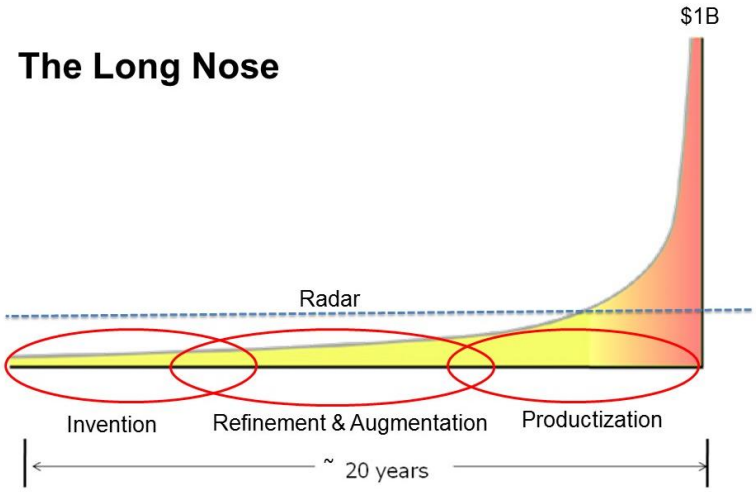
BusinessWeek
About Our New Lifestyle Channel
VIEWPOINT January 2, 2008 (Revised May 30, 2014)

The Long Nose of Innovation[1]

The bulk of innovation is low-amplitude and takes place over a long period. Companies should focus on refining existing technologies as much as on creation

by Bill Buxton



In October of 2004, Chris Anderson wrote an article in *Wired* magazine called *The Long Tail*, a theory he expanded upon in his 2006 book, *The Long Tail: Why the Future of Business is Selling Less of More*. In it he captures some interesting attributes of online services, using a concept from statistics which describes how it is now possible for the "long tail" of a low-amplitude population to make up the majority of a company's business. One of his examples came from music: A large quantity of often obscure but nonetheless listened-to music can outperform a much smaller quantity of huge hits. The implications of the phenomenon have been significant for those interested in understanding the meaningful attributes of online vs. brick-and-mortar businesses and the book has apparently had an enormous impact among executives and entrepreneurs. But those looking to apply the theory to the implementation of innovation within an organization should beware. My belief is there is a mirror-image of the long tail that is equally important to those wanting to understand the process of innovation. It states that the bulk of innovation behind the latest "wow" moment (multi-touch on the iPhone, for example) is also low-amplitude and takes place over a long period—but well before the "new" idea has

[1] This is a revised version of the original article. While keeping close to the original text, I have corrected some points of history, added some references, and expanded on a few key points. A link to the original text appears in the footer, below.

http://www.businessweek.com/stories/2008-01-02/the-long-nose-of-innovationbusinessweek-business-news-stock-market-and-financial-advice

become generally known, much less reached the tipping point. It is what I call The Long Nose of Innovation.

A MOUSE FAMILY TREE

As with the Long Tail, the low-frequency component of the Long Nose may well outweigh the later high-frequency and (more likely) high-visibility section in terms of dollars, time, energy, and imagination. Think of the mouse. First built in around 1965 by William English and Doug Engelbart at the Stanford Research Institute (SRI), it was publicly demonstrated to wide acclaim in 1968[2], and within a year had been duplicated (with Engelbart and English's assistance) in at least two locations: the National Research Council of Canada and the University of Geneva. Then, in 1973, Xerox PARC adopted the mouse for their prototype Alto Computer, on which the foundations of the Graphical User Interface were laid.

What is significant and little known is that the mouse was independently "invented" in Germany, by Rainer Mallebrein of Telefunken, and was shipped with the Telefunken TR86 computer in 1968 – at almost exactly the same time as the famous Engelbart demo, five years before Xerox PARC adopted the mouse, and fully sixteen years before the 1984 launch of the first computer to bring the mouse to the broader public's attention – the first Macintosh. And yet, even then, it was not until 1995, with the release of Windows 95, that the mouse became ubiquitous.[3]

On the surface it might appear that the benefits of the mouse were obvious—and therefore it's surprising it took 30 years to go from first demonstration to mainstream. But this 30-year gestation period turns out to be more typical than surprising. In 2003 my office mate at Microsoft, Butler Lampson, presented a report to the Computer Science and Telecommunications Board of the National Research Council in Washington which traced the history of a number of key technologies driving the telecommunications and information technology sectors.[4]

UNDERSTANDING IMMATURE TECHNOLOGIES

The report analyzed each technology (time-sharing, client/server computing, LANs, relational databases, VLSI design, etc.) from first inception to the point where it turned into a billion dollar industry. What was consistent among virtually all the results was how long each took to move from inception to ubiquity. Twenty years of jumping around from university labs to corporate labs to products was typical. And 30 years, as with the mouse and RISC processors, was not at all unusual (and remember, this is the "fast-paced world of computers," where it is "almost impossible" to keep up).

