

**Prospectus**

**Research into Data Security and Privacy in Modern Applications and Devices**

(Technical Topic)

**The Role of Technological Innovation in the Domestic Sphere**

(STS Topic)

By

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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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## **Introduction**

Modern day America is defined by a rapidly increasing consumption of technology. In some cases, this is nothing new; businesses and governments have always relied on innovation to increase productivity, reduce expenses, and provide a better product for citizens. However, the 21<sup>st</sup> century has brought cutting-edge technology into the home more than ever before. Instead of following the classic proverb “Necessity is the mother of invention,” today’s technology is often developed for the purposes of comfort and efficiency. The world of “smart” technology has expanded past the realms of communication, transportation, and computing and now encompasses refrigerators, washing machines, and entire home control of lights, locks, and air conditioning.

Ever since the introduction of the World Wide Web in the early 1990’s, technology in the home has followed a trend of rapid innovation. When Apple introduced the first iPhone in 2007, it was a massive breakthrough in the cell phone market, and just 13 years later in 2020, the highest-end iPhone on the market has increased the processing power by 48x (Wikimedia, 2020). Companies like Apple have continued to push the limits of what is possible in the realm of consumer-focused technologies, as well as finding new ways to market these technologies to an ever-increasing consumer base. With innovation comes increased costs, leading to a continuous rise in prices for the buyer, but many consumers continue to upgrade their technologies past the point of necessity. This is the idea I intend to investigate further: what factors go into the modern development and marketing of technologies intended for everyday use, and why have we accepted the rapid cycle of innovation in these technologies that cost users a premium?

**Technical Topic**

Because of the academic challenges caused by the COVID-19 pandemic, the Computer Science capstone process has been modified in several ways, including that it is a one semester project. I have chosen to start the project in the spring semester, so I do not currently have a solidified technical research problem, team members, results to discuss, etc. As of now, I am interested in researching data security and privacy. Unfortunately, monetary prices are not the only cost that comes with an increase in developing our modern smart lifestyles—our privacy is often violated as well. Throughout the information age, there have been too many data breaches to name, and as our system of databases becomes more advanced and interconnected, the number of ways hackers can access our data also increases. One such attack happened in 2018, when over 50 million Facebook users had their personal information exposed, potentially allowing hackers to take control of accounts (Isaac & Frenkel, 2018). Unlike robbing a bank or a home burglary, data theft can have multiple repercussions, including financial loss, identity theft, and fraudulent online activity, and the attackers can hide behind a wall of anonymity.

Too often, companies rush to get devices to market before competitors win the race or the device itself becomes irrelevant. In that process, data security can often be an afterthought, sometimes relegated to software updates rather than an at-launch feature. While not the flashiest parts of the development cycle, maintenance and security management are among the most critical aspects. Recently, however, a paradigm shift has started among tech companies to pay more attention to and intentionally market the security of their devices. For example, Apple recently released a revamped version of their HomePod with the hope that consumers would build a smart home around it and other products. Alongside this release, the newest software for iPhone, iOS 14, puts security at the forefront, primarily by being more explicit about what data is

accessed by each app and allowing users to easily restrict access if desired (Apple). A key feature is the idea that users should opt-in to their data being accessed, rather than having to opt-out from the default of full access.

Personal data does play a critical role in the business side of the internet, as “if you’re not paying for a product, you—and your data—are the product,” but it is clear that data security is still not up to par (Newman, 2020). For my capstone, if I choose the path of building some sort of practical application, I would either build the app with user security in mind, or I would design an app where the principle design is to inform users about how apps are using personal data and alert them of any potential security breaches. Another option for the CS capstone is to design a new class or suggest modifications to an existing class. I think that a class about modern security issues and the ethics and morals behind the governance of these principles would not only be interesting, but would contain topics that we do not cover enough. The same goal could also be accomplished by modifying a class like Intro to Cybersecurity or Defense Against the Dark Arts to add more ethical and social topics, rather than just technological security.

### **STS Topic**

As previously mentioned, our technologies are improving at a faster rate than ever before, and we have integrated technology into our daily lives at a similar rate. I initially became interested in this topic because of its similarity to Moore’s Law, the observation in Computing that computing power doubles roughly every two years. It was initially written in 1965 and has held fairly true since; however, many believe that Moore’s Law is more of a self-fulfilling prophecy and less of a law of nature. I believe that our consumption of technology follows a similar logic—our need does not double every two years, but we demand (and pay the price for)

rapidly evolving technology cycles that exceed our need. For the most part, I will specifically zoom in on upper-middle class America, I am personally most familiar with that climate and because it is a group where many people do not need highest-end technology for their daily lives. Exceptions would include professions such as IT, graphic designers, etc., but for many with “office jobs” or that stay-at-home, premium technology has become less of a necessity and more of a desire.

