HOW CATALYSTS IGNITE:
THE ECONOMICS OF PLATFORM-BASED START-UPS

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ABSTRACT

Entrepreneurs who start multi-sided platforms must secure enough customers on both sides, and in the right proportions, to provide enough value to either group of customers and to achieve sustainable growth. In particular, these entrepreneurs must secure "critical mass" to ignite the growth of their platforms; the failure to achieve "critical mass" quickly results in the implosion of the platform. There are a number of strategies available to entrepreneurs to reach critical mass. For example, the "zig-zag" strategy involves successive accretions of customers on both sides to build up the value to both. The relevant strategies depend in large part on whether the nature of the platform requires securing participation by both platform sides at launch (e.g. dating venues), whether it is possible to acquire one side before approaching the other side (e.g. search engines), and whether it is necessary to make pre-commitments to one side to induce them to make investments (e.g. video games).

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I. INTRODUCTION

Starting a business and getting it to the point where it is economically viable is the most difficult problem for all entrepreneurs. Most new businesses fail. In the United States, 61 percent of new businesses that were started in second quarter of 1998 had ceased business within five years.[1] Venture capital firms that invested in new firms do not get any of their money back in 43.7 percent of the first-round investments they make and get less than their initial investment back in 66.7 percent of the first-round investments.[2]

The start-up problem is particularly difficult for firms that are based on multi-sided platforms. In addition to the usual problems faced by new firms they often must contend with the well-known chicken-and-egg problem. Their firm can deliver value to one side of the platform only if there are participants on the other side of the platform. They have to figure out how to get both sides on board their platform. That problem, which is the subject of this chapter, is very different from that faced by a one-sided startup whose main challenge is getting just one set of customers to buy its product or service.[3]

The chicken-and-egg problem is central to the study of multi-sided platforms. Yet most of the theoretical and empirical research on two-sided businesses has focused on mature platforms and examined their pricing structures and other properties. Little attention has been given to critical issues that entrepreneurs must solve to create a viable platform business.[4] These include strategies for getting both

[1] Amy Knaup and Merissa C. Piazza, "Business employment dynamics data: survival and Longevity, II," *Monthly Labor Review Online 130, no.9 (September 2007), http://www.bls.gov/opub/mlr/2007/09/art1full.pdf.*
[2] Andrew Metrik, *Venture Capital and the Finance of Innovation* (New York: Wiley, 2006), Exhibit 7-4.
[3] These comments also pertain to communication platforms in which it is important to distinguish between senders and receivers—even though they are the same people—for both economic analysis and business strategy.
[4] There are several notable exceptions to this statement. The role of critical mass in launching exchanges is analyzed in a dynamic model in Gabor Fath and Miklos Sarvaryi, "Adoption Dynamics in Buyer-Side Exchanges," *Quantitative Marketing and Economics*, Vol. 1, No. 3 (September), pp. 305-335. Also see Bernard Caillaud, and Bruno Jullien, (2003), "Chicken & Egg: Competition Among Intermediation Service Providers," *Rand Journal of Economics*, Vol. 34, No. 2 (Summer), pp. 309-328 which considers platform launch but in a

sides on board, the role of critical mass in establishing the foundations for success, and the particularly thorny issues that arise when both sides must arrive simultaneously.

This introduction provides an overview of multi-sided platforms and the start-up problem. Section II then presents some building blocks for solving this problem. A few of these building blocks are similar to those for one-sided businesses while others are unique to multi-sided ones. Section III describes several complementary strategies for solving the chicken-and egg problem. We then turn to two case studies. Section IV examines a modern classic in a failed strategy for starting up multi-sided platforms: the en masse demise of the B2B exchanges whose assured success was extolled by many academics and practitioners.[5] Section V considers how social networking sites have started up and considers a successful and unsuccessful one. Section VI presents some concluding remarks.

A. The Catalyst Framework

We use the framework developed by Evans and Schmalensee.[6] A business is an "economic catalyst" if it creates value by bringing two or more groups of customers together and getting them to interact. Catalysts create value by reducing transactions costs faced by multiple distinct economic agents that would benefit from coming together. Catalysts reduce search efforts, facilitate matching, and make it easier for the two groups of economic agents to exchange value between each other. In the traditional literature, a catalyst is referred to as a "two-sided market" or as a

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single-period setting. The role of commitment is analyzed in a two-period game in Andrei Hagiu, "Pricing and Commitment by Two-Sided Platforms", *The RAND Journal of Economics* 37, no. 3 (fall 2006). A managerial treatment of the issues is presented in Annabelle Gawer and Michael Cusumano : How Companies Become Platform Leaders (Sloan Management Review, Winter 2008, Vol. 49, No. 2, pp.28-35.

[5] *See* David Lucking-Reiley and Daniel F. Spulber, "Business-to-Business Electronic Commerce*," Journal of Economic Perspectives 15, no.1 (2001):55-68*; Nicholas Carr, *The Digital Enterprise: How to Reshape Your Business for a Connected World*, (Massachusetts: Harvard Business Press, 2001); and Arthur Sculley and William Wood, *B2B Exchanges: The Killer Application in the Business-to-Business Internet Revolution*, (ISI Publications, 1999).

[6] *See* David S. Evans & Richard Schmalensee, *Catalyst Code: The Strategies Behind the World's Most Dynamic Companies* (Massachusetts: Harvard Business School Press, 2007).

"multi-sided platform."[7] In this chapter we use catalyst and multi-sided platform interchangeably.

The economic value created by the catalytic reaction is essential for understanding the feasible set of business strategies that a multi-sided platform can use. That value must be significant enough to warrant the cost and risk of investment in developing the platform. The value also provides the "pie" that can be split among the distinct groups of economic agents to provide incentives for them to join and interact on the platform with a portion of the pie going to the platform for performing its role. Some of the pie can be used to subsidize certain groups of economic agents, or members of those groups, to join the platform.

Catalyst innovators are ones who discover that it is possible to create economic value by getting two or more groups of economic agents together on a shared platform or develop a more efficient platform for starting and accelerating a catalytic reaction.

B. Securing Ignition

In chemical catalysis it is necessary to get the catalytic agent and the chemical agents in the right proportions to ignite and accelerate a reaction. The same is true for economic catalysis. Both economic agents have to be present on the platform in the right parts and levels to create any value at all and to accelerate value creation.

This conundrum is often referred to as the chicken-and-egg problem in the academic and popular literature on platforms. That analogy does not work for many platforms. The problem that platforms face is sometimes sequential as the riddle suggests—does the platform need to get economic agents ***A*** on board the platform before economic agents ***B***; or ***B*** before ***A***? Other times, though, it is simultaneous—how does the platform secure the participation of economic agents ***A*** and ***B*** so that both will be present on the platform when members from each group show up. That

[7] I prefer not to use the "two-sided market" term because the term really refers to a platform business that provide a matchmaking service in competition with other platform businesses in a market for that service.

typically involves solving a very difficult coordination problem between the platform and these two groups of economic agents.

The problem, however, is not just getting members of the two groups of economic agents to show up at the same time to create value. There have to be enough members of group ***A*** to make it valuable to members of group ***B*** to incur the costs of participating in the platform and to return it in subsequent periods; and vice versa. Strength in numbers arises primarily because economic agents in one group are searching for appropriate value-creating matches among members of the other group. There have to be enough members to make it likely that economic agents will find valuable matches.

In the literature on market microstructure, for example, for financial exchanges a "liquid" market is one that has enough buy and sell-orders to facilitate transactions.[8] Markets that are too "thin", or too illiquid, collapse. There is a critical mass of buy and sell orders that allows markets to sustain themselves. We will see below that the B2Bs failed because they did not achieve a critical mass of buyers and seller; in particular they did not create enough value to suppliers to entice them to participate in the exchanges.

