A Bitter Pill to Swallow: The Rise and Fall of the Tablet Computer

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Footnotes begin on page 24.

Tablet computers (or tablet PCs) are a form of mobile personal computer with large, touch-sensitive screens operated using a pen, stylus, or finger; and the ability to recognize a user's handwriting—a process known as "pen computing."

The first of these devices, which appeared at the end of the 1980s, generated a huge amount of interest in the computer industry, and serious amounts of investment money from venture capitalists. Pen computing was seen as the next wave of the silicon revolution, and the tablet computer was seen as a device everyone would want to use. It was reported in 1991 that "Nearly every major maker of computers has some type of pen-based machine in the works." [1]

Yet in the space of just a few years, the tablet computer and the notion of pen computing sank almost without a trace.[2] Following a series of disastrous product launches and the failure of a number of promising start-up companies, the tablet computer was discredited as an unfulfilled promise. It no longer represented the future of mobile computing, but instead was derided as an expensive folly—an irrelevant sideline in the history of the computer.

This article traces the early development of pen computing, the appearance, proliferation, and disappearance of the tablet computer, and explores possible reasons for the demise of this particular class of product.

Product Failures in the History of Computing

This article is concerned with the design, production, and consumption of artifacts, and the numerous factors which can affect their success or failure in the marketplace. For any company bringing a product to market, the amount of time and money invested in the research, design, and development of the product itself and in the market research, promotion, packaging, distribution, and retailing of a product means that an unsuccessful product launch is an extremely serious but unfortunately all too real prospect. The risk perhaps is understandably more common when the artifacts are complex technological products in a fiercely competitive field, and where the technology itself is still relatively young, not yet stable, and in a constant state of flux. Consequently, the historical development of the personal computer is (quite literally) littered with examples of products that have failed in the marketplace.

Occasionally, because of poor manufacture, misdirected marketing or promotion, and software not meeting consumer expectations, some of these products could be said to have "deserved" to fail. However, advances in production technologies and quality control in recent years have reduced manufacturing failures (notwithstanding some very well publicized events such as the poor battery life of earlier "iPods," the cracked screens of the first iPod "Nano," and exploding batteries in some Sony laptops[3]). But despite advances in manufacturing quality, there still are numerous examples of well-designed products (often winning design awards) which were heavily promoted and performed as promised, yet still failed in the marketplace. Obviously, merely solving pragmatic problems is no guarantee of success.

Product Failures and Theories of Technological Change

A great deal has been written from a number of different perspectives about why technological products fail in the marketplace. These include economic and business analyses, marketing critiques, design critiques, and sociological enquiries. This body of work is far too large to describe in any depth here, but concludes that there are multiple reasons in each case for product failure in the marketplace.

In *The Invisible Computer*, Donald A. Norman refers to the notion of "disruptive technologies"—technologies which have the ability to change people's lives and the entire course of the industry.[4] It is Norman's contention that this ability to disrupt inherently produces products to which there initially is a large amount of resistance. Norman also believes that company attitudes, including internal politics, the preference for an existing, tried and tested market over the need to develop a new one, and the need to produce profits quickly rather than investing in new products which may take a number of years to reach maturity means that new technologies are not taken seriously enough.[5]

Norman's argument is that, in order to be accepted in the marketplace, three factors have to be right: the technology, the marketing, and user experience. As an example, he quotes the well-known story of the Xerox "Star" computer designed at Xerox PARC in the early 1980s. The Star was a product well ahead of its time, having the first commercially available graphical user interface (GUI), and a design philosophy of user interaction that set the standard for an entire generation of PCs. Unfortunately, it was a consumer product before the consumer existed. The product had not gone through the process of exposure to the marketplace, which normally occurs when a new technology appears, is accepted by "early adopters" of technology, and then is refined for the mass market. The same thing happened a few years later when Apple introduced the "Lisa"—a larger, more expensive precursor to the Macintosh. In both cases, the technology wasn't quite ready. They both were painfully slow, had limited functionality because no one had written applications for them, and were extremely expensive. Therefore, there was no benefit for "early adopters" of technology in using these products, despite the novelty of the GUI , as the lack of application software meant that they didn't do anything other computers couldn't already do. The fate of the Star and the Lisa would have been shared by the Macintosh, had it not been saved by the advent of a "killer application," making it indispensable to specific groups of users. This was desktop publishing software and the invention of the laser printer.[6] Norman's view is that the Star and the Lisa both had superb user experiences, but insufficient technology and marketing.[7] Not having all three was the reason for failure.

This underscores the fact that the reasons for failure in the marketplace of any product are more complex than at first might be imagined. We will explore this notion in other theories that address the same issues.

