

Jumping Barriers

Using Design to Aid Technology Adoption

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Abstract

Every year, tens of thousands of new technologies are developed by companies, academic researchers, and private individuals. But until those technologies are incorporated into products—well-designed products—it is often as though those technologies don't exist. Worse, viable technologies can be put into poorly-designed products, calling into question their validity or, even worse, causing that technology to be dismissed or under-utilized for years. Good design can help overcome these barriers to adoption by creating a compelling argument for the product's use. Designers can craft products that utilize the technology to meet users' latent needs and thus making them desirable to own. I hypothesize that design becomes a means of introducing new technologies. This paper, directed towards the general business reader, makes a case for involving designers in the process of introducing new technologies.

Table of Contents

Abstract	2
Table of Contents	3
Introduction	4
The S-Curve of Adoption	5
The Barriers	6
Using Design to Jump Barriers	8
Conclusion	10
References	14

Introduction

Every year, tens of thousands of new technologies are created by businesses, research labs, universities, and private individuals. But until those technologies are incorporated into products—well-designed products—it is often as though those technologies don't exist. Worse, viable technologies can be put into poorly-designed products, calling into question their validity or, even worse, causing that technology to be dismissed or under-utilized for years.

DSL (Digital Subscriber Line) technology is an excellent example of this. DSL was introduced in 1989 for use with Video On Demand and interactive television. Those products were poorly-designed and the technology wasn't widely adopted. DSL resurfaced in the mid-1990s as a method of delivering broadband internet access. Again, adoption was slow, and it looked as though cable-delivered broadband would overcome DSL. But then in 1999, due to the cost of sending out technicians to install DSL, the major telecom providers introduced do-it-yourself DSL kits called "DSL in a Box." These well-designed little kits (image 1) contained not only the DSL hardware, but also very clear, step-by-step instructions for installing the modems and DSL filters for normal phone lines. The box itself was also a part of the instructions, indicating what items were packed in it and where to begin the installation. This kit not only saved phone companies millions of dollars in service fees, but also led to the widespread adoption of DSL. Currently, DSL has over 63 million subscribers worldwide and over 9 million in the US alone.

It's well known that there are many barriers to adoption for new technologies: culture, economics, tradition, existing systems, and competitors, to name a few. The means of overcoming these barriers have traditionally focused on marketing (to craft campaigns to promote and sell more products), economics (for example, removing



Image 1: DSL in a Box included cables, the modem, instructions for set-up, and telephone filters. Not shown: the packaging, which also contained helpful instructions for set-up.

tariffs and market distortions), education (teaching people how to use the product), or, interestingly, other technologies (forcing existing products to utilize the new technology) . But what has been overlooked is the importance of design in the adoption of new technologies. The design of a product can be an aid to overcoming these obstacles.

In this paper, I will use the term “design” to mean the activity of creating human-centric products through a process of research, visualization, prototyping, and testing. The outcome of this design process should be a well-designed product. By “well-designed,” I mean that the product strikes the right balance of useful, usable, and desirable in its support of human activities (Sanders, 1992).

Design does not, however, necessarily mean engineering design or software design, which can often produce products that are not human-centric in their outcomes. Examples abound of physical and digital products, like the classic potato peeler and Windows 3.1, that were “designed” by engineers and might have been useful, but weren’t especially usable and especially not desirable.

It is only when a product contains the right balance of useful, usable, and desirable that it stands the best chance of progressing through The S-Curve of Adoption.

The S-Curve of Adoption

Most technologies go through three stages of growth: an innovation phase, a growth phase, and a maturity phase. According to noted business futurist and author Harry Dent, it takes about the same time for a new technology or product to go from zero to 10% adoption (the innovation phase) as it does for it to go from 10% to 90% adoption (growth phase) and as it does from 90% to 100% (maturity phase) (1993). These three stages can be shown visually in what is

called an S-curve (figure 1) (Rogers, 1962).

First shown by Everett Rogers in *Diffusion of Innovations*, the S-Curve points out some crucial time periods for adoption, particularly the jump from innovation to growth (1962). Here is where many products and technologies are stopped by barriers to adoption.