C. Catalytic Ignition and Critical Mass

Figure 1 shows the basic concept of critical mass and catalytic ignition.[9] There is a range of minimal numbers of customers in each group that, if achieved, provides a "thick enough market" or a sufficiently "liquid" market to permit sustainable growth. When the mass of economic agents on either side is insufficient a

[8]In financial exchanges liquidity providers (such as market makers) provide buy and sell orders. They attract liquidity takers (such as investors who buy and sell through broker-dealers). In other exchange markets there is no institution that plays the role of liquidity providers. However, in these other exchange markets it is essential that the platform attract enough buyers and sellers to make the market liquid. *See* Larry Harris, *Trading and Exchanges: Market Microstructure for Practitioners* (Oxford University Press, 2002).

[9] For the technical development of this framework see David S. Evans and Richard Schmalensee, "Failure to Launch: Critical Mass in Platform Businesses,". We show that in certain plausible cases there is a critical level of liquidity that platforms need to get to in order to evolve towards a stable equilibrium with largest platform size. This framework does not cover the process of getting to critical mass. This chapter uses the framework to motivate an informal analysis of how catalysts can achieve critical liquidity.

catalyst fizzles rather than ignites. Once a catalyst achieves critical mass on C'-C", for example, it can grow to its profit-maximizing potential of D*; if it does not achieve critical mass on the segment C'-C'' it contracts and fails.

The growth paths to critical mass depend on many factors including pricing. But the point here is that achieving critical mass is essential. Google Video, for example, failed to achieve critical mass because it did not generate enough content to attract viewers and did not attract enough viewers to attract paid or user-generated content.[10]

The optimal growth path to critical mass and to long-run equilibrium is well away from the horizontal and vertical axes in most plausible cases.[11] Relatively balanced growth is necessary. This is reflected in Figure 1 in that the equilibrium growth path to critical mass must occur within the triangle 0-C'-C". Having too many of one side and too few of another side will lead to quick failure.

The challenge that catalyst entrepreneurs face is how to achieve the critical mass that is necessary for ignition. That means getting to critical mass over some reasonable space of time. One can think of this phase as the ignition phase of the product launch process, in which customers are trying the platform and assessing its value; these early adopters will stop coming back, and stop recommending it to their friends, if the platform does not grow quickly enough. The entrepreneur must increase the number of customers on each side to a point where there are enough to reach critical mass. That involves horizontal and vertical movements within the cone-shaped area in Figure 1. A transaction platform, for example, needs to take actions that increase buyers and sellers.[12] The entrepreneur must also maintain the right proportions of customers on each side so that there are enough participants on each side to interest the participants on the other side. That involves diagonal movements

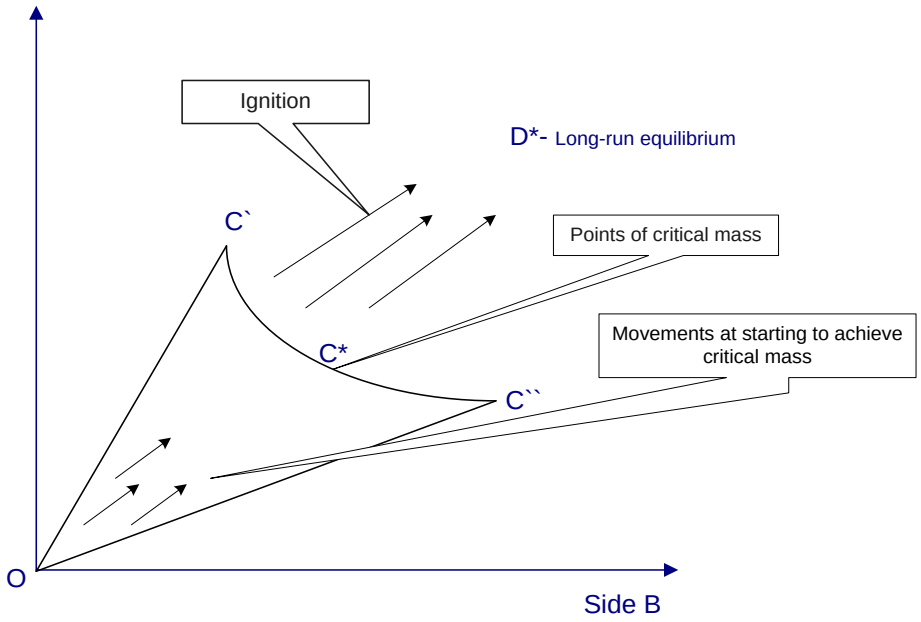
[10] See Steve Johnson, "Google Video isn't ready for Prime Time," *Chicago Tribune*, January 18 , 2006, and David Pogue, "Google Video: Trash Mixed with Treasure," *The New York Times*, January 19th , 2006, http://www.nytimes.com/2006/01/19/technology/circuits/19pogue.html

[11] See Evans and Schmalensee, "Failure to Launch," op. cit.

[12] For most financial exchanges the two sides are liquidity providers who announce prices at which they stand ready to buy or sell and liquidity takers who provide order flow that interacts with those standing orders. See Larry Harris, *Trading and Exchanges: Market Microstructure for Practitioners* (Oxford University Press, 2002). For non-financial exchanges such as e-commerce the two sides are simply buyers and sellers.

to the northeast in Figure 1. An exchange platforms needs to make sure there are enough buyers to interest sellers and vice versa.

Figure 1. Catalytic Ignition and Critical Mass



II. BASIC CONCEPTS

There is an extensive literature on launching new products.[13] Key tactics involve logistics; advertising, sales, and marketing; and pricing. Companies should make sure they have a production and distribution system for getting products and services to consumers. They need to provide sell consumers on the merits of trying a product through the dissemination of information as well as persuasion. Finally, they need to set prices recognizing both the competition and the fact that consumers may

[13] *See*, e.g., Susan Hart and Nikolaos Tzokas, "New Product Launch "Mix" in Growth and Mature Product Markets," *Benchmarking: An International Journal*, Vol. 7, No. 5, (2000): 389-406 and Biren Prasad, "Analysis of Pricing Strategies for New Product Introduction," *Pricing Strategies and Practice*, Vol. 5, No. 4, (1997): 132-141. For literature summary see, V. Krishnan and Karl T. Ulrich, "Product Development Decisions: A Review of the Literature," *Management Science* 47, no. 1, (Jan., 2001): 1-21.

need an incentive to try to a new and unproven product**.** These traditional strategies facilitate obtaining consumers on both sides of a two-sided platform, that is, in making horizontal and vertical movements.

This section focuses on several aspects of product launch and product design that are likely to be particularly applicable to the ignition problem faced by catalysts. Before we begin it is useful to clarify some issues concerning the relationships among different platform members which will affect the discussion below.

For some platforms, customer groups are very distinct. Companies such as Electronic Arts that develop and sell videogames for the Sony PlayStation platform are distinct from people who buy and use Sony PlayStations.

For other platforms, the customers appear so similar that the platform may not appear multi-sided at all. A telephone platform connects people who talk to each other. People are people. Closer inspection, though, often reveals that people fall into one of two distinct positions on the platform at any point in time, that they need people in the other positions to connect to, and that it is possible to manipulate the pricing structure to mediate the externalities between these two groups.[14] At any point in time members of a phone network are either calling someone or being called and carriers can adopt pricing structures to alter the incentives to make or take calls. The same is true for social networking sites that involve inviting and accepting friends and then involve participating in other interactions that entail initiating or receiving messages communications.[15]

The fact that customers on the different sides may be the same economic agents clearly facilitates platform ignition. While the catalyst entrepreneur might have to provide incentives for these economic agents to engage in different types of

[14] The fact that the pricing structure—the relative charges to the two groups matters—makes these a two-sided platform under the definition proposed by J.C. Rochet and J. Tirole, "Platform Competition in Two-Sided Markets," *J. European Economic Association* 1, no.4 (2003): 990-1029. See e.g, Jerry Hausman, and Julian Wright, "Two Sided Markets with Substitution: Mobile Termination Revisited," 2006, mimeo. Using data from Australia they explore the equilibrium prices of fixed-to-mobile calls by taking into account that fixed-line callers might be cell-phone users themselves, and thus be from either side of the market. They also point out that it is important to consider whether the mobile receiver pays for the call (as in US) or does not (as in most EU countries).

