstrate the superiority of their product, and gain momentum in the eyes of consumers, may very well prevail, as would be required if the market were working efficiently.<sup>21</sup> Therefore, it is uncertain, in theory, whether strong forms of lock-in are likely to occur.

Examples of strong lock-in have been put forward, such as the typewriter keyboard or video recorder format, but as I discuss below, these examples have been shown to be flat out wrong.

It might appear that winner-take-all brought about entirely by economies of scale might also be capable of strong form lock-in of an incumbent. After all, a new challenger, even with a better product, will have serious cost disadvantages relative to the much larger incumbent. However, the challenger has a straightforward task: investing sufficient resources to achieve a large enough scale so as to reach a low cost will allow him to prevail. The task facing a firm trying to overcome network effects appears less simple, somewhat less clear, but is not necessarily more difficult to achieve.

## **ii. Weak Lock-In**

Alternatively, it is possible that a firm might produce a product that is superior to the incumbent, but is not sufficiently superior to cover the self-compatibility costs of switching to a new and different product. An example might be if a competitor to Zip drives were to produce at an identical cost an incompatible system with a capacity of 260 megs as opposed to the 250 meg capacity of the Zip drives. Current Zip consumers are not likely to switch to the new system since the very small advantage of the new system is unlikely to make it economical to throw out the old Zip drives and disks for the new alternative.

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<sup>21</sup> There is a debate about these topics in the economics literature. The major participants are Paul David, Brian Arthur, Michael Katz, Carl Shapiro, Stan Liebowitz, Steve Margolis, and many others. A more accessible version of one aspect of these debates, with proxies often standing in for the main players, can be found at the economic history discussion groups: <http://eh.net/FORUMS/PathDepe.html> and <http://eh.net/FORUMS/QWERTYSu2.html>.

These consumers of Zip drives can be thought of as *weakly locked-in* to the Zip system.<sup>22</sup> In this latter case it is inefficient for current consumers to switch to the new product and although the term lock-in can and has been used to describe this situation, it is quite distinct from the strong form of lock-in. If the incumbent already dominates a mature market, then the incumbent will remain the dominant technology and it is efficient to remain that way.

There are many, many instances of weak lock-in. From your unwillingness to purchase a new computer three weeks after buying one, your willingness to continue driving your no longer brand-new car, living in a house after the kids have grown up and the numerous other decisions we make which might be optimal when made but are not optimal at every moment of a durable good's life. All of these, and millions others, are examples of weak lock-in. These forms of lock-in are insufficiently strong, most of the time, to warrant a rule for manufacturers to get market share at all cost.

### **iii. Differential Impacts on First-Mover-Wins.**

Proponents of the strong form of lock-in essentially assume that consumers act as if the market share at the initial period of time will remain unchanged even in the fact of a superior challenger. Critics of strong lock-in, on the other hand, believe that the expected market shares will depend heavily on self-compatibility. In other words, if the new product is better than the old product, enough so that it pays individuals to switch (ignoring network effects), then the expectations of consumers will be such that the new product will come to dominate the market.

If the strong form of lock-in were to hold, the object lesson for firms would be to get to market first and largely ignore relative quality since even a significantly better product would not allow the challenger to dislodge the incumbent. The weak form of lock-in, on the other hand, gives little support for this tactic. The weak form of lock-in implies that the key to winning is to produce a product that is sufficiently better that it overcomes the switching costs. Unless self-compatibility costs are very large, which is to some extent under the control of the challenger's product design, a better product will likely be able to overcome weak forms of lock-in.

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<sup>22</sup> I am ignoring here the possibility that consumers might want to be compatible with one another. Since this new technology wouldn't replace the old technology (assuming that the incumbent already controlled a majority of potential consumers) even if there isn't any form of coordination problem, there is no need to examine coordination problems, even though coordination failures lie at the heart of the strong form of lock-in.

### ***D. Does Real-World Evidence Support First Mover Wins?***

Weak lock-in is hardly sufficient to claim that rushing to market is the dominant strategy. Weak form lock-in has been around forever. I am used to going to a particular gas station. It is a habit. It is a weak form of lock-in. Does that mean that competing gas stations have to charge prices one half to two thirds lower to get my business, a number that has been put forward several times as the differential required to break out of lock-in?<sup>23</sup> Obviously not. Although the precise number will differ by driver, I would bet that a large majority of drivers would pick the gas station charging \$1.00 a gallon compared to their old gas station charging \$1.25 a gallon.