The theory of the social construction of technology takes the view that a complex range of factors are involved in the success of products, and that social factors have precedence in the process. As a counterpoint to a physical reality affecting outcomes (i.e., the technology itself), social constructionists see a web of relationships between people and between institutions that share beliefs and meanings as a collective product of a society, and that these relationships are the basis for subjective interpretations rather than physical or objective facts. The notion of the "truth" of a socially constructed interpretation or piece of knowledge is irrelevant—it remains merely an interpretation.[8] It is an interpretation, though, which has significant agency.

This is in direct contrast to the theory of technological determinism—the view that technology and technological change are independent factors, impacting on society from the outside of that society—and that technology changes as a matter of course, following its own path, and in doing so changes the society on which it impacts. (A good example is the notion of "Moore's Law," which states that the power of a microchip doubles every year as if it were a "natural" phenomenon). There is an element of truth contained within this, in that technological products do affect and can change our lives, but it is simplistic to imagine that other factors are not at play. Put more simply as "interpretive flexibility," the argument of social constructionism is that different groups of people (i.e., different relevant social groups of users) can have differing views and understandings of a technology and its characteristics, and so will have different views on whether or not a particular technology "works" for them. Thus, it is not enough for a manufacturer to speak of a product that "works": it may or may not work, depending on the perspective of the user.[9]

The above arguments on social constructionism perhaps have been most widely promoted by the sociologists Trevor Pinch and Wiebe Bijker,[10] who use examples such as the developmental history of the bicycle to show how a linear, technological history fails to show the reasons for the success or failure of different models, and that a more complex, relational social model is required.

A slightly different view is held by others, such as the historian of technology Thomas Hughes, who sees technological, social, economic, and political factors as parts of an interconnected "system." In this instance, different but interconnected elements of products, the institutions by or in which they are created, and the environments in which they operate or are consumed are seen as a complete, interdependent network. However, a technological system remains a socially constructed one: "Because they are invented and developed by system builders and their associates, the components of technological systems are socially constructed artifacts." [11] There still is a distinction here between the human and nonhuman components of a system: "Inventors, industrial scientists, engineers, managers, financiers, and workers are components of but not artefacts in the system." [12]

By comparison, Actor Network Theory, associated with the sociologists Bruno Latour, John Law, and Michael Callon, breaks down "the distinction between human actors and natural phenomena. Both are treated as elements in "actor networks." [13] In Actor Network Theory (ANT), all parts of a system or network are equally empowered as actors having an influence on technology—there is no distinction between small or large elements, animate or inanimate, or real or virtual. Technology is conceived of as a growing system or network. The actors (and the relationships between the actors) "shape and support the technical object." [14] An important aspect of the theory is that:

> The actor network is reducible neither to an actor or a network alone nor to a network. Like networks it is composed of a series of heterogeneous elements, animate and inanimate, that have been linked to one another for a certain period of time. The actor network can thus be distinguished from the traditional actors of sociology, a category generally excluding any nonhuman component and whose internal structure should not, on the other hand, be confused with a network linking in some predictable fashion elements that are perfectly well defined and stable, for the entities it is composed of, whether natural or social, could at any moment redefine their identity and mutual relationships in some new way and bring new elements into the network. An actor network is simultaneously an actor whose activity is networking heterogeneous elements and a network that is able to redefine and transform what it is made of.[15]

In other words, the role of any particular actor in a network is not fixed, but indeterminate and changeable, being at times dominant or, at other times, insignificant in its agency.

These theories are useful in the analysis of the introduction of complex new technologies, and the tablet computer is an excellent case in point, having a particular level of complexity. As a product, the tablet computer brought together a number of discrete technological advances, each having its own history of development: pen interfaces, handwriting recognition, and touchscreen technology.

The History of Pen Computing: Early Developments in Pen Interfaces

The principle of using a pen device rather than a keyboard to interact with a computer may appear to be a relatively recent development. As a matter of fact, pens were one of the earliest devices to be used in this way, many years before the invention of the computer mouse. Light pens (or light guns) were used in the experimental "Whirlwind" computer built at MIT between 1946 and 1949, when it became operational, for analyzing aircraft stability for the U.S. Navy. In this system, a light pen pointed at a symbol of an aircraft on a display screen produced identifying text about that aircraft. This machine formed the basis of the later TX-0 machine started in 1953 and the SAGE (Semi-Automatic Ground Environment) air defense system (Figure 1) started in 1958; both developed at MIT's Lincoln Laboratories. In the SAGE system, the light gun was used to convert the "blip" on a cathode ray tube (CRT) showing the location of an aircraft or missile into X-Y coordinates. When a blip appeared, a "light gun" was pointed at that point on the screen, and an inter-

Figure 1
The SAGE Air Defense System of 1961 used a light pen on a radar display screen to register the position of aircraft and missiles. Image courtesy of Computer History Museum.

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