The Barriers

In their book *Creating Breakthrough Products*, Jonathan Cagan and Craig Vogel outline three factors that allow for the creation of successful products: Social (social and cultural trends and drivers), Economic (state of the economy, level of disposable income), and Technology (state-of-the-art and emerging technology), collectively called the SET factors (2002). Ironically, it is these same three factors that present the barriers to technology adoption.

As barriers to adoption, the SET factors can cause otherwise viable products to fail. A poor economy can reduce disposable income and stop the purchase of new products. Other technologies, in the form of existing systems or as competitors, can cause new technologies to die on the vine through compatibility issues or merely through being first-to-market. Tradition and social norms can hinder adoption. When Betty Crocker tried to market her moist cakes in Britain, the English, used to drier baked goods, rejected them (Kelley, 2001).

Good design can help overcome each of the SET factors. In November 2001, Apple introduced an MP3 player called the iPod (image 2), priced at \$400 per unit. At the time, it was two months after the terrorist attacks on the World Trade Center, and the United States was reeling from an economic and psychic blow. Initially, the iPod was not well-received. As Rob Walker notes in his *New York Times* article "The Guts of a New Machine," one online skeptic suggested that the name might be an acronym for "Idiots Price Our Devices"

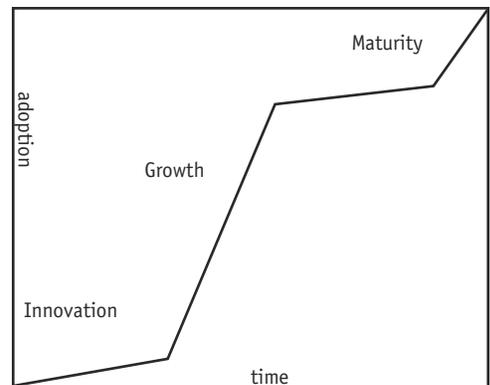


Figure 1: The S-Curve of Adoption (after Rogers, 1962)

(Walker, 2003). Apple was also late to the game when it came to digital music. Other companies like Creative Labs already had MP3 players on the market. But over two years later, despite the economic barriers (in the form of a poor economy) and technological barriers (from competitors like Dell (image 3)), the iPod has sold over two million units and become an icon of product innovation.

The reason most likely cited for the success of the iPod is its design. Phil Baker in the *San Diego Source* noted that, “the iPod is one of the best-designed consumer products of the decade. It brings together perfectly executed functionality and gorgeous industrial design into a package that all of us can use and enjoy” (2003).

Another excellent example of design overcoming barriers to adoption is the search engine Google. By the time Google launched in September of 1998, Lycos, Yahoo, InfoSeek, HotBot, Ask Jeeves, Excite, and LookSmart (to name a few) had all been online and operating with some considerable success. Some of these search engines were well-established, and had been for years. Web users were accustomed to using their favorite one and had invested time in learning how to use it. So how did new search engine technology succeed in breaking into this crowded market, so that by February 2003, Google was serving 250 million searches a day?

The answer is design. Google took the utilitarian look-and-feel of Yahoo (image 5) one step further, stripping down its interface to a text box, a button, some tabs, and a handful of links. It embraced a minimalist aesthetic that users immediately responded to. It did one thing very well. At a time when the other search sites were attempting to turn themselves into destination portals, Google focused solely on the users’ need to quickly search and get a comprehensive list of results. It presented the correct amount of interface to complete the task at hand—searching and displaying



Image 2: Apple’s elegant iPod



Image 3: Dell’s not-so-elegant Digital Jukebox



Image 4: Google’s minimalistic interface

results—and no more. It was seemingly modest in its goals and presentation. In doing so, its clean, unfussy design has won it Search Engine Watch’s Best Design award four years in a row. “Googling” has even entered the lexicon as a euphemism to search.

Social barriers may be the most difficult adoption impediment to overcome. When answering machines made their first commercial appearance in the late 1970s, they were not initially accepted. For over a century, the only voices that had been heard over a phone were live human beings. To reach a machine playing a recording instead of a person was considered rude and impersonal. It took nearly a decade before they were considered acceptable to have. Similarly, a decade ago it was startling to see someone walking down the street, having a conversation on a cellular phone. But as their design became better, the phones got smaller (and thus more mobile and usable), their interfaces more robust (and thus more useful), and their appearance more pleasing to the eye (thus more desirable). It’s now commonplace to see cell phones used in public; indeed, it is hard to find a location where one is not in use.