My research with Stephen Margolis (that formed the subject of my book with him), however, found none, nada, nothing in the way of support for claims of strong lock-in and therefore little support for first-mover-wins hypothesis. That explains why Altair, VisiCalc, and Ampex—the first firms to produce PCs, spreadsheets, and VCRs respectively—are not the leaders today. Neither are any of the other early leaders in these markets still entrenched.

The two most popular examples of truly pernicious lock-in, the type that would scream to get that product out the door and spare no expense, are the typewriter keyboard, and the VCR.<sup>24</sup> These examples are popular in the press and particularly among academic authors.<sup>25</sup> They are popular because they provide verisimilitude to what otherwise might appear to be purely theoretical abstractions about the world. The problem is that these stories are counterfeits.

The keyboard story is elsewhere described at great length.<sup>26</sup> The basic story, as repeated in Shapiro and Varian, starts with the claim that to

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<sup>23</sup> Brian Arthur has claimed that a new product has to be 200-300% better to break the grip of lock-in. This number seems to be taken entirely out of thin air, and it really is based on the strong form of lock-in although he makes no distinction between strong and weak forms of lock-in. See, for example, his article in the July-August 1996 Harvard Business Review where he states: “A new product often needs to be twice or three times better in some dimension—price, speed, convenience—to dislodge a locked-in rival.” This can be found at: [http://www.santafe.edu/arthur/Papers/Pdf\\_files/HBR.doc](http://www.santafe.edu/arthur/Papers/Pdf_files/HBR.doc)

<sup>24</sup> Technically, these are formats and not products. The Qwerty keyboard patent quickly expired and many, in fact virtually all rival keyboard manufacturers adopted it. Therefore, the most successful typewriter company didn’t have to be the one that brought the Qwerty design to market. The VHS standard, on the other hand, still was owned when the format became dominant and the market large and mature.

<sup>25</sup> For example, Shapiro and Varian present the Qwerty example on page 185 and 186. After presenting the strong lock-in story as if it were true, they announce in the last sentence or two that something appears wrong with the story because computer keyboards are so easily reprogrammed that strong form lock-in would seem impossible. Yet on page 233 they are back to stating that Qwerty is an inferior design.

<sup>26</sup> See Liebowitz and Margolis, “The Fable of the Keys,” Journal of Law and Economics, April 1990. Also available at: <http://wwwpub.utdallas.edu/~liebowit/keys1.html>



prevent jamming of the mechanical keys, the typewriter mechanics who worked on the original Qwerty machine in the late 1800s came up with a design to slow typing down. Interestingly, there appears to be not a shred of evidence to support this claim. Rather, it is more commonly reported that to prevent jamming, the keyboard designers came up with a way to shift typing successive letters from left to the right hand through experimentation. It also turns out that shifting successive letters between alternate hands also leads to faster typing speeds.

In the 1930s a professor of ergonomics at the University of Washington, August Dvorak, patented his own keyboard which was painstakingly created from a systematic examination of which pairs of letter were most commonly used in English writing, and then applying this knowledge to position the keys to minimize the distance the fingers traveled. Dvorak's own research claimed that this keyboard design worked much better than the Qwerty design.

A study conducted by a component of the US Navy during World War II purported demonstrated that Professor Dvorak's design was indeed 40% faster than the Qwerty design. If one examines the Navy Study, as was not done by academic practitioners of lock-in theory, one discovers several important irregularities in its conduct that biased the results in favor of the Dvorak keyboard and that make it unacceptable as a 'scientific' study.<sup>27</sup>

A more important problem with this strain of the academic lock-in literature is that it failed to discuss the most important study comparing the two keyboards. Professor Earl Strong, from Penn State conducted a study in the 1950s for the General Services Administration, and the results received a great deal of publicity, including several articles in leading newspapers such as the NY Times. Strong found that Dvorak was not superior to Qwerty. He also reported that the studies conducted by the Navy during World War II were conducted by the Navy's chief expert in such things, Lieutenant Commander August Dvorak.

It is also the case that modern ergonomic studies of the keyboard, and other experiments examining the costs of retraining typists to use the Dvorak keyboard are consistent with Strong's results and inconsistent with those reported by the Navy Study.

These little pieces of information, which have been available to economists since 1990, are almost never reported when lock-in advocates tell their version of the keyboard story. Instead, if they present any evidence

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<sup>27</sup> This is discussed in Liebowitz and Margolis, 1990, especially the text material in and around footnote 25.

contrary to the lock-in story, they usually just cite my 1990 paper with Margolis and mention that there is some disagreement in the academic literature. The intent seems clearly to leave the reader with the impression that the keyboard lock-in story is correct.