[15] The social networking literature distinguishes between senders and receivers and highlights the important role that gregarious members of a network (i.e. individuals who initiate many interactions) and prestigious members of a network (i.e. individuals who are the recipients of many messages) play. *See* Wasserman, S and Katherine Faust, *Social Network Analysis: Methods and Applications* (Cambridge University Press, 1994).

behavior it can focus on securing the participation of one well-identified group of agents.

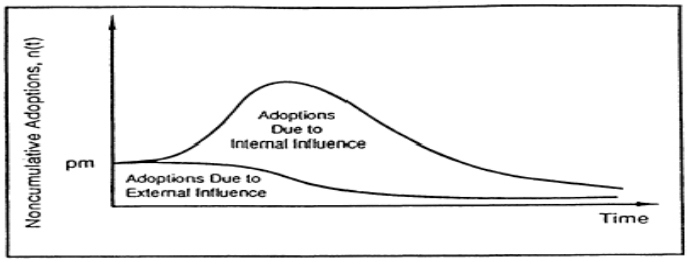
A. Product Diffusion

The original models of product diffusion[16] distinguished between two types of consumers: innovators who would try a product as a result of direct communication with them and imitators who would try a product as a result of communication with someone else who had tried the product. The innovator might learn about the product through advertisements in the mass media. The imitator might learn about the product either from the innovator or from other people who learned about it directly or indirectly from the imitator. The word-of-mouth aspect to this model gives rise to the well-known S-curve of product diffusion where there is a convex rise in adoption, an inflection point, and a concave rise that levels off at some saturation point. The population of economic agents is sometimes broken down into innovators, early adopters, early majority, late majority, and laggards. Figure 2 shows the standard framework.[17]

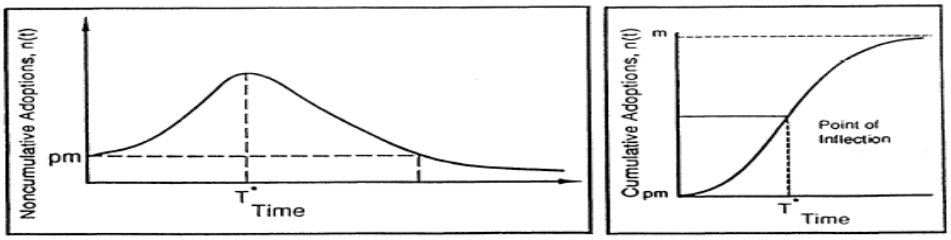
Figure 2: The Basic Model Of Product Diffusion.

[16] *See* Vijay Mahajan, Eitan Muller, and Frank M. Bass, "New Product Diffusion Models in Marketing: A Review and Directions for Research," *Journal of Marketing* 54, No. 1, (Jan., 1990): 1-26

[17] *See* Vijay Mahajan, Eitan Muller, and Frank M. Bass, "New Product Diffusion Models in Marketing: A Review and Directions for Research," *Journal of Marketing* 54, No. 1, (Jan., 1990): 1-26.



A. Adoptions Due to External and Internal Influences in the Bass Model.



Source: Mahajan, Muller, and Bass (1990)

The literature on social networks provides insights into the process of word-of-mouth communication.[18] The social graph describes the relationships among members of a network. It consists of nodes which reflect the agents and lines that show the connection between the agents. The connections can be uni-directional (x communicates with y) or bi-directional (x and y communicate with each other). The nature of the relationships among members of the network can provide insights into the organic workings of the network. There are three key ramifications for product diffusion. Word of mouth will spread more quickly: (1) the more connections innovators have; (2) the more connections friends of the innovators have; and (3) the denser the network is in the sense of there being fewer degrees of separation among members of the network.

Two types of agents facilitate the diffusion information within the network. "Influencers"—or gregarious members—account for a disproportionate share of communications. They send a lot of messages out to a broad range of connections. "Centers" have connections with many people who are not connected to other

[18] *See* Jacqueline Brown and Peter H. Reingen, "Social Ties and Word-of-Mouth Referral Behavior," The Journal of Consumer Research,Vol.14, No. 3, (Dec. 1987): 350-362, and Jo Brown, A. Broderick, and Nick Lee, "Word of Mouth Communication Within Online Communities: Conceptualizing the Online Social Network," *Journal of Interactive Marketing* 21, no. 3, (2007): 2-20.

agents.[19] They are important because they are the only way to reach isolated agents within the network.

Product diffusion may provide double duty for two-sided businesses in which economic agents have shifting roles in the platform. Individuals who upload photos on the photo-sharing network Flickr may view photos from their friends. People who use eBay's auto exchange may use it for both buying and selling, though some users may specialize in selling, and some may never sell.

B. Direct network effects

Consumers may value a product more if similar consumers use that product as well. This is known as a positive direct network effect.[20] It can arise because it is easier to connect to people using the product or because there are knowledge spillovers among them. Consumers may also value a product less if similar consumers use that product. This is known as a negative direct network effect. That might happen because of congestion or because people want to be different. For simplicity, we will assume that direct network effects are positive unless noted otherwise.

Direct network effects act as an accelerant to a catalytic reaction. Diffusion happens more quickly. The value of the network is higher to each additional member who is contacted. All else equal direct network effects increase the likelihood that each subsequent agent that is contacted by an earlier adopter will adopt the product also. Figure 3 shows how direct network effects modify the S-curve of diffusion.

Social networking theory provides some guidance on how to use direct network effects strategically. I would conjecture that economic agents that are more densely connected in a network have stronger direct network effects among them. Thus using influencers to connect to more densely connected portions of networks will tend to have higher payoffs.

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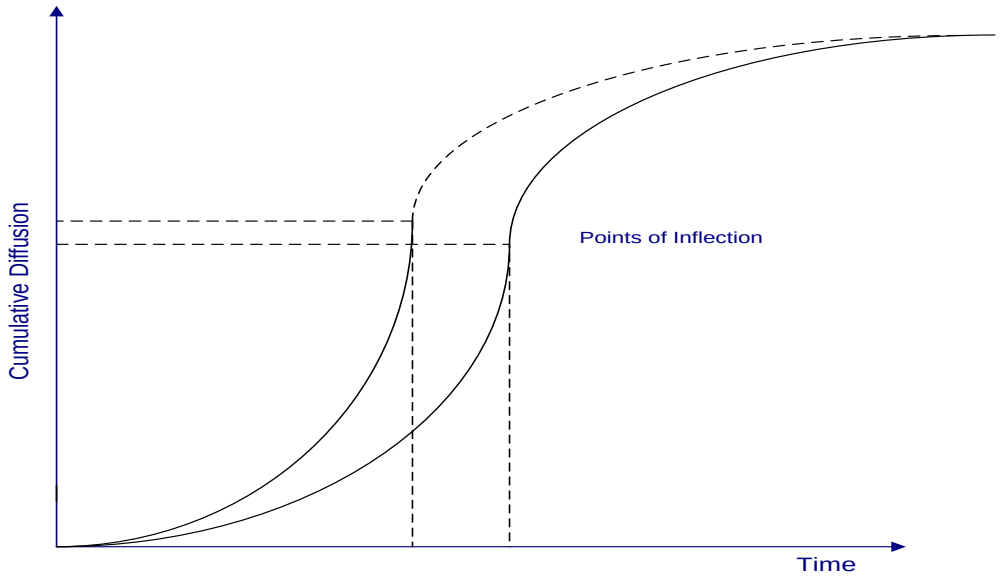
[19] The centers are the nodes for "stars" in which the center is connected to other nodes and the points of the star are connecter to the center node.

