Network Externalities in Innovation

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Introduction

To explain what network externalities is, in an understandable manner, I will use an example. Imagine if you were the only person having an email address and using emails as a form of communication, this network would not worth anything as the product as no one else uses this product. The more users there are using the product, the more valuable the medium becomes. If you are not able to write email to anyone else then what use/value does the email have to you. In concrete terms, network externalities exist when the value of a product to any user is greater the larger is the number of other users of the same product.

Writing in 1950, Harvey Leibenstein analyzed the “bandwagon effect,” by which he meant “the extent to which the demand for a commodity is increased due to the fact that others are also consuming the same commodity. It represents the desire of people to purchase a commodity in order to get into ‘the swim of things’; in order to conform with the people they wish to be associated with; in order to be fashionable or stylish; or, in order to appear to be ‘one of the boys’.”

Types of Network Externalities

There are two types of Network Externalities, namely, Direct and Indirect. Direct network externalities exist when an increase in the size of a network increases the number of others with whom one can “communicate” directly. Direct network externalities involve the value aspect of things like telephone systems, computing platforms, and especially the Internet and e-Commerce. On the other hand, Indirect Network Externalities exist when an increase in the size of a network expands the range of complementary products available to the members of the network. Additionally, indirect externalities involve related items like devices (telephones, fax machines, or software applications) becoming cheaper and more accessible as the number of overall users increases. This may also extend to things like service or parts.

Many industries exhibit network externalities. Some examples are:

- Telephone Network (direct): value of that any user places on subscribing depends on the number of others with whom he can communicate
- ATM machines (indirect): the larger the network the greater is the number of machines at which an ATM card can be used, hence greater is the value of the network to any user
- Diesel powered cars (indirect): having more widely available fuel and service facilities the larger the number of other drivers of such cars

In each case the value of the good derives entirely from its ability to link many people possessing the same good. As a result, the marginal benefit of the good to any one individual depends on the number of other individuals who use it.

Benefits of Network Externality

Network externalities are the effect that one user of a good or service has on the value of that product to other people. Positive network externalities exist if the benefits are an increasing function of the number of other users (a lot of people use that product/service). Negative network

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Externalities exist if the benefits are a decreasing function of the number of other users. Considering firstly the **positive externality**\(^3\), the classic example is the phone market. The more people own phones, the more valuable the phone is to each owner. That phenomenon generates a positive effect because a user may purchase their phone without intending to create value for other users, but does so in any case.

Let’s consider Apple as an example: it derives most of its revenues from the network externalities created from its iTunes platform. The iPhone mainly and the iPod drive the company’s revenues, according to the main principle that “everyone will have compelling reasons to use an iPhone because the network externality will make that device the product someone uses simply because it is the one everyone else uses”\(^4\).

There are two important concepts that can rise as a consequence of positive network effects: the **bandwagon effect** and the **tipping effect**\(^5\). The first one is an observed social behavior in which people tend to go along with what others do or think without considering their actions. The likelihood of a bandwagon effect is greatly increased as more and more people adopt an idea or behavior; this has led to the pejorative description “herd effect” in reference to this interesting behavioral phenomenon. The bandwagon effect can be seen at almost all levels of human interaction, and being aware of its influence on you can help you make calculated decisions which are based on your beliefs and values rather than the temptation to go along with a group. Tipping, indeed, is a situation more related to a competitive scenario. It occurs when two companies are trying to sell quite the same product and a small initial advantage for one of two competing goods proves self-reinforcing, even with the possibility to drive the other out of the market. In other words, it appears when positive feedback causes consumers to swing to one of the two competing products; when a good that has a substantial but not dominant market share may stay in that range for an extended period, then, quite suddenly, and often for no obvious reason, the market tips either for or against it, and the good either become dominant or fades away. A typical example of this phenomenon is the case of Betamax Vs VHS: Sony’s Betamax video standard was introduced in 1975, followed a year later by JVC’s VHS. For around a decade the two standards battled for dominance, with VHS eventually emerging as the winner. The victory was not due to any technical superiority, it was just a consequence of the tipping effect.

On the other side, **negative network externalities** can also occur, where more users make a product less valuable (network congestion)\(^6\). Congestion occurs due to overuse. The applicable analogy is still related to a telephone network. While the number of users is below the congestion point, each additional user adds additional value to every other customer. However, at some point the addition of an extra user exceeds the capacity of the existing system. After this point, each additional user decreases the value obtained by every other user. In practical terms, each additional user increases the total system load, leading to busy signals, the inability to get a dial tone, and poor customer support.

Improvements in the technology of goods subject to network externalities may at first lead to only gradual increases in the size of the network, but when that network reaches a certain size, a **critical mass**, it suddenly explode. At that point, in fact, the value obtained from the product or service is

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\(^4\) Loc.cit. Yale University.


\(^6\) Ibid.
greater than or equal to the price paid for the product or service. As the value of the good is determined by the user base, this implies that after a certain number of people have subscribed to the service or purchased the good, additional people will subscribe to the service or purchase the good due to the positive 'utility/price' ratio. Beyond the critical mass, the increasing number of subscribers generally cannot continue indefinitely. After this point, in fact, most networks become either congested or saturated, stopping future uptake.

