

Failures and Successes Technologies Experience in Societal Adoption

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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I. Introduction

Technologies frequently fail to be adopted because of the connection between societal circumstances and publication of the product. Successful technologies, such as television and social media, were eventually adopted on a mass scale, but they both experienced the years in their adoption life cycles in which only a few people used the product. This delay in widespread adoption could be caused by reasons such as price, societal rejection of change, and incompatibility with culture. There are many instances of technology productions never leave that beginning stage in the technology adoption life cycle; then one company causes the technology to jump into the middle stages (mass adoption). Examining society and its reaction to those failed releases versus the one that finally made the technology mainstream, can hold incite for engineers looking to invent and produce.

This research analysis will study the way successful products and their producers interacted with the public during their launch. It is also imperative to analyze the path their failed counterparts took and the reasons why they were not adopted. This will be accomplished by following the timelines of two inventions, the video telephone and the tablet: failing until one company's release resulted in wide spread adoption. These technologies were finally successful because of changes in societal views of the product, the societal technology norms shifting to fit with the product, or the inventors learning from past companies' marketing mistakes. Engineers can, therefore, use the adoption of both the successful and failed productions as a model to increase likelihood of success for their own products.

II. Context

The technology adoption life cycle is a visual model demonstrating society's acceptance of new inventions. This sociological model uses the demographic and psychological characteristics of adopter groups in order to show the process of how many people tend to start using a technology in the time after it is released. The adoption curve is based off of Roger's Theory of Diffusion of Innovation, which describes how new innovations and ideas are accepted and adopted by groups and cultures through communication over time among the members of a social system (Lai, 2017; Maeli, 2018). This diffusion is spread through individuals observing others adopting personally or through social media (Straub, 2009). The process of adoption over time for successful technologies is illustrated as a normal distribution, where few people start using new technological devices immediately after production, then gradually the majority of people start using it, before finally the reluctant people start using it (Figure 1).

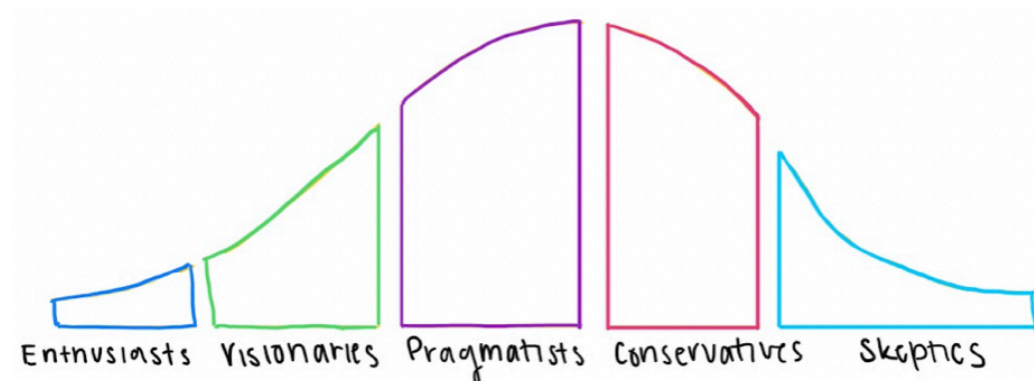


Figure 1. The Technology Adoption Lifecycle Model. Demonstrates the way in which people in a society adopt new technologies, where the x-axis represents the amount of time a technology has been produced and the y-axis represents the number of people who adopt the invention at that time.

Widely adopted technologies such as the television and social media demonstrate this curve. The first televisions for consumer use were presented in 1939; however, World War II societal circumstances caused TVs not to go into production until 1945 (Reinhardt & Ganzel). Figure 2 demonstrates that by 1950 only nine percent of U.S. households had a television; the

same year prices were decreased. Televisions were then rapidly adopted resulting in 90 percent of Americans having televisions in their homes in 1963. Adoption continued at a slower rate through 1978 when 98 percent of households had TVs. This is the exact cycle that the technology adoption curve predicts.

Number of TV Households in America					
Year	Number of TV Households	% of American Homes with TV	Year	Number of TV Households	% of American Homes with TV
1950	3,880,000	9.0	1964	51,600,000	92.3
1951	10,320,000	23.5	1965	52,700,000	92.6
1952	15,300,000	34.2	1966	53,850,000	93.0
1953	20,400,000	44.7	1967	55,130,000	93.6
1954	26,000,000	55.7	1968	56,670,000	94.6
1955	30,700,000	64.5	1969	58,250,000	95.0
1956	34,900,000	71.8	1970	59,550,000	95.2
1957	38,900,000	78.6	1971	60,900,000	95.5
1958	41,920,000	83.2	1972	62,350,000	95.8
1959	43,950,000	85.9	1973	65,600,000	96.0
1960	45,750,000	87.1	1974	66,800,000	97.0
1961	47,200,000	88.8	1975	68,500,000	97.0
1962	48,855,000	90.0	1976	69,600,000	97.0
1963	50,300,000	91.3	1977	71,200,000	97.0
			1978	72,900,000	98.0

Figure 2. Number of Households in America with TVs from 1950-1978 (*Television History*).