[20] *See* Carl Shapiro and Hal. Varian, *Information Rules, A Strategic Guide to Network Economics*, (Harvard Business School Press, 1998).

Figure 3. Network Effects and Diffusion



C. Indirect network effects

One type of economic agent may value a product more if more of another group of economic agents uses that product as well. This is known as a positive indirect network effect.[21] It can arise because one type of economic agents (e.g. a buyer, a man, cardholder) wants to search for and transact with another type of economic agent (e.g., a seller, a woman, a merchant) and vice versa. It can also arise because one type of economic agent (e.g. a computer user, a video game user) wants to be able to find complementary products for the platform they use (e.g., applications, video games) and the maker of those products want to be focus its efforts on platforms that have users who will demand its products. There are also negative indirect network effects: one type of economic agent on the network harms another type of agent. The leading case of this for platform businesses is advertising-supported media. Consumers may dislike the advertisements. The platform solves the externality problem between advertisers and consumers by using content to bribe people into viewing ads.

[21] *See* Shapiro and Varian, *id.*

Indirect network effects are the key aspect of multi-sided platforms. They are the source of the catalytic reaction—and much of the value—created by the platform. A key practical aspect of these indirect network effects is that they require that the platform "balance" the two sides to maximize the value of the platform to either side. The platform has zero value to either side if the other side is not on board. For many platforms the optimal balance is likely well into the interior and away from the axes as was shown in Figure 1.[22]

D. The Role of Customer Heterogeneity

The analysis above has already pointed to the fact that not all customers are created equal for multi-sided platforms. It is useful to pull these concepts together here and summarize their implications for platform ignition. There are three major kinds of heterogeneity.

First, some customers value a product or service more than other customers. All else equal those are the ones to go after initially to grow a business because they involve the lowest cost of sales and marketing. They can then kick off product diffusion. Two-sided platforms sometimes need to recruit these customers on both sides.

Second, some customers on one side are valued more by customers on the other side. The two-sided literature calls these "marquee" customers[23] while the social networking literature calls them "prestige" nodes—i.e. nodes that many people want to connect to and therefore receive many messages. All else equal marquee customers are the most important one to attract early on. They not only increase the value of the platform but also bring in more customers on the other side who help stimulate product diffusion on that side. Marquee customers may appear on one or both sides.

Third, some customers are more gregarious than others in the sense that they are more likely to influence other customers to join the platform. These "influencers"

[22] See Evans and Schmalensee, "Failure to Launch," op. cit.
[23] *See* J.C. Rochet and J. Tirole, "Platform Competition in Two-Sided Markets," *J. European Economic Association* 1, no.4 (2003): 990-1029.

are important to attract early on because they will accelerate the vertical or horizontal growth of the platform. To ignite, platforms want to identify and recruit heavy influencers on both sides early on.

Prestige and influencer customers both generate significant direct or indirect externalities. It therefore often pays to subsidize their joining the platform.

III. STRATEGIES FOR IGNITING CATALYTIC REACTION BY SOLVING COORDINATION PROBLEMS

This section focuses on diagonal strategies for getting both sides on board in the right proportions. Catalyst entrepreneurs must ultimately solve a coordination problem to get both sets of economic agents to get on board their platforms. The dynamics of this coordination problem can vary considerably depending on the nature of the platform business.

Sequential entry. In some cases it is possible to get one group of agents on board over time and then make these agents available to the other group of agents later in time. That is the situation with advertising-supported media. One can use content to attract viewers and then bring advertisers on board later. This dynamic works because there are non-positive indirect network effects between the two sides: viewers do not care about advertisers (and may dislike advertising) but come to platform for the content.

Entry with significant pre-commitment investment. In other cases one group of economic agents need to make investments over time to participate in the platform.[24] That is the case with software-based platforms such as video game

[24] This is the case treated in Andrei Hagiu, "Pricing and Commitment by Two-Sided Platforms," *The RAND Journal of Economics 37, no. 3 (fall 2006)*: 720-737.

consoles. Game developers must invest in creating games for the next release of a console without knowing how many consumers will be interested in using that platform when their development is done. The video-game console platform must either convince game developers that buyers will show up, provide them with some financial guarantees that buyers will show up, or self-produce games until the platform has demonstrated itself.

Simultaneous entry of sides. In some cases the economic agents are making decisions to join the platform around the same time and have to both join around the same time for the platform to provide value. A dating venue demands almost perfect simultaneity. Heterosexual men would quickly leave a new nightclub that had no women and vice versa. Other platforms provide more latitude. Buyers may not desert an exchange platform right away if there are no sellers but they will arrive soon.

In all cases, however, platform growth is not sustainable until the platform reaches critical mass. Therefore the key challenge for new platforms is figuring out ways to reach critical mass quickly.

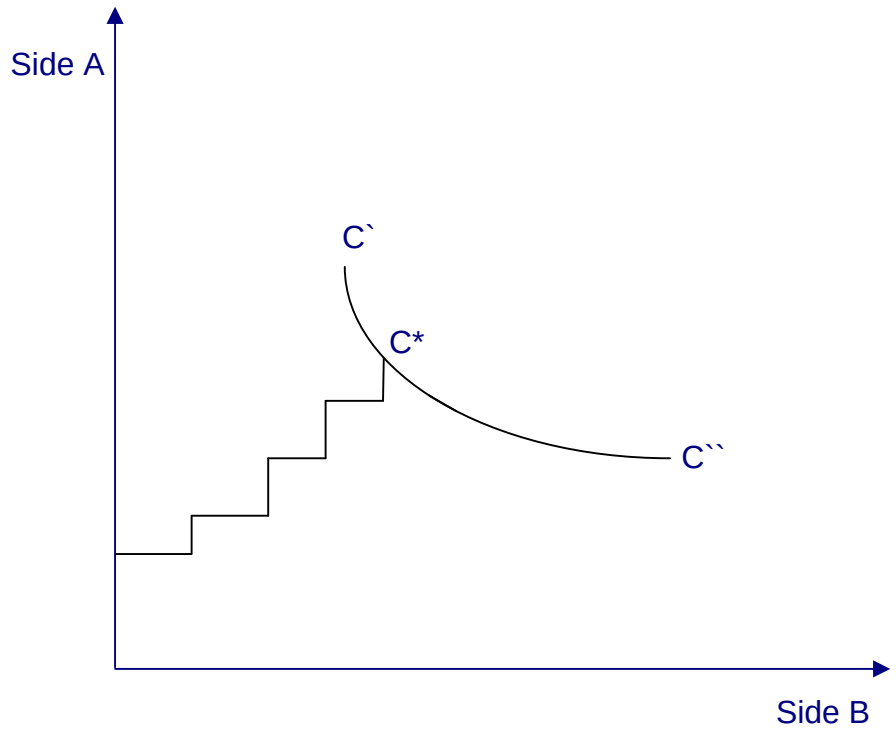
A. The basic zig-zag

A basic strategy for reaching critical mass is to build participation on the two sides incrementally. The platform starts with a small number of economic agents on both sides. It then persuades agents on either side to join. It also relies on the natural processes of product diffusion. Because of indirect network effects, the platform is more valuable to each successive group of prospective customers. Figure 4 shows that basic zig-zag approach to growth.

eBilleMe provides an example of this strategy. Consumers who click on the eBillMe sign at the checkout for an e-tailer can pay with their online banking account. They then send an email which contains details for paying from their online banking account. After they enter the information into their online banking account they receive a receipt and the product is shipped. This payment alternative is attractive to people who are either concerned about the security of paying with cards

online or do not happen to have a card conveniently available. A small but significant fraction of consumers, as it turns out, like paying this way.