I have used Apple as an example of this phenomenon because their business model (and resulting success) resembles the modern integration of technology cycles. Apple products are undoubtedly of high quality, but their main selling points have always been design and the user experience, specifically around the idea of an entire ecosystem of connected products. Their product announcements focus on delivering information in a fun, personalized way, rather than simply listing technological specifications, and the extravagance and elegance of the showcase makes up for any technical deficiencies the products may have compared to cheaper alternatives from competitors. Apple has been criticized in the past for overcharging the consumer, but their financial success shows that the consumer base is willing to pay a premium for the products they desire. Pattuglia and Amoroso investigate this from both the company and consumer perspectives. They point out that price and quality are only two of many factors that consumers weigh when making decisions and developing brand loyalty; originality, trust, heritage, sincerity, and others also play a key role. They also show how different generations value different aspects of brands; they suggest that “brand image, over than other constructs, positively affects Millennials and Gen Z more than Baby Boomers and Gen X” and “Brand Heritage positively influences Boomers more than Millennials and Generation Z” (Pattuglia and Amoroso, 2019). Based on their research and many others’, the technology market is no longer

controlled solely by the company with the most advanced product at the cheapest cost, but by the company that can effectively advertise to a consumer base that values much more than simply technological prowess.

Corporate strategies are not the only facet of this phenomenon; society has evolved in such a way that technology has become a crutch for many people's lifestyles. In the information age, efficiency and productivity are emphasized more than ever before; we have moved past our basic needs of food, shelter, community, and stability, and now we seek to optimize our lifestyles. This ideology has provided an opportunity for technology to fill a much larger role in our lives; we will consume whatever will satisfy our daily need and are willing to pay the price for it. If we can maximize the productivity of technology, the only limiting factor will be ourselves, not our resources. In a study of Asian smartphone users, Wang and Lee collect data on users' smartphone use and dependence, along with how important security, privacy, and innovativeness is to each user. Across the board, the numbers show that on a 1 to 7 scale, the average user rates their level of smartphone dependence at a 4.43 (Wang and Lee, 2020). While not extortionately high, the numbers show that most users maintain a consistent dependence on their phones in their day to day lives.

The idea of socio-technical futures provides a useful model to analyze both how society has arrived where we are and where we are going in the future. Konrad and Böhle investigate both the processes that contribute to the construction of futures and how they affect the innovation process. They propose that socio-technical futures, like many technical artifacts themselves, are inherently political, regardless of whether a future is explicitly or implicitly defined (Konrad and Böhle, 2019). Socio-technical futures make up a subset of the SCOT framework, which I see as the most relevant framework to use when discussing how we use

technology in our everyday lives. Many people have an image of an ideal world of human-technology interactions, where everything is safe, secure and at maximum efficiency. Companies then take those ideas and futures and integrate them into their products, and the consumers are then more likely to buy in because of brand loyalty, quality, and other factors.

A major part of the future of this sector of technology is sustainability. In order to continue this rate of innovation we desire, we must build a future where our lives are benefitted, but we are also being responsible with our world. Our modern life as we know it cannot survive without a healthy Earth to support it; we need to balance durability, sustainability, and environmental cleanliness with our preexisting expectations of quality, design, and brand image. As discussed earlier, security also plays a part in the overall ideal of responsible innovation. The big question going forward will come down to whether or not we can integrate these socially conscious ideas into our discussions of profitable and beneficial futures.

### **Next Steps**

I do not plan to, nor do I think I can, provide an argument for how to balance these factors on a large scale. Going forward, I think it will be most important to continue finding the gaps between marketing and social/environmental consciousness. A specific example to look into is once again provided by Apple, as they have recently announced they are working to be fully carbon neutral for its supply chain and products by 2030. They also have an ambitious and thorough zero-waste plan, which may or may not benefit their financial status in the long run (Vonk, 2018). Analyzing their business model going forward will help to demonstrate how corporations follow (or don't follow) a future that synthesizes sustainability, profitability, and innovation.

## References

- Konrad, K., & Böhle, K. (2019). Socio-technical futures and the governance of innovation processes—An introduction to the special issue. *Futures*, 109, 101–107.  
<https://doi.org/10.1016/j.futures.2019.03.003>
- Isaac, M., & Frenkel, S. (2018, September 28). Facebook Security Breach Exposes Accounts of 50 Million Users. *The New York Times*.  
<https://www.nytimes.com/2018/09/28/technology/facebook-hack-data-breach.html>.
- Newman, D. (2020, September 30). Apple's iOS 14 Privacy Update Changes The Complexion Of User Data Collection.  
<https://www.forbes.com/sites/danielnewman/2020/09/30/apples-ios-14-privacy-update-changes-the-complexion-of-user-data-collection/?sh=35603cf5ed9e>.
- Pattuglia, S., & Amoroso, S. (2019). Organizing the Marketing Actions around Premium Price in Technological Brands: The Case of Apple. *Skyline Business Journal*, 9–20.
- Privacy*. Apple. <https://www.apple.com/privacy/>.
- Vonk, L. (2018.). Will Liam save us? : An analysis of Apple’s zero-waste goals and waste networks associated with the MacBook. 140.
- Wang, X., & Lee, K. M. (2020). The paradox of technology innovativeness and risk perceptions—A profile of Asian smartphone users. *Telematics and Informatics*, 51, 101415.  
<https://doi.org/10.1016/j.tele.2020.101415>
- Wikimedia Foundation. (2020, October 30). iPhone (1st generation). Wikipedia.  
[https://en.wikipedia.org/wiki/IPhone\\_\(1st\\_generation\)](https://en.wikipedia.org/wiki/IPhone_(1st_generation)).
- Wikimedia Foundation. (2020, November 2). iPhone 12. Wikipedia.  
[https://en.wikipedia.org/wiki/IPhone\\_12](https://en.wikipedia.org/wiki/IPhone_12).