---

[2] http://sloan.stanford.edu/mousesite/1968Demo.html

[3] For a more detailed chronology of the mouse, as well as some other input devices, see: http://www.billbuxton.com/inputTimeline.html

[4] For this report and a related predecessor (both available for free download) see:
Committee to Study High Performance Computing and Communications (1995). *Evolving the High Performance Computing and Communications Initiative to Support the Nation's Information Infrastructure*. Washington DC: The National Academies Press.
Computer Science and Telecommunications Board of the National Research Council (2003). *Innovation in information technology*. Washington DC: The National Academies Press.

http://www.businessweek.com/stories/2008-01-02/the-long-nose-of-innovationbusinessweek-business-news-stock-market-and-financial-advice

Any technology that is going to have significant impact in the next 10 years is already at least 10 years old. Any device that is going to have significant impact in the next 5 years already has a 15 year history, and yet, is still below the radar, where most people do not see it, despite it being right in front of them. Furthermore, even if seen, these long histories do not mean that the technologies we might draw on are mature, or that we understand their implications. This is just the start.[5]

Here's the message to be heeded: Innovation is not about alchemy. In fact, innovation is not about invention. An idea may well start with an invention, but the bulk of the work and creativity is in that idea's augmentation and refinement. The newer the idea, the coarser the granularity of most analysis, and the more likely people are to say, "oh, that's just like X" or "that's been done before," without any appreciation for how much work and innovation is involved in taking an idea from concept to wide practice.

If we briefly revisit the mouse, for example, it is important to understand that it didn't matter that most people who saw it knew immediately that it was a good idea. It didn't matter that the benefits could be demonstrated. It still wasn't ready for prime time. Not only did the mouse need to be refined, so did practically the entire ecosystem required to exploit its potential: the components of the graphical user interface, graphics displays and processors, applications, operating systems, etc. One generally needs a "perfect storm", created by the maturing of all of the key components of the ecosystem, before any "invention" reaches the tipping point of broad adoption.

REWARDING THE ART OF REFINEMENT

The heart of the innovation process has to do with prospecting, mining, refining, and goldsmithing. Knowing how and where to look and recognizing gold when you find it is just the start. The path from staking a claim to piling up gold bars is a long and arduous one. It is one few are equipped to follow, especially if they actually believe they have struck it rich when the claim is staked. Yet the true value is not realized until after the skilled goldsmith has crafted those bars into something worth much more than its weight in gold. In the meantime, our collective glorification of and fascination with so-called invention—coupled with a lack of focus on the processes of prospecting, mining, refining, and adding value to ideas—says to me that the message is simply not having an effect on how we approach things in our academies, governments, or businesses.[6]

Too often, universities try to contain the results of research in the hope of commercially exploiting the resulting intellectual property. Politicians believe that setting up tech-transfer incubators around universities will bring significant economic gains in the short or mid-term. It could happen. So could winning the lottery. I just wouldn't count on it. Instead, perhaps we might focus on developing a more

---

[5] While it may appear that things moving ever faster today, and the length of the nose shortening, this has more to do with the quantity of things moving slowly than a change in the length of the nose of any single technology. By sheer virtue of combinatorics, there is more change. But the nose of today's "hot new thing" is just as long today as it was in our grandparent's time.

[6] The notion of new discoveries being based on previous ones has a long history. In the 12th century Bernard of Chartres wrote about standing on the shoulders of giants, as did Newton in the 17th century. For an eloquent articulation of how "new" technologies typically evolve from new combinations of existing sub-assemblies, see: Arthur, W. Brian (2009). *The Nature of Technology: What it is and how it evolves*. New York: Free Press.

balanced approach to innovation—one where at least as much investment and prestige is accorded to those who focus on the process of refinement and augmentation as to those who came up with the initial creation.

To my mind, at least, those who can shorten the nose by 10% to 20% make at least as great a contribution as those who had the initial idea. And if nothing else, long noses are great for sniffing out those great ideas sitting there neglected, just waiting to be exploited.

Bill Buxton is Principal Scientist at Microsoft Research and the author of Sketching User Experiences: Getting the Design Right and the Right Design. Previously, he was a researcher at Xerox PARC, a professor at the University of Toronto, and Chief Scientist of Alias Research and SGI Inc.

http://www.businessweek.com/stories/2008-01-02/the-long-nose-of-innovationbusinessweek-business-news-stock-market-and-financial-advice