Figure 4. Basic Zig-Zag to Critical Mass



To get started, eBilleMe persuaded ToolKing to offer eBillMe at checkout.[25] A small percentage of customers used this payment alternative. eBillMe then went to other online retailers. Each led to eBillMe having more people who were accustomed to using its service. For each subsequent merchant it went to it offered an increasingly valuable offer since it had more users who were predisposed to use this payment alternative. At the same time it let its users know that they could pay at more places thereby increasing the value to the merchants. eBilleMe grew from 1 merchant and hundreds of users during its first year of entry in 2005 to hundreds of online stores taking 2% to 10% of the merchant's transaction volume by 2008.

[25] Interview with Marwan Forzley, founder and chairman of eBillMe.

B. Pre-commitment to both sides

Some platforms such as eBillMe are able to start with one member on one side that it uses to attract members on the other side. More commonly platforms need to have multiple members of both sides to begin the zig-zag process above. They therefore need to persuade a minimum number of early adopters on both sides to show up at the start of the platform to make it credible. That requires getting both sides to believe that when the platform opens for business there will be members of the other side present.

Diners Club is the classic example of this strategy.[26] Although the precise sequence is lost to history it persuaded 14 restaurants in Manhattan to accept Diners Club cards for payment. At the same time it persuaded several hundred people in Manhattan to take the Diners Club Card. Those commitments were enough to start the platform. Over the next year Diners Club zig-zagged its way to 330 restaurants and 42,000 cardholders.[27]

Customers may require more assurance that the other side will in fact show up especially if they have to invest resources to join. Contingent contracts can be entered into for this purpose. Customers agree to commit to join the platform conditional on other customers on the same and other side also joining. Once these contracts have been entered into the catalyst only needs to persuade one customer to sign on because that will have a domino effect on all the other customers. MobiTV[28] serves as an example where contingent contracts play an important role for "catalyzing" the platform. Started in 1999, MobiTV's planned to offer TV service to customers on their mobile phones for a subscription fee. It needed to persuade TV content providers and mobile operators to join its platform. Neither of the two wanted to embark on the new project unless they were assured that the other side

[26] For description and discussion of this example, see David S. Evans & Richard Schmalensee, *Catalyst Code: The Strategies Behind the World's Most Dynamic Companies* (Massachusetts: Harvard Business School Press, 2007), p. 1.

[27] At this point in time credit cards were mainly used in local markets so Diners Club had to secure critical mass in a number of different cities to ignite the platform. The 330 restaurants and 42,000 cardholders refers to the total across these separate markets.

[28] Id., p. 89.

would also join. MobiTV used contingent contracts to ignite the platform. It signed an agreement with Sprint that if television channels join, Sprint would offer service and agreements with MSNBC and other TV channels that if Sprint join they would broadcast. It was enough for MobiTV to get Sprint to agree and everyone else followed.

The video-console example considered by Hagiu is an extreme example of this phenomenon.[29] Video-games and other software application are platforms that connect application developers and video game players. The game player will not purchase a video console without enough applications and games, and the former will not put the time to develop such if they are not sure that people will buy their applications. Because game developing is a long process, the vendors have to secure sellers a long time before the new game is launched in order to make sure that developers will provide the applications.

C. Single and Double-Marquee Strategies

The marquee strategy discussed above is another way to obtain enough members on both sides to begin the zigzag to critical mass. In a single-sided marquee strategy the platform acquires an "influential" or "prestige" member of one side. Announcement of that may attract enough members of the other side at the beginning. The shopping mall strategy is the classic: the mall gets an anchor tenant which many shoppers want to connect to. In a two-sided marquee strategy the platform acquires "influential" or "prestige" members on both sides. They provide value to each other as well as attract other members. Nightclubs are common users of this strategy. They try to get popular men and women to come on opening night. They want to connect to each other and less popular men and women want to connect with them.[30]

[29] Hagiu, *id.*
[30] *See* Evans & Schmalensee, *Catalyst Code*, *id.*

D. The Two Step

The two-step strategy involves getting enough members of one side on board first and then getting members of the other side on board. As mentioned earlier this works when the first side does not value access to the second side which is often the case for advertising-supported media. Search engines followed this strategy. They attracted users who did searches of the world-wide-web. The search results were displayed on a series of pages. Once they obtained enough page views they sold access to those pages to advertisers. Google, for example, operated its search engine for 23 months (including a beta version) before it opened it search results pages to advertisers[31]. At that time it had more than a billion pages indexed and 18 million user queries per day.

E. Ziz-zag with self-supply

Catalysts may be able to jumpstart their platforms by providing one of the sides themselves at least initially. Consider YouTube which is a three-sided platform: user-generated content attracts viewers, viewers attract content providers who want an audience, and access to be viewers can then be sold to advertisers. YouTube started by focusing on users and viewers. Its founders seeded the site with content they generated themselves and started the process of diffusion by suggesting that members of their personal social networks check out the content.[32] They also used various marketing strategies to attract viewers: they posted an ad on craigslist to compensate attractive women to post on the site and promised to give an iPod to a random user every day till the end of the year.

F. Summary

We have introduced several concepts.

- First, multi-sided platforms often must attain critical mass to ignite a catalytic reaction that leads to organic growth. Platforms that do not reach this critical mass implode.

[31] Google Milestones: http://www.google.com/corporate/history.html.
[32] See YouTube videos: "The History of YouTube" and "The Real History of YouTube in 3 minutes."

- Second, to reach critical mass platforms can engage in a number of strategies to get "enough" customers on either side, and in the right proportions, on board. These include the zig-zag and the two-step.
- Third, these strategies can usefully employ many of the tactics used for new product introductions by non-platform businesses.

We have taken some liberties in explaining the dynamics of platform ignition. As a formal mathematical matter one would have to reach critical mass instantaneously to ignite the reaction. In practice it appears that platforms have some limited time to get to critical mass. Early adopters use a platform. If they come back and if later adopters also find value then it is possible to reach critical mass. If the platform does not grow quickly enough to critical mass early adopters lose interest, fewer later adopters come, and word-of-mouth referrals stop or turn negative.

IV. B2B EXCHANGES

Entrepreneurs and investors flocked to developing B2B exchanges in the late 1990s.[33] The thesis was simple. Build a better platform for exchange and buyers and sellers will flock to it. The failure was stark. When the exchanges opened their doors few sellers showed up. The sellers largely kept staying away.[34] Buyers lost interest. The exchanges could not reach critical mass. They failed en masse in the 2001 dot.com bust.[35] Despite the great promise many held out for this new way of doing business few successful B2Bs have emerged in the post 2004 web boom.

The B2B platforms failed to ignite for three related reasons.

First, a new platform must create a significant value as a result of getting two sides together that exceeds what they can do on their own or on alternative platforms.

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[33] There were over 1600 B2B exchanges by 2001 according to David Lucking-Reiley and Daniel F. Spulber, "Business-to-Business Electronic Commerce*," Journal of Economic Perspectives 15, no.1 (2001):55-68.*

[34] That was the story of Chemdex, one of the first B2B exchanges. Chemdex did not manage to attract enough sellers and buyers in order to secure the authomation of the business process. *See* Flora Nguyen, "The Changing Face of E-Healthcare, Is healthcare too complicated for an Internet-based supply-chain solution? Here's what manufacturers should expect in 2001," http://www.devicelink.com/mx/archive/01/03/0103mx072.html

[35] See, e.g., Jack Nickelson and Hideo Owen, "A Theory of B2B Exchanges Formation," 2001, manuscript.

The B2Bs did not provide enough value compared with buyers and sellers connecting without a platform through existing bilateral relationships or an existing offline consortium.