A more modern representation of the technology adoption curve is social media. The first recognized social media platform was created in 1997. Figure 3 demonstrates, however, by 2005 just five percent of American adults used a networking platform. Between 2005 and 2014, there was a mass adoption leading to 62 percent of the public using social media. Today 72 percent of American adults use some type of social media. Therefore, figure 3 demonstrates how the adoption of social media directly follows the bell curve of the adoption life cycle since before the data starts there is low adoption, then there is a spike, before the rate of adoption evens out.

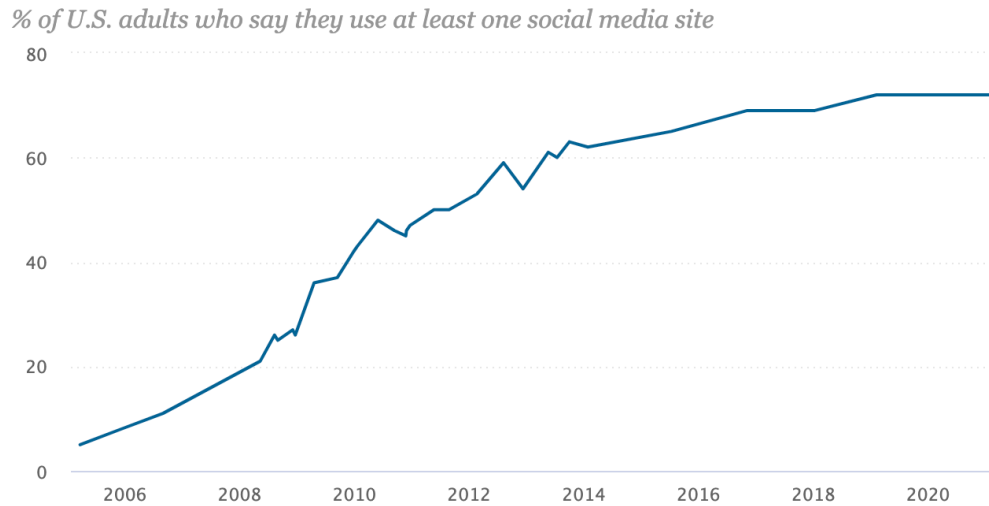


Figure 3. Percentage of U.S. Adults who Use Social Media (*Demographics of social media users and adoption in the United States 2021*).

Technology adoption is a complex, social, developmental process. It is influenced by individuals' unique yet malleable perceptions of technology, which is based on their personal beliefs, prior experiences, characteristics of the innovation, peers, and societal norms (Straub, 2009). Therefore, cultural conditions determine whether, when, how, and in what form a new item will be adopted; the closer the innovation is compatible with the structure of the culture, the greater the chance of societal acceptance (Graham, 1954). Successfully facilitating a technology adoption needs to address cognitive, cultural, and contextual concerns. Even if an innovation is useful, any one of these concerns can lead to unacceptance (Straub, 2009).

Technologies are successful not by objective measures of their goodness or efficiency, but is rather a more complex process involving the perception of each technology as it relates to the interests of individuals and social groups (Johnson). "Technology and society are mutually constitutive; they cocreate one another" (Johnson, p. 1792). Technology adoption incorporates two essential elements, the acceptance of the technology by individuals and its insertion in society. As social computing technologies become increasingly embraced by individuals and embedded in everyday lives and activities, technologically enabled social structures are emerging

that are changing the way individuals interact and communicate (Vannoy, 2010). Understanding the adoption patterns allows innovators to successfully implement a technology by first addressing societal uncertainties regarding the product in order to “reconcile opposing views and conflicting demands of the various stakeholder groups among the public” (Ruggeri et al., 2018, p. 40).

Each stage of the Technology adoption life cycle comes with its own psychological description and reasoning; “understanding these stages helps you avoid pitching your idea to the wrong group early on” (Maeli, 2018, p. 15). Technologies may not be successful if the innovations are not adopted by the intended users (Sharma 2018).

A 1954 study where sociologists researched demographic differences between the households that adopted versus rejected the television as seen in Figure 4. Researchers found that the families whose culture prior to the introduction of television was compatible with the behavior required for its use, passive recreational patterns such as listening to the radio and attending motion pictures, would accept it to a greater degree than others. Acceptors of the television mentioned that they had acquired it partly because it could educate themselves and their children. However, highly educated individuals rejected television on the grounds that it was not educational enough (Graham, 1954).

