

The (un)predictability of technology

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The growing importance of the Internet makes it imperative to study the myriad factors that will influence its future. But while doing that, it might be worthwhile recalling just how hard it is to predict the effects of social, economic, regulatory, or technological developments. It is not just that technological developments are often surprises, but, in addition, people react in unpredictable ways.

It is well known that the Internet bubble developed out of unrealistically high expectations for the spread of technology. But very often expectations for novel goods or services have been too low, as was certainly true in most of the telecom industry in the early 1990s, when the Internet was dismissed as an insignificant playground for researchers. And one of the key mistakes in the history of AT&T was to take seriously consultants' predictions that by the year 2000 there would be only 800,000 cellular subscribers in the United States. Furthermore, it is not just industry that has repeatedly been wrong, academic researchers have not done any better in predicting which technologies would succeed. (Just witness the fate of techniques such as RSVP, multicast, and many others, which absorbed so much effort over the years.)

Such faulty predictions are not exceptions, but rather the rule. As an example, in the early days of railroads, both opponents and advocates of that revolutionary new technology expected that many fewer horses would be needed. (The opponents regarded this as a serious defect of the new system, the proponents as an advantage.) As it turned out, both sides were wrong, as demand for horses grew vigorously, in order to cope with the "first mile" problem that railroads had. (Rail transport was great once you got to the rail, but you had to get there by some other means, as rails were not ubiquitous.) More recently, the "paperless office" has been a surprise through its stubborn refusal to appear.

It is common even for the inventors and promoters of new technologies to not understand how they are going to be used, and "stumbling to success" may be said to be the usual pattern. A few forecasting mistakes are systematic, and have been repeated for centuries (such as the overvaluation of content, and the underappreciation of the importance of locality), even in the face of contrary evidence and explicit arguments. Others are more baffling, apparently the results of mysterious workings of human psychology and network effects (as in the popularity of Orkut in Brazil but not in the United States).

It is worth keeping such examples in mind, for many of the policy choices we face have historical precedents. As one example, our recent concern about "net neutrality" was preceded by attempts to impose what we might call "rail neutrality." An understanding of how previous predictions and policies went wrong might provide some humility in attempting to predict and shape the evolution of the Internet.