Second, a new platform must allocate that value between the two sides to provide both with a sufficient incentive to join the platform. The B2Bs were not able to offer enough of a value proposition to sellers to get enough of them on board. The sellers saw the B2B exchanges as methods for driving down their prices through auctions. That did not leave them with enough of a long-term return and they therefore stayed away.

Third, a new platform must get enough of both sides on board and in the right proportions to achieve the critical mass that provides a minimum amount of value to both sides. Sellers came on board too slowly. Buyers lost interest. That provided even less motivation for sellers. Platforms that do not achieve critical mass implode and never have the chance to grow.

A. The Rise and Fall of the B2B Exchanges

B2Bs were viewed as an obvious way in which the Internet could create great value. In the late 1990s and early 2000s business strategists, economists, and others wrote numerous articles on how B2Bs would transform buying and selling. The title of one of the business books on the subject provides a flavor: *B2B Exchanges: The Killer Application in the Business-to-Business Internet Revolution*.[36] Various researchers forecasted that B2Bs would become account for a large fraction of commerce. Goldman Sachs predicted in 2000 that B2B e-commerce transactions would equal $4.5 trillion worldwide by 2005. The Gardner Group estimated in 1999 that by 2004 B2B e-commerce would reach $7.3 trillion.[37] Entrepreneurs and venture capitalists poured into this new industry. Between 1995 and 2001 there were more than 1,500 hundred B2B sites. Some of the most prominent ones were Ventro, VerticalNet, Neoforma, Cordiem, CorProcure, Chemdex. Most of them collapsed in

[36]Arthur Sculley and William Woods, *B2B Exchanges: The Killer application in the Business-to-Business Internet Revolution* (ISI Publications, 1999).
[37]David Lucking-Reiley and Daniel F. Spulber,"Business-to-Business Electronic Commerce," *Journal of Economic Perspectives* 15, no. 1, (2001): 55-68.

the early 2000s as investors realized that they did not have a viable business model and as the expected buyers and sellers failed to turn up.[38] Many of the ones that survived—such as Ariba, which merged with FreeMarkets—shifted their focus from operating true exchanges to offering procurement software that facilitated the normal process of bilateral buyer-seller transactions.

Perhaps the best evidence on what happened to not only B2Bs, but the idea of B2Bs, is revealed from a simple Google search. News and analyst reports about B2Bs largely end in the early 2000s. The flourishing academic literature on the economics of business of B2Bs appears to have collapsed soon thereafter. Surprisingly, there are few rigorous port-mortems on why B2Bs failed to ignite. This chapter does not provide a rigorous study either but places some of the contemporaneous observations about the collapse in the context of the framework presented above.

B. The Value Proposition

There were well developed methods that enabled business buyers and suppliers to deal with each other well before the development of the commercial Internet. Buyers had supplier lists which they would turn to when they had a need. They had sophisticated procurement departments that experience in putting the purchase of goods and services out to bid and had knowledge about suppliers. Suppliers also had relationships with companies and had ways to get on the bidding lists. Buyers had the greatest difficulty finding new suppliers especially for areas where they had few bidders. New suppliers who had not developed relationships also had difficulty. A key question for starting a platform was whether it could provide enough additional value to these two market sides.

The B2Bs were patterned after the successful auction-based B2C sites such as eBay. They introduced various types of auction mechanisms that tended to maximize

[38] According to a research study, *Shakeouts in Digital Markets: Lessons from B2B Exchanges*, conducted by Wharton School and Pembroke Consulting in November 2002, of the 1,500 independent business exchanges that existed in 2001, less than 200 remained at the end of 2003.

competition among suppliers but mainly based on price. That of course was not attractive to suppliers because it depressed prices and profits and eliminated the value of other sources of differentiation. As one consultant noted about the proposed B2B exchanges for the airline industry:[39]

> [suppliers] continue to be reluctant to sign up to portants and other e-mechanisms created by the prime contractors. The key reason for this is that the primary objective of e-procurement is perceived to be a reduction in the purchase price, therefore forcing pressures on [supplier] margins.

A number of observers of the demise of the B2Bs observed that a major problem was that suppliers were scared, as Kabir puts its, "of comparison shopping and brand dilution."[40]

Once we go beyond the perfectly competitive model it is easy to see why exchanges that were built around efficient procurement auctions were not attractive to suppliers. Most businesses have fixed costs that they have to recover. They therefore cannot survive if their prices are competed down to short-run variable costs. Department stores can have sales periodically where merchandise is sold at low margins; they could not survive if they were selling at those prices all the time. B2B auctions will tend to attract suppliers that can offer low prices because they have excess inventories as a result of lack of success.

The B2Bs were not necessarily advantageous to buyers either. Company procurement officers typically learn about the quality of their suppliers. Through interactions over time and discussions with people in the industry they discover the quality of supplier goods and services as well as their reliability for delivery. They can take this information into account in deciding who to put on the bid list thereby selecting the lowest price from pre-qualified bidders, or they can take non-price features into account in selecting the winning bid. Many of the B2B exchanges focused mainly on price and did not provide companies with significant services for

[39] *See*, Mark Odell, "B2B Struggle to Achieve Take-off," *Financial Times*, June 18, 2001.
[40] *See* Nowshade Kabir, "E-marketplace; Facts and Fictions," WebProNews, posted on August 20th, 2003, http://www.webpronews.com/topnews/2003/08/20/emarketplace-facts-and-fictions.

assessing quality. Indeed, the importance of quality and experience was learned the hard way by American toy manufacturers who found suppliers through some of the successful B2Bs that have focused on connecting Chinese suppliers to multinational buyers. Many of these suppliers used lead in their products which led to significant health risks and product recalls when this was discovered.[41]

C. Ignition Strategies

Based on the general articles that have been published on the mass demise of the B2Bs and several B2Bs it appears that the B2Bs made several fundamental mistakes in achieving critical mass and in igniting. To begin with it is not clear that many of these B2Bs could have ignited without modifying their business models to provide sufficient value to the two sides of the platform. That is, it is not clear that the global communication aspect of many of their models, based on the Internet, provided enough value over and above the traditional methods of procurement to warrant buyers or suppliers to change. Therefore, there may not have been a pricing structure, and ignition strategy, that could have, under any circumstances, sustained many of these B2Bs.

Some of the B2Bs seem to have adopted the following two-step strategy. They would begin by organizing the buyer side. That could occur by securing the participation of one or more large buyers—a one-sided marquee strategy. For example, Chemdex started with Genentech which purchased most of the value on the exchange initially. That could also occur as a result of the exchange being started by a cooperative of buyers—that was the case with the automobile exchange, Covisint, which was started by General Motors, Ford Motor Company, DaimlerChrysler, Nissan, and Renault. They could then seek suppliers. This strategy would not work for exchanges that were organizing larger groups of smaller buyers. They would have to adopt a simultaneous strategy and secure enough buyers and sellers at the same time.

[41]David Barbosa, "Mattel recalls toys made in China," *Herald Tribune*, August 2, 2007.

Many of the B2Bs made the mistake of establishing symmetric pricing structures that sought to earn revenue from both buyers and suppliers.[42] One of the most famous B2B failures—Chemdex—charged suppliers a listing fee for products and charged buyers a commission on transactions.[43] It is possible that a symmetric pricing strategy could work if an exchange had enough buyers and suppliers already on—at that point suppliers might lack access to a significant market if they refused to pay the fees. But at the start of these exchanges buyers and sellers would have to be persuaded to switch from the widely used bilateral procurement methods.

In any event, it appears that many of the exchanges ended up well off the path to critical mass because they did not offer suppliers with enough of an incentive to join. That could have come in the form of subsidies in cash or kind to suppliers to join the exchange. If the B2Bs could have gotten enough suppliers through what is known as a "divide and conquer" strategy they might have gotten enough buyers and then more suppliers.[44] Of course, such subsidies could have been large risky investments in the success of the B2Bs and granting them would have been foolish if, as suggested above, there was no feasible profitable model for the B2B.