Positive feedback is obvious, more people means more interaction (Wikipedia itself, for instance, depends on positive network effects). Negative network effects result from both resource limits and provider complacency (The absence of viable competitors in a successful network can cause a provider to restrict resources, consider fee increases, or otherwise create an environment contrary to the users' benefit). What is obvious is that both success and failure are self-reinforcing, which represents a way to pat yourself on the back for progress towards the goal or standard you have established. Self-reinforcement is an invaluable link between the response & the outcome. The more often that a person can pick out a target behavior & consistently give him or herself reinforcement for that behavior, the more likely it will occur in the future.

The Impact of Network Effects on Technology

If a technology that is dependent on network effect starts to lose market share to a challenger with a disruptive innovation, the network effects will possibly be beneficiary to the challenger, who perhaps have been successful in differentiating itself. In addition, the technology life cycle will accelerate the tipping point, meaning going from the maturity stage to the decline stage quickly.

Hence, how do technology companies use network effects as a competitive advantage?

Lock-in
One method for creating a network effect is vendor lock-in, also known as proprietary lock-in or customer lock-in. Lock-in can be caused by network effects, and network effects generate increasing returns that are associated with lock-in. This method is well known in the telecommunications industry, where telecom operators enthusiastically SIM lock the mobile phones that are sold with their subscription which makes the phones only able to use the specific telecom operator’s own SIM cards. This method can help in ensuring the technology life cycle for a period of time.

What types of network effects exist today?
Today, there two kinds of values when discussing network effects: Inherent, when people gain value from the use of the product. A known example is Apple who is using both the iPod Touch and the iPhone together with their Apps store, enabling the user to take advantage of the product’s full capability.

The other value is Network, which can be both direct and indirect. One gains value from the product when other or more people use the same product. When it is a direct network value you get an immediate result from more people’s use of the product, and when it is an indirect network value, it is a secondary result that the user gain. For example, when many users adopt the same standards, the complementary products become cheaper. This results in an increased value of the original

8 Ibid.
9 Ibid.
product.\textsuperscript{10}

On the other hand, network effect can both be positive and negative. Positive network effect is basically defined as the more people the more interaction is achieved. Wikis depend mostly on positive network effect. They usually only have value if there is many users who share knowledge.

A well known example of positive network effects today is Apple’s iPhone along with their Apps store, where the Apps store has created an added value to the iPhone. According to Michael Arrington, an entrepreneur and founder/co-editor of the online blog TechCrunch, Apple has an opportunity in increasing the value of the iPhone even more through the Apps store. The suggestion was that Apple should consider ways to have users interact with each other in order to build network value in order for Apple to have a long term success with the iPhone. Arrington also argues that ignoring this opportunity will open the doors for other competitors.

One opportunity in increasing the positive network even more is through the development of game applications with a multiplayer game mode that enables iPhone owners to interact with each other across the world.\textsuperscript{11}

A decade ago, Apple claimed its computers were better than PCs. However, PCs became omnipresent, meaning that there were more applications available everywhere. As a result, Apple’s share of the computer market fell. So, why did the assumed inferior product win?

Apple was at the time promoting negative network effects, meaning that their computer was limited to only a few applications that was at that time only developed by Apple, resulting in Microsoft gaining the competitive advantage of having many applications to offer.\textsuperscript{12}

Ironically, the negative network effects, that killed the Apple computer, made Apple able to redeem it self through the iPhone and the Apps store and at the same time beat Microsoft at its own game.

**Competition and Network Externalities**

Companies, who are dealers of Information goods, are completely aware of the significance of Network Externalities. But, the question remains as how does this concept shape their ideas. Building a strong Sales Network is often the answer to products which are believed to account for strong Network Externalities. This could even be at the expense of short-term profits. The theory is often seen to be relevant for the information industry which tend to gather profits.

In order to understand this effect, lets look at an example subject to a critical mass effect, such as that of NetBooks. At the beginning, only Asus and MSI was the suppler of the product, which was largely to in their interest to get the industry to critical mass-to get explosion of sales that will occur when many people feel that they should have NetBooks as so many other have it. But, the question always remain on how the companies got the industry to critical mass. Asus and MSI provided the


\textsuperscript{11} Arrington, Michael. Most iPhone Apps are Appealing to Leverage the Network Effect. TechCrunch. \textless http://www.techcrunch.com/2008/08/07/most-iphone-apps-are-failing-to-leverage-the-network-effect/\textgreater

NetBooks at a cheaper price may be even at a loss in the start-in order to increase the size of the network. So we often see companies introducing new high-technology products at a price below production cost.

Similar logic could be applied in markets in subjects to Tipping. As companies want to do it all it can to induce the market to tip towards their product, it has the audacity to introduce the product at a cheaper rate until the market has diverted towards its favor. Of course, firms offering rival products have the same incentive, so the early stages of competition in information goods often involve rival firms offering their products for very little—in some cases nothing. The most famous case may be the “browser wars” of the 1990s. A browser is software used to access the Internet; the two main competitors—Netscape Navigator and Microsoft Internet Explorer—were both available for free.

In the reality, of course, we cannot be quite sure whether a new product will ever achieve critical mass or whether it is possible to tip the market toward a product by offering it cheaply. The result is that there are many cases of attempts to launch products that seem foolish in retrospect: goods sold cheaply, with lots of money lost, that never take off.

Conclusion

Forecasting the future, market analysis and strategy are the most important aspects of a product launch but, often, strategist forget to think about the Network Externalities. It remains as the hidden force which contributes towards success of the product. A major reason how products like the Windows OS, NetBooks and the iPhone App Store sustained the hard times and made place for itself.

Bibliography


