

Micro Economics



Digitization and Value Creation

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..... Often, the simplest economic questions are the hardest to answer. Consider these: How much economic value did the massive decline in the cost of digitization in the last two decades create? And, would a similar level of decline in the next decade create the same amount of value?

These are surprisingly difficult questions to answer. Do not get me wrong. Obviously, large cost declines create new value. How much value? We can look deeply at the past but still find it hard to answer that question with any precision. Many factors enhance or limit the extent of value created. If we cannot analyze the past, surely predicting the future is fraught with challenges.

Subscription revenue

I will use a bit of shorthand to describe two decades of the Internet. The commercial Internet has gone through two waves. These waves partially overlap in time, but they are also distinct. One wave is affiliated with deployment and uptake of dialup access, the other with deployment and uptake of broadband access.

Figure 1 illustrates the two waves (<http://www.ntia.doc.gov/data/index.html>). The blue line represents the fraction of households with PCs (which the US stopped counting after 2003), green the fraction of households with broadband Internet, and red all Internet households. Dialup is the difference between the red and the green.

Before the first wave, there was substantial uncertainty about the number of users willing to pay for the dialup Internet. Forecasters who were certain in their predictions were either delusional or selling something. (Those delusions partly explain the dot-com boom and crash, but I digress.)

As it turned out, many users were willing, but that willingness took a while to show up in households without technology enthusiasts. More to the point, willingness-to-pay for the Internet did not remain constant over time. It increased as more content came online, better search technologies became available, new forms of communities became popular, and better security technologies lowered the chances for identity theft and fraud during transactions.

Similar broad forces fueled the second wave. As it turned out, many users were willing to pay for a one-time upgrade from dialup to broadband. Willingness to pay has also risen dramatically for many households with several years of experience with broadband. For many experienced households, broadband has grown into a virtual necessity.

Building on the installed base

Two additional classes of revenue exist for the online economy, and these are less direct than subscriptions for access. One comes from advertisers and the other from electronic retailers.

The biggest increase in electronic retailers occurred during the first wave. Firms such as Amazon, E-Bay, Expedia, and a host of catalogue converts, such as L.L. Bean, arrived in that era, as did tens of thousands of specialty retailers selling everything from Vermont maple syrup to 3D puzzles.

During the second wave of investment, the biggest growth in electronic retailing has been in music revenue, at the expense of offline retailing. Most observers expect online gaming and video/movies to go through a similar transition. Some of this has started already.

Online retailers invest in infrastructure by buying hosting and cache services. This investment pumps money into the Internet ecosystem. These retailers also buy huge numbers of services offline, as they always did, from such firms as UPS and Federal Express.

One other large category of activity pumps money into the system—advertising. To be sure, online advertising has taken a while to grow. Many experiments failed during the first wave. AOL and Yahoo were kings of new media advertising (the latter still collects considerable revenue today).

Google changed online advertising at the start of the second wave. The company invented a new advertising market for keywords to support search. Today it supports billions of dollars worth of advertising (approximately \$15 billion worldwide). Google took market share from

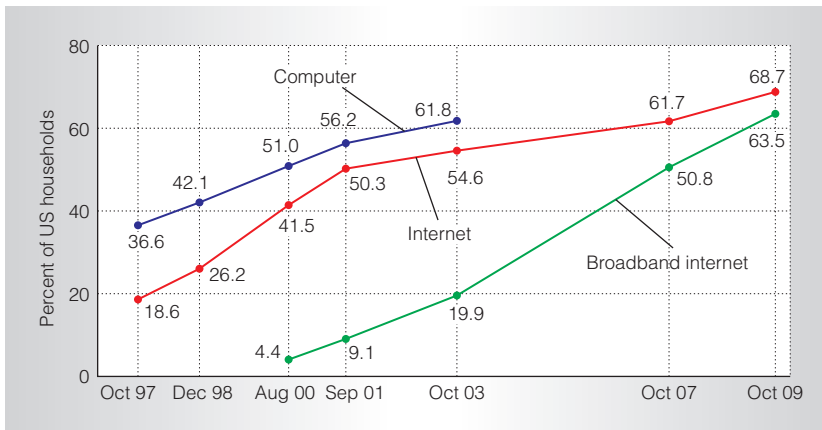


Figure 1. Percent of households with computers and Internet connections for selected years between 1997 and 2009. (Note that 2001, 2003, 2007, and 2009 use census-based weights, and earlier years use 1990 census-based weights.)