V. SOCIAL NETWORKING

Social networks have exploded on the web. By August 2008 there were more than 110 social networking sites, as classified by Alexa [45], which had more than 580 million active users[46]. In the United States MySpace is the largest one with more than 68 million active users. The second largest one, Facebook, has about 32 million active users.[47] These sites generally allow people to construct a public profile, make

[42] See the case studies in Anne Engstrom and Esmail Salehi-Sangari, "Assessment of Business-to-Business e-Marketplaces' Performance," (PhD diss., Luleå University of Technology, 2007). Of them the 6 B2Bs they examined, five started trying to earn revenues from both buyers and suppliers and one of these moved towards a model in which suppliers obtain services largely for free.
[43] *See* M. Meyer, Neil de Crescenzo, and Bruce Russell, "Case Study: Chemdex: In Search of a Viable Business Model,*" International Journal for Entrepreneurship Education* 2, no.2. (2004), http://web.cba.neu.edu/~mmeyer/cases/Ventro-010105.pdf
[44] *See* Jack Nickelson and Hideo Owen, "A Theory of B2B Exchanges Formation," 2001, manuscript.
[45] http://www.easy-viral-traffic.com/blog/index.php/top-list-of-social-networking-sites/
[46] http://www.comscore.com/press/release.asp?press=2396
[47] ComScore Data

this profile available to other users to whom they grant permission, and in return obtain the right to see the profiles of these users. The profiles and related technologies provide ways for friends to communicate with each other. For example, Facebook has a place where people can say what they are doing; when a user goes to her profile page on Facebook she will then see what all of her friends are doing.

The first social networking site, SixDegrees.com, was started in 1997. But it did not attain critical mass and shut down in 2000. Its founder speculated that was because people did not have enough friends online and there was not much to do together once they were on line. The promise of social networking became apparent with the rapid growth of Friendster which started in 2002. In the United States, it grew to a peak of 1.5 million users in the third quarter of 2003 in the United but then went into decline in the United States. MySpace and Facebook have emerged as the two leading global social networking platforms.[48]

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A. Background on Social Networking

Social networking sites are multi-sided platforms with usually at least three sides.

The first two sides are individuals who want to connect with each other. For many social networking sites such as Friendster these are friends seeking friends. However, people seek to find friends on social networking sites and people are recipients of requests for friendships. This sender-receiver relationship has important consequences for how social networking sites are ignited. The role of gregarious and influential members of the site can have significant effects on the dynamics of growth. The third side consists of advertisers who want to reach these users. Some social network sites a fourth side that consists of software developers who write

[48]See D. Boyd and N. Ellison, "Social Networking Sites: Definition, History, and Scholarship," Journal of Computer-Mediated Communication, 13:1, 2007, available at http://jcmc.indiana.edu/vol13/issue1/boyd.ellison.html, last visited on September 27, 2008. In addition to these "friending" sites there are also professional social networking sites such as Linked In which in theory help people form professional relationships and in practice help people find jobs and recruiters to find candidates.

applications that work with the social networking site and provide value to users and advertiser.

Social networking sites typically have two sources of revenue. In part they are traditional advertising supported media. The social networking features and applications attract viewers. Advertisers then pay for the ability to present advertising messages to these viewers. The social networking site earns revenue directly from advertisers or indirectly from application providers who sell advertising. They also earn revenue by selling things that facilitate interactions between the users. These include "pokes" such as virtual flowers that people can send their friends.

Social networking sites use a variant of a two-step to ignite. They focus on getting a critical mass of "friends" which generates traffic on their sites. They then earn revenue through selling advertising and pokes. They also persuade developers who want access to their network to write applications which further increase the value of the network as well as provide for additional revenue possibilities.

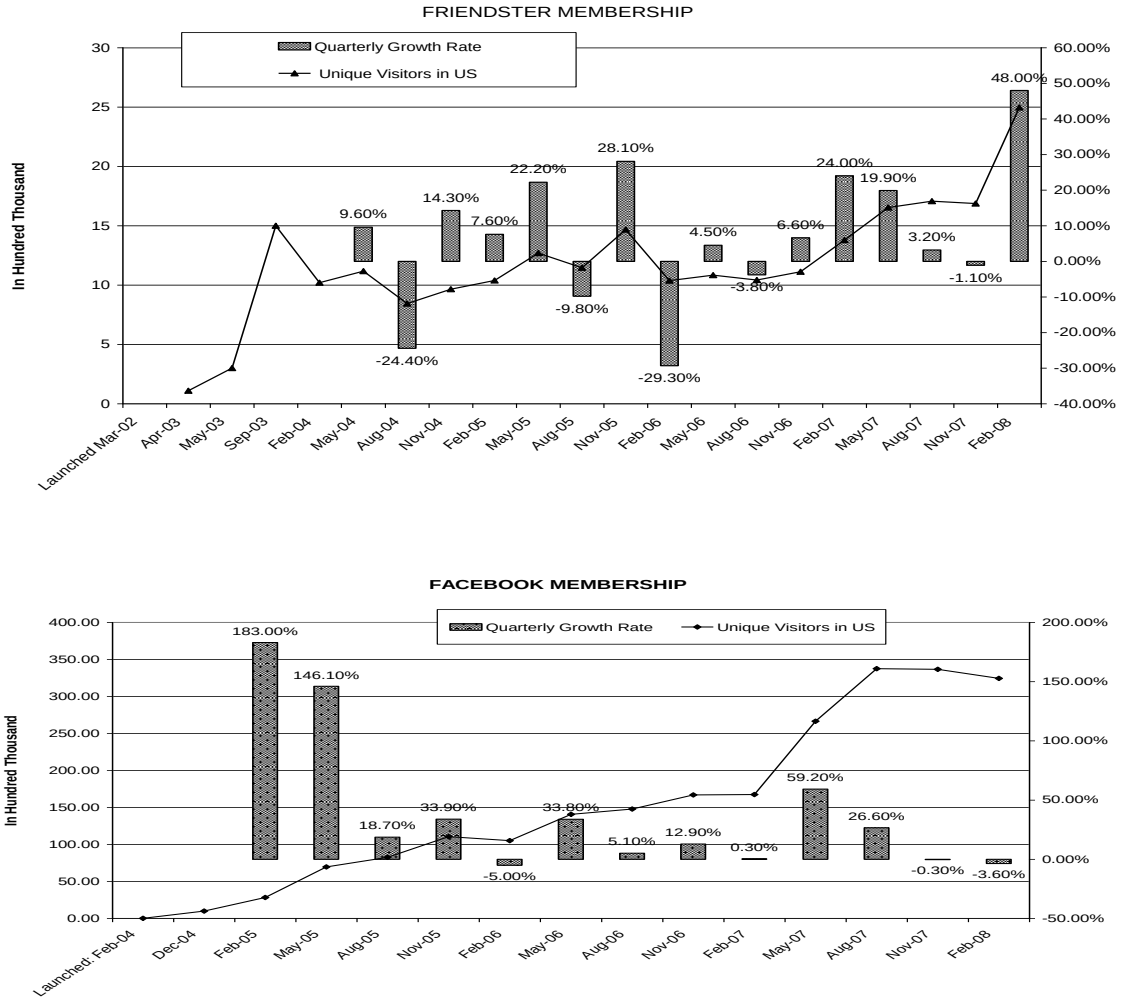
We now turn to the ignition strategies and growth paths for two well-known social networking sites: Friendster and Facebook. Figure 5 shows membership on these sites and the growth rates in membership over time.