The VHS/Beta story, as an example of lock-in, or first mover wins, is even more flawed.<sup>28</sup> First, it is important to note that the Beta format was first on the scene and had a head start of about a year and a half. It might be natural to ask where its first mover advantage was since it was soon routed from this market. The proponents of lock-in report, with some justification, that the video recorder market wasn't yet very mature, and that the number of units sold was too small to give much of an advantage to Beta. But even more important, and perhaps the reason the videorecorder market didn't mature more rapidly under Sony's initial tutelage, was the fact that the initial Betamax could only record for one hour, eliminating the possibility of watching movies.

VHS had a larger cassette, but otherwise virtually the same technology as Betamax. The companies behind the two formats (Sony and Matsushita) had a patent sharing agreement as they had previously jointly produced a previous generation of video recorder. When Sony engineers saw the VHS machine they thought it was a clone of the Betamax, so similar was it in terms of technology. VHS's much bigger tape allowed a longer playing time for a given quality of picture. It was the inferior playing time that led to the demise of the Betamax. Not the fact that it was first, or second, or third.<sup>29</sup>

Now you might expect that this strong form of lock-in, given its impact on current thinking (not just business strategy but antitrust prosecutions such as the Microsoft case) must depend on more than just these two quite feeble stories. And it does, but not much more. It survives mostly due to the economic theory that demonstrates that it could happen, on a few other slightly more far-fetched examples, and on the hopes and wishes of those who put forward the theory in the first place.

So the claim has been made, by Brian Arthur and others, that that the internal combustion engine was possibly a mistake that locked-out superior

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<sup>28</sup> See Liebowitz and Margolis, 1995? For a view that states that this battle was won because of coalitions, see Cusomano and XX. The problem with their story is that the number of firms likely to join a coalition is itself a function of the perceived likelihood of success of a product in the market. So that the causation may well go the opposite way from the story in Cusomano and xx. Second, in order for the number of producers to matter, it is either their additional brand names or their additional capacity that must help. But surely Sony had sufficient brand name (and Zenith, the number two television producer put its name on the Betamax, as well as Sanyo and xx) to succeed if it had the better product. have to be a shortage of capacity

<sup>29</sup> In fact, there were many previous videorecorder formats, all failures.

alternatives such as steam or electric.<sup>30</sup> If this seems pretty far-fetched, that is because it is. But not too far fetched to avoid serious academic scrutiny, particularly by those hoping to find a strong form of lock-in.<sup>31</sup> But even with every incentive to conclude that the internal combustion engine was a terrible mistake, the research could not come to that conclusion.

Perhaps AM stereo should have replaced FM. Perhaps DC should have replaced AC as the standard for electrical generation. Perhaps quadraphonic sound of the 1980s should have replaced stereo. Perhaps the Macintosh operating system should have replaced DOS (it did, but it happened to be called Windows). Perhaps railroads used the wrong gauge tracks (distance between the track pairs) for the trains to run on.<sup>32</sup> These are all examples of possible instances of strong form lock-in. These examples have also failed to make the case.

There are as yet no real examples of strong lock-in. Someday, one or two might be found. But those will tend to be the exceptions that prove the rule.

Instead, what we find, over and over again are cases where the product that wins also happens to be as good or better than the others. My research with Margolis has shown that even in winner-take-all markets such as software, where you find both network effects and economies of scale, good products push out lesser ones, relegating the first winner to 'former-winner' status, even where the lesser products had dominant market positions. VisiCalc was supplanted by 1-2-3, only to be replaced by Excel. Managing Your Money was supplanted by Quicken, and so forth.<sup>33</sup>

Arthur and David have tried to turn the debate around by claiming that it is not they who should have to find strong forms of lock-in, but that critics of strong form lock-in should have to prove that every market has the most efficient product. Arthur has said in several interviews that we (Liebowitz and Margolis) have not proven that Qwerty is the best possible keyboard.<sup>34</sup> Indeed, we have never made any such claim. It is hard to provide better evidence of the difficulty of demonstrating strong form lock-in than the claim

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<sup>30</sup> See W. Brian Arthur "Positive Feedbacks in the Economy" Scientific American, 262, 92-99, Feb. 1990.

<sup>31</sup> See ("The Electric Car and the Burden of History: Automotive Systems Rivalry in America" Stanford, Department of History, 1996" authored by David Kirsch. I should note that Stanford is the home of Paul David, of Qwerty fame (who was on the dissertation committee) and Brian Arthur.