others (especially Overture) and increased the scale of online advertising to new levels. In the middle of the second wave, they also invented AdSense, a way to bring affiliate networks to blogs (approximately \$7 billion worldwide).

This activity has begun to cannibalize the advertising that went into magazines and newspapers (and, perhaps, television), but it also brings something new. For example, it supports a wide set of blogs online that otherwise could not have raised as much advertising revenue.

The advertising economy also creates value through better targeting than was possible offline. For example, television and radio commercials must spray their messages over a general area. In contrast, online sites can see exactly which stories a user clicks on, and make a reasonable guess as to where that user lives or works. Online advertising adjusts accordingly. As targeting improves, the potential for less wasteful and more useful information going to consumers is tremendous.

Cannibalization

Much of the revenue generated by the online economy during the first wave was new. At the same time, plenty was just a restructured—and better delivered and more efficient or more convenient—version of activities previously performed offline.

New users went online during the dialup era for many reasons, email and browsing being the most prominent. Some went online for other reasons, such as shopping or news and entertainment. The Internet was new and just plain exciting for many households.

Electronic retailing cannibalized a lot of offline retailing. Many entrepreneurs foresaw electronic retailing's potential and set up business to facilitate the purchase of books, DVDs, electronic goods, and just about any service, such as airline reservations. The Web let buyers and sellers meet virtually. Entrepreneurs devoted time to matching buyers and sellers of second-hand goods, overstocked goods, and idiosyncratic goods. Altogether these new retailing services drove many offline retailers out of business.

To be sure, some new applications have continued to emerge during the second wave. A range of Web 2.0 applications, such as Facebook and Wikipedia, qualify as new in the sense that no similar offline applications exist. Let's be clear, however, that most of these applications appeal to existing users, enhancing their experience and changing their willingness to pay. They do not support much advertising yet, but more is expected.

In many respects, however, the second wave has been more about cannibalization, especially of media. To be sure, many households spend time online doing the

same things they did with dialup, only they do more of it now than they used to. Broadband made many applications easier, faster, and more functional. Meanwhile, electronic commerce's cannibalization has expanded to include different targets, such as music, news, and video markets.

Value creation overall

For two decades, a symbiosis has existed between online advertisers, online retailers, and access providers, and that symbiosis has shaped the general tenor of the value creation from which society benefits. Better advertising and more retailing raised users' willingness to pay for access, while more subscribers brought more potential customers to online retailing outlets and gave online advertisers more opportunity to find large audiences.

New services, such as those found during the first wave, were almost pure value creation. The number of users who subscribe to an Internet service provider (more than seventy million) or the size of the revenue (more than forty billion) provides a good sense of the scale.

Online services that cannibalized offline services also provided a new gain, but—wait a minute—the amount of online activity is not the same as the value created. A lot would have happened offline had the broadband Internet never been built. The net improvement was a lot lower than the levels of online activity.

More to the point, the first wave of investment brought considerable economic value. Not necessarily with the second. The first wave introduced new services to consumers whereas the second mostly cannibalized service already in existence offline.

Thus, the first wave was not necessarily prologue for the second wave. Rather, the first wave of the Internet created economic value because it helped create services where there had been none. This difference between waves is related to why the future might not resemble the past. The broadband economy created value, but this value might not be much if broadband only (or mostly) incrementally improves what already exists.