B. Friendster

Friendster was the first social networking site to gain wide popularity.[49] It attracted users initially by providing a dating venue where people could find romantic partners among friends of friends. That was a different approach than existing online data venues that matched up strangers based on predictions of their likely compatibility. People posted their profile and were able to communicate with other users who were no more than four-degrees of separation away. People interested in finding romantic partners liked the fact that there were social connections which not only helped screen people but also helped police bad behavior.

[49] See Boyd, D. M., & Ellison, N. B., "Social network sites: Definition, history, and scholarship" *Journal of Computer-Mediated Communication, 13*(1), article 11 (2007).

Figure 5: Friendster and Facebook Growth



Note: Based on ComScore data for the period Feb 04 –Feb 08 and "Facebook Case Study", Harvard Business School, 2006, for the period Apr 03-Feb-03.

Friendster started with a prototype in 2002. Its founder invited 20 close friends to join.[50] The site launched formally in March 2003. It grew virally from the

[50] http://www.inc.com/magazine/20070601/features-how-to-kill-a-great-idea_pagen_2.html

initial seed of 20 friends and had 835,000 registered users by June 2003 and 1.5 million by September. There is no evidence that it focused on influencers or gregarious people—instead it just grew naturally. The growth was not driven entirely by the users looking for people to date. Most people used it to communicate with and expand their network of friends. Many people used it as a source of entertainment from looking the profiles of people that they would not otherwise have contact with.

Although it reach critical mass and grew explosively Friendster encountered two major problems[51]. The first was technological. It was not prepared for the upsurge in users and users started finding that the site was not reliable. The four-degree of separation rule was a major source of the problem. Every time someone signed on to the site the software had to determine who was within the individual's community. As the size of the overall network grew it took longer and longer to do that calculation.

The second involved changes in the community and Friendster's response to those changes. As the community grew the four-degree of separation rule made people's profiles accessible to people that they did not necessarily want in their social network—for example their bosses. At the same time the four-degree of separation rule limited the size of the community that one could acquire. To counter this, people started gaming the system to create more friends. One of these efforts involved creating Fakesters that were fake profiles that were designed to attract a lot of attention and therefore many friends. Friendster banned fake profiles and also dropped the "most popular" attribute that had encouraged people to engage in some of the bad behavior. As it turns out, the Fakesters were a popular source of entertainment and way to create groups such as alumni of particular universities. Friendster also policed the profiles and kicked users off who did not comply.

The user community became dissatisfied with Friendster. Growth slowed.[52] In the U.S. market which is the most significant source of advertising revenue

[51]*See* Gary Rivlin, "Wallflower at the Web Party," New York Times, October 15, 2006.
[52]MySpace picked up a number of Friendster's users. It provided a platform in which people could see anyone's profile and in which people had a great deal of freedom in designing their profiles. An important group that it

Friendster declined dramatically after the third quarter of 2003 and remained roughly flat for the next three years while other social networking sites grew explosively. Nevertheless, it achieved a critical mass of users in other countries, and remains the 3th largest social networking site worldwide;[53]in August 2008, announced that they received a $20 million of venture capital[54].

C. Facebook

Facebook's founders also started with the idea that they would provide a convenient method for dating. As students at Harvard they thought it would be helpful to have a place where students who saw each other in class and other settings could connect. Within the first month of starting in February 2004, more than fifty percent of Harvard college students had put their profiles on the site[55]. Since Facebook was designed to facilitate communication within a closed community it was able to obtain critical mass—enough people found it valuable enough to use the site—very quickly and then captured most of the population of potential users.

Shortly thereafter Facebook extended its model to other universities beginning with Stanford, Columbia, and Yale. In each case a significant portion of the undergraduate student body set up profiles. By the end of the year Facebook had almost 1 million active users. All users had to have an ".edu" email extension to verify that they were part of an academic community. Facebook continued to add local networks of students. It had more than 800 college networks by May 2005. It then added international schools and work environments. By August 2006 it had 14,782 million registered users.

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attracted were indie rock groups, some of whom had been ejected from Friendster, and then musicians more broadly who used the site to connect with their fans.

[53] http://www.prnewswire.com/cgi-bin/stories.pl?ACCT=109&STORY=/www/story/08-18-2008/0004869579&EDATE=

[54] See Tom Taulli, "Friendster is still alive and well ... and gets $20 million," Bloggingstocks, posted on Aug 5, 2008, http://www.bloggingstocks.com/2008/08/05/friendster-is-still-alive-and-well-and-gets-20-million/ (accessed September 24, 2008).

[55] http://www.guardian.co.uk/technology/2007/jul/25/media.newmedia

Facebook opened its doors to everyone in September 2006. However, it offered a much different level of privacy than either the imploding Friendster or the exploding MySpace. When a person creates a profile on Facebook you cannot interact with anyone else at the beginning. That person can build a community of friends either by sending out friend requests, or by being invited by others to be a friend. Users can also "de-friend" people and have various ways to restrict access to portions of their pages.

Facebook did not have any significant revenue stream for its first 36 months and focused instead on building its user base. In February 2007 when it had 16,737 million unique users worldwide[56] it introduced Facebook Gifts. These are icons such as flowers, hearts, and balloons that users can purchase for $1 can send to other friends. In May 2007 they launched Marketplace for classified listings for sales, housing, and jobs. In November 2007 the company launched Facebook Ads, an ad system that allows businesses to target their advertising to the precise audience they seek to reach[57]. As of September 2008, it is estimated that Facebook earns $350 million[58] from advertising and $35 million[59] from the sale of gifts.

Facebook's successful ignition was based on a form of the two-step. The first step involved developing the user base. There was a chicken-and-egg problem to be solved there since the network could grow only if there was a reciprocal relationship between enough people. However, by providing an effective vehicle for communication social networking sites can grow very quickly virally as friends invite friends who invite more friends.

The second step involved earning revenue from that user base. An important aspect of that was selling access to the user base to advertisers. Facebook and other social networking sites have been disappointed at their ability to secure advertising revenue. Online advertising is sold on the basis of "cost per thousand" viewers of an advertisement. The average CPM for online advertising is in the range of $10-15.

[56] http://www.comscore.com/press/release.asp?press=1519
[57] http://www.facebook.com/press/info.php?timeline
[58] http://www.emarketer.com/Article.aspx?id=1005257
[59] http://lsvp.wordpress.com/2008/01/23/facebook-digital-gifts-worth-around-15myear/
http://facereviews.com/2008/09/02/facebook-virtual-gifts-make-big-bucks/

The average for Facebook is reportedly below $0.50. (Of course although Facebook may not prove as valuable as its founders and investors might have liked it is likely to be enormously profitable.)

Part of the difficulty which appears not to have been anticipated is that advertising is a bit alien to a social networking community. It is natural to see advertising on publisher web sites. It is less natural to see advertising on your own profile page or the profile pages of friends—especially if you have been using Facebook for a while without such advertising. Facebook alienated its customers when as part of its Beacon advertising strategy it started tracking users` purchases from third-party websites. Facebook and other social networking sites are looking for innovative ways to advertise that satisfy the needs of advertisers without reducing the value of the social networking aspects of the sites.

The social networking sites illustrate the power of diffusion in generating web traffic. The successful sites grew very quickly because they provided existing physical networks of friends much more powerful tools for interacting with each other more efficiently virtually. That, however, is only the first step in a sequential entry strategy. The later strategies have required getting advertisers on board the platform.[60]

VI. CONCLUDING REMARKS

In this article I have tried to raise some of the important issues and provide some preliminary thoughts on them. There is considerable room for further theoretical and empirical research. On the theoretical front we need dynamic models that address the creation of multi-sided platforms especially in the case in which the platform needs to get both sides on board at the same time. On the empirical front we need research on the successful and unsuccessful launch of platforms. Both econometric studies of platform dynamics and case studies would be informative.

[60] At this point in time the social networking sites have, as noted above, found it difficult to obtain much interest from advertisers and are charging vastly lower prices for viewers than are other content-oriented sites.