<sup>32</sup> On this there is a dissertation by Van Vleck ?? that demonstrates that railroad gauges were not a major mistake.

<sup>33</sup> See our book, 1999.

<sup>34</sup> Here is the quote from the interview Arthur had with Pretext Magazine: "As for the QWERTY keyboard, if Margolis and Liebowitz can prove it's the best, my hat is off to them." The interview can be found at: <http://www.pretext.com/may98/columns/intview.htm>

by its proponents who after fifteen years of trying to find examples now claim that it is not their scientific responsibility to actually find any examples.

### ***E. The Internet and first-mover-wins.***

\*\*somewhere I need to talk about lock-in impacts of network effects and economies of scale. Both imply a winner-take-all result. Both could be thought to imply lock-in since the largest firm has a cost advantage over all rivals. However, with economies of scale, challenger can coordinate consumers through the simple tactic of charging a lower price. Since challengers product is better, consumers will switch and problem goes away. The coordination problem with network effects seems more complicated since decision is not a one time deal. If you wind up with the wrong product its value is lower. Of course, in the former case you wind up with a product from a firm that went out of business if its discount pricing strategy didn't work, so that would seem like a risk too.\*\*

For the most part, online retailing will not have the characteristics of winner-take-all or first-mover-wins. Most online retailers will not exhibit characteristics of network effects or instant scalability. Economies of scale, on the other hand, could be important, but there is little reason to think that brick-and-mortar firms in the same industry would not possess equivalent economies of scale.

Take the case of Amazon, the firm most famous for its strategy of forgoing current profits in order to establish its brand name and produce a large market share, a firm willing to lose fifty cents for each dollar of sales in the name of market share growth. Is this a smart move? Does online bookselling exhibit the economic characteristics that will lead to winner-take-all or first-mover-wins?

As already mentioned, the creation of the web site is a fixed cost perhaps imposing some economy of scale effects since the average website cost falls as output increases. But other costs are likely to swamp the cost of creating the web site. Therefore, the fixed cost component will be too small to dominate Amazon's overall average costs.

Network effects for Amazon are also very limited—things like product reviews by users, purchase circle information, and little else. Product reviews have network effect characteristics because they make the retailing activity more valuable to users and the number of product reviews depends on the number of other users. But product reviews, although likely to be of modest value to most users, are not likely to be sufficient to turn a market into winner-take-all. Barnes and Nobel, whose web site has far fewer reviews, never seemed to understand the potential importance of these network effects

since it could have prodded consumers to provide more reviews by offering, say, discount coupons to consumers who wrote reviews, or contracting with an organization like *Book Review Digest* to generate its own set of reviews. could counteract these effects without needing as large a base of users.

Amazon's winner-take-all characteristics, therefore, will be largely limited to those enjoyed by brick-and-mortar booksellers. If brick-and-mortar bookselling is not winner-take-all (and for all the bookstore agglomeration in recent years, Barnes and Noble and Borders each hold only about 10% of the book retailing market), then online bookselling is also unlikely to be winner-take-all. Amazon's generation of enormous losses may have been largely without purpose, except to create brand name and provide a quality experience for consumers, a worthwhile goal but hardly ones that shouldn't require enormous losses to achieve.

What is probably the leading strategy allowing firms to resist competition (other than petitioning the government to restrict entry) is for a firm to produce better products, since that is a hard strategy for other firms to imitate. This conclusion is more than just anecdotal. I conducted a study for McKinsey in 1999 will come in handy here.

In that study I examined the financial performance of firms in twenty industries for which product quality ratings existed. There was a very strong relation between producing the best quality product, earning above normal profit, and generating high stock market returns. Since PC manufacturers, software producers, and web site portals were all included in the study, it will provide some specific cases to support this claim that being better is most important, even in high tech markets. For example, in personal computer production, being first didn't count for much. Dell didn't achieve its success by being first, but by having better performing products needing fewer repairs. Packard Bell gained a large market share with low prices, but was plagued with poor quality and service, and essentially went bankrupt. Similarly, Yahoo not only was first, but also was a higher quality portal than its competitors, and that is why it is one of the few profitable web portals.

## ***F. Business Lessons***

This offers two simple principles for managers, investors and entrepreneurs. First, foremost, and probably most obvious, not all Internet markets are winner-takes-all. For many industries, the Internet will offer an enhancement to business, but it will not bring about a fundamental restructuring. Second, even markets that are or become winner-takes-all, will be better characterized as winner-takes-all-for-a-while. A firm with a dominant market position can expect to maintain that position only so long as consumers regard its products as the best.