Trait	Accepters (n = 81)	Rejecters (n = 69)	Chi-Square
Education in years			
0-8.....	26	18	
9-12.....	53	33	
13 and over.....	21	49	p < 0.001
	100	100	
Weekly Incomes			
\$0-75.....	70	52	
\$76 and up.....	30	48	p = 0.02
	100	100	
Reading type*			
Passive.....	69	27	
Active.....	31	73	p < 0.001
	100	100	
Radio listening (hours per day)			
0-5.....	44	67	
6-16.....	56	33	p = 0.03
	100	100	
Movie attendance (in average 2-month period)			
0-5 times.....	43	80	
6 and over.....	57	20	p < 0.001
	100	100	

* *Active* designates non-fiction reading; *passive* includes fiction reading, cursory reading of newspapers, or no reading.

Figure 4. Cultural Characteristics of Acceptors and Rejecters of Television (Graham, 1954).

Technologies are often demonized by people in society who reject change in the earlier stages of their adoption. However, increased positive attitudes are associated with greater exposure to a technology. This exposure effect “suggests that innovations in contemporary society have the capacity to create their own constituency once an initial foothold is gained” (McQuarrie & Iwamoto, 1990, p. 221).

III. Theory/Framework

Social construction of technology argues that human action shapes technology. It also argues that the ways a technology is used cannot be understood without understanding how that technology is embedded in its social context. This means that a variety of social factors and

forces shape technological development, technological change, and the meanings associated with technology. Therefore, “engineers invent and build things that fit into particular social and cultural contexts” (Johnson, p. 1792).

On the other end of this argument, technological determinism assumes that a society’s technology determines the development of its social structure and cultural values. Technological determinism states that when technologies are adopted by societies it brings about social change and patterns of social behavior. Technological change may create a cultural lag until culture catches up (Johnson).

This analysis combines these two theories with Mutual Determinism, which refers to the way two objects or ideas can influence each other. This concludes that technologies have mutual deterministic relationships with society and the people using them. Society has a set of rules and desires that technological devices have to fit into. However, many rules are dynamic and can be adjusted when people start adopting the innovations. The technology, therefore, changes public opinion and in turn creates room for new devices that people now have new standards for.

IV. Methods

In order to understand how engineers can use the adoption of both successful and failed technologies to increase likelihood of success for their own products, the interaction between consumers and the production of the video telephone and tablet. Both of these technologies were produced by different companies multiple times since their inventions. By analyzing the marketing, societal circumstances, culture etc. of each failed versus the first widely spread production, there can be a conclusion on some ways engineers can increase their technologies change of being adopted.

V. Evidence/Data

The iPad was not the first tablet computer; it was, however, the first widely adopted one. The idea for the tablet was created by Alan Key in 1962 (Vogelstein, 2013). Since the 1980s many tablets have been produced but were not massively bought like the iPad. Palm Computing launched the first tablet computer in 1989: the GridPad. People attribute the failure of this product with the high price and bulkiness (Bort, 2013). In 1994, when Jobs was not CEO, Apple made their first attempt at created a tablet that did not replace a laptop with the Newton MessagePad. It was a personal digital assistant that the user could write on with a stylus. This tablet failed because of pricing and the handwriting recognition, the key feature, poorly working (Mosley, 2021).

The first somewhat successful tablet was the PalmPilot. Palm computing learned from its mistakes with GridPad and made an affordable, simple option that people attribute its mediocre success to. Microsoft then launched a tablet that contained a version of their personal computer operating system. This is where Gates went wrong; he was trying to replace the laptop with the tablet, thinking that people would want to do the same things on the tablet as the computer. This made it more expensive, but it also made people wonder why they needed it if they already had a laptop (Gralla, 2011).

In 2010, however, Steve Jobs thought of a new way to think of the tablet: a device that combined the best of both the Mac and the iPhone. He presented it a device more intimate than a laptop, and more capable than a smartphone. It did almost everything that the Mac did, but lighter, better battery life, touchscreen, and always connected to the internet. The public was still skeptical about the tablet since they had not wanted any other tablet released; their main

question was why did they need it. Jobs sold the idea of a package deal for the iPad, iPhone, and Mac, all connected with the same log in info. Marketing a technology as a form of collecting is something that encourages people to this day to buy all Apple products.

Jobs thought that the iPad could revolutionize the way people watched movies and television and read literature. In order to promote this, he created the iBooks app, making features such as pages curl like a real book when flipped and color drawings enhanced by having an illustrated Winnie-the-Pooh as a free book.