Using Design to Jump Barriers

As we’ve seen, design can help technologies push their way through the S-Curve of Technology Adoption. But how?

Certainly, designers can make a product more appealing and more attractive to own. As Don Norman points out in his book *Emotional Design*, attractive things work better (2004). They put users at ease, and thus make them better able to deal with any problems they encounter with the product. The designer’s contribution to the aesthetics of a product is often belittled, but its importance for the eventual adoption of new technology shouldn’t be underestimated.

This aesthetic can also make a product compellingly different



Image 5: Yahoo’s utilitarian, yet cluttered, interface

from other competing products. A product that differentiates itself is often one that is easier to sell and is noticed more by potential users. But more importantly, it encourages experimentation and play with something new. It lowers social barriers.

Of course, paired with a successful marketing and advertising plan, a compelling product can quickly revolutionize the whole product category. The Macintosh, with its famous “1984” commercial and take-over of every advertisement in Newsweek, are the classic example of this; practically overnight, PCs without a graphical user interface seemed outdated and difficult to use. Since many technological advances are hidden or invisible to the naked eye, an appealing product gives marketers something to market.

But aesthetics are only a part of why consumers choose a product: it also has to fit their way of viewing the world (Kälviäinen, 2002). When introducing a new technology, how it’s presented and in what form are crucial. Radically new technology should be introduced incrementally, so that users acclimate it into their worldview. Famed industrial designer Raymond Lowey (1893-1987) coined the term *MAYA*: Most Advanced Yet Acceptable that designers have used ever since to create forms that both entice and comfort users. Often this is accomplished by using familiar forms to introduce new technology. For decades, the automobile resembled the horse-drawn carriages it replaced. Television sets were initially placed in wooden casings that resembled the radios that were already in people’s homes. Email doesn’t resemble mail in the slightest, nor do the web pages of the internet much resemble the pages of a book any longer. Yet, by using these familiar forms, designers could overcome social barriers to acceptance.

There is an art to mixing familiar and novel forms: the art of design. The re-introduced Volkswagon Beetle (image 6) is one



Image 6: The New Beetle, a good example of the MAYA principle

example of this. The new Beetle is on one hand a classic use of the original form, and on the other a fresh, radical new look at small cars. It is up to the designer to make the appropriate form choice.

Designers can use the older forms to begin to craft a story about the technology and its use. “See, it’s sort of like a radio, but with pictures...” These narratives of use can drive how the technology is shaped, presented, and sold. These stories can help find the space between users and technology, so that designers can create the appropriate interface to the technology, be it a new manufacturing process or a new telephony application. The product’s story is one of potentialities, of what is possible.

Designers can make a case as to why a technology should be adopted *in the product itself*. The product, aside from any marketing or positioning *is* the argument for its use. The reason for adopting it is in the pleasurable experience of using it. One need only use a mouse or a Good Grips peeler for less than a minute to understand why using them is better than what preceded them. A well-designed product connects with the latent needs of users so that they feel like they’ve been waiting for this particular product for years. They feel that new things are possible with this technology. Barriers become irrelevant.

Conclusion

The iPod, Google, and DSL are all examples of technologies embedded in products that overcame barriers to adoption: social, technological, and economic. They did it by their designers crafting a story of their use, then presenting that story to their potential users. The iPod’s compelling interaction and industrial design reinvented how people think about music. Google’s minimal interface design, born from the familiar web form, positioned it as the most simple

yet powerful application on the internet. And DSL, without the effective communication design surrounding its hardware, might be just another also-ran instead of a viable technology for delivering broadband access. Designers, using the MAYA principle, made these advanced products aesthetically appealing, yet comfortable. The experience of using them was such that, after using them, one couldn't imagine not using them; they became their own best argument for adoption.

Thus, the difference between a technology succeeding or failing can be the design of the product that contains it. While a poorly-designed product can sometimes be commercially successful, it could also hinder further technological innovations; discredit valid technology, ideas and research; cost its creators billions of dollars; and, in the worst cases, cause human injury or death. The best chance for a new technology's success lies in an alignment of market and social conditions and the proper interface to the technology, crafted by a designer to meet the unmet needs of potential users. Only then can the product share the prestige and success of Google, the iPod, DSL, and countless other products that we use and enjoy every day. Only then can the barriers be jumped.

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