The iPad would not have worked without the iPhone. The technology that Apple perfected for the touchscreen and other features would have made the iPad too expensive. However, with the technology from the iPhone and with the selling of so many iPhones driving the price of components down, Apple was able to make the iPad affordable. Not only the iPhone, but the iPad would not have been successful without learning from the mistakes of the previous tablets. Jobs saw what happened with the others and found a way to make and market Apple's as difference and necessary.

When the iPad went on sale, is sold 1 million in the first month and 19 million in the first year. In 2011 the iPad beat out the DVD player as the hottest selling consumer electronics device (Vogelstein, 2013). Jobs examined the trends of technology adoption for the previous tablets. In order to create a successful product, he needed to market it in a different way. All of the other tablet's adoptions got cut short because the company could not answer the "why do I need this?" question to the public's satisfaction. He saw society's reaction to Microsoft's tablet that was the exact same as a laptop including price. He also analyzed the adoption of the iPhone and how that could help promote a new kind of tablet that wasn't quite a smartphone, and not quite a laptop. Therefore, Job's used the failed adoption curves of the tablets that came

before and the successful adoption curve of the iPhone in order to create the success of the iPad.

The idea of the video phone was introduced to society as a science fiction concept as early as 1879. From then on there have been many science fictions that portray video calls. Therefore, the idea of the video telephone was embedded into society, but as pure science fiction. AT&T unveiled their picturephone in 1964. However, the technology and every call were extremely expensive: a 15-minute video call was about \$600 (Lowbrow, 2018). Throughout the 60s the video phone continued to be in pop culture as a technology of the future or only for fictional characters like spies.

One of the biggest issues was a video phone did not make sense unless both parties had one, so even people who could afford it had no use for it. Another reason the average person was hesitant about this technology was because they were not sure if they would want to be on video for all calls. This did not fit into the culture of the 60s when society put a lot of pressure on appearances. AT&T tried many marketing tactics from the 1960s until the 1990s including focusing on businesses as videoconferencing, but it never took off due to the expensive price and it being unsuitable for the needs of society.

What diffused video conferencing was attachable cameras on computers. The webcam by Connectix and others became widespread in the 2000s because of the affordability and compatibility with their current technology. The success can also be attributed to the distinction because calling and video chatting: “if you want to talk, use a phone; if you want to video chat, use a webcam” (Edwards, 2022, p. 5).

The webcams created a spot in society for the videotelephony application Skype to be created in 2003, from that successful technology, video calls were made mainstream by the

iPhone in 2010. The front-facing cameras, screen, and software designed made video calls painless. AT&T tried to make an affordable video phone based off of landlines for decades, but the videophone only succeeded in society when they were incorporated with smart phones that already had the necessary screen and camera. This might also be explained because the AT&T video telephones were stationary, and not much different than looking at a picture while talking with a person; however, with portable cellphones the idea of video calling is changed in the eyes of the public. It is not only a way to see the person on the other end of the line, but also a way to show surroundings. The video phone could also not get out of the beginning stage of the technology adoption life cycle while people could not use the product unless more people owned it. Therefore, it was an application downloaded onto technologies with front-facing cameras and screens or a smartphone mass bought for other reasons, that finally made the technology diffuse.

VI. Conclusion

Engineers should use the analysis of these adoption life cycles and other successful or failed technologies as a model to increase likelihood of success for their own products. From the data collected about the video telephone and the tablet, conclusions can be made on certain rules engineer entrepreneurs should take in order to have successful technologies. Products can be a good idea, but if they do not fit into societal culture or the technologies currently used, they are unlikely to succeed. The video phone did not work until there was a smart phone that made the concept easy to use and convenient. The tablet did not succeed until the iPhone caused components to be cheaper and make it a more affordable more portable version of a laptop.

Video calling was too big of a jump for people who didn't know what it would entail to be seen whenever they got on the phone. By having webcams introduce people to the idea of video chatting, the iPhone was able to make it a popular technology. They allowed society to diverge from science fiction and make the standard voice calling, allowing people to video call only when they want. Video calling was made mainstream when it became a part of a technology people were already buying, the smartphone, and it was not necessary to buy an entirely new product.

The iPad succeeded because the marketing changed societal views of what a tablet was used for. It was no longer a keyboard-less computer, but an entirely new product that customers needed. Since Steve Jobs learned from the public's reaction the failed tablets and the positive customer reviews of the iPhone, he was able to release a product that sold on a mass scale as soon as it was released.

By analyzing failed releases of a technology Apple was able to create success for the tablet and the video phone. Engineers can now examine the differences that were made to the produced and their releases in order to lead the technologies into the mass adoption stage of its technology adoption life cycle. They need to know how to make their technology more affordable, accessible, and usable; for a product to become mainstream, it needs to fit into the culture and has a positive view from society.

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