Developing a Multimodal Entertainment Tool with Intuitive Navigation, Hands-Free Control, and Avatar Features, to Increase User Interactivity
(Technical Paper)

Rockwell's Nightmare: The Digital War Between Smart Technology and Personal Privacy
(STS Paper)

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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

Have you ever been talking with a friend about a product you're interested in, and then the very next day, you get a phone ad on Instagram for that exact product? Just last week, Tom Holland came up in conversation. The very next day, videos of him were popping up on a friend's TikTok "For You" page. It seemed as if the phone had been eavesdropping. While this may seem like an invasion of privacy, targeted ads, personal assistants, and smart devices are essential parts of modern-day society. A study conducted by Sykes Enterprises concluded that 73% of users' rationale for recently buying connected devices was to "allow for a more convenient living experience" (*"Why do"*, 2020). Additionally, the gradual emergence of 5G has made society more interconnected than ever ("How 5G", 2020). However, there are significant trade-offs that come with using these types of devices. All smart devices need lots of data to help personalize everyone's own experience. Smart devices enhance the user experience, and to be able to do that, companies need to collect data to gather accurate information about their user bases. Now that applications like TikTok have made their algorithm so reliant on the use of personal data, the line between personal privacy and smart technology improvements has grayed. TikTok's algorithm is largely based on a user's interactions with content on the app (Newberry, 2021). It is also important to remember that TikTok provides these interactive services to both make money and to provide really deep insights into their user base (*"Is TikTok"*, 2020). These types of technologies provide convenience and entertainment to the user, but at the same time, can appear to be intrusive on many aspects of people's lives. By recognizing personal data technologies such as TikTok influencing the sociotechnical relationship between enhancing the user experience versus infringing personal privacy, the problem with interconnectivity emphasizing personal data collection can be addressed.

Smart technologies do not just stem from devices such as Ring security cameras, iPhones, or TikTok. Streaming services recommend shows, movies, and other forms of entertainment to their users depending on what the users have previously watched or interacted with. To complement the research regarding the personal privacy question, the 2021-2022 UVA capstone project with Professor Gregory Gerling has partnered with a streaming service and has been tasked with creating a new multimedia experience for them. The all-too familiar problem of cooking while your hands are dirty, timers are beeping, and three burners are full is very stressful and complicated to someone, so this project hopes to make that process less confusing and more enjoyable. The group has established a scope of reimagining this cooking experience by using voice recognition, along with both hand gestures and some touch interaction to help solve this frustrating and stressful part of cooking. While the usage of data mining will probably not be extensive in the first iteration of the prototype, it is very possible that the first prototype introduced could involve recommendations for other dishes, given what the user has already cooked and how they have rated the recipe and process. Thus, the process of continually using user input to drive future recommendations stands at the forefront of this project, along with all other digital interactions done in modern-day society.

Technical Topic

A decade ago, streaming services were barely even a thought, and Blockbuster and Redbox were still mainstream sources for entertainment. While movies have always garnered widespread enthusiasm since their inception, the rise of streaming services that put not only these movies, but also TV series, games, live sports, and so much more in the palm of someone's hand has undoubtedly changed the way people consume media. This client has been a driving force in the digital entertainment industry, and their continued desire to provide new forms of

entertainment to customers has culminated in the project of Professor Gregory Gerling's capstone team. The project aims to reimagine the platform's multimedia experience, specifically in terms of cooking interaction. While many mediums such as YouTube, Hulu, and Netflix offer one-dimensional cooking experiences with little engagement, the team plans to not only recreate the linear cooking experience, but also incorporate an interactive aspect to the series with hand gestures, voice recognition, and textual elements to make cooking both easier and more engaging for the user. The group plans on creating brand new cooking videos to supplement the whole experience, tying in both functionality and entertainment to the platform, a value-add that no other service has on the market. Why sit back on a couch and press play on a cooking video when the videos are rooted in engaging with both the chef on the show and the user's kitchen? With this capstone project, said end-state will no longer suffice.

There are three main components of the project: the storyline, the navigation of the cooking interaction, and the gestures and voice interaction. The storyline describes a typical user's entire journey throughout the cooking show. From the channel appearing on the platform's home page until the user is recommending the recipe to their friends, the storyboard encapsulates the entire process from start to finish through the user's interaction with the software. The navigation aspect of the project describes how the user will interact directly with the cooking aspect of the channel. Cooking has always been seen as a linear process, and the chef must work step-by-step to achieve their desired end-goal. Such a framework is obsolete and needs to be revamped, and that is exactly what the Gerling capstone team plans to accomplish. Lastly, different types of gestures will be used in congruence with the typical swiping and clicking that someone might do on their phone. These interactions might take the form of voice recognition, such as the way Siri or Alexa currently operate. Hand gestures might also be

utilized to curb the common use-case or a chef having hands that are full or hands that have cilantro stuck to them and don't want to dirty their phone screen. The combination of these three elements will provide a new experience for the user to not only cook dinner, but also enjoy the process of cooking, something that can be stressful for all parties involved. The show is to be presented to company representatives by the end of the academic year. The process will hopefully culminate in the platform adding it as a show for its customers, with celebrity chefs working alongside the project to realize its success.

STS Topic

Before the 21st century, if personal privacy and technology were mentioned in the same sentence, it was most likely in reference to Orwell's *1984*. In the novel, Orwell describes characters' terrified obsessions with the telescreens, and how there was "no way of knowing whether [they] were being watched at any given moment." Nowadays, personal privacy involves finding out ways to turn off your location services (Bay & Cohen, 2021). Congress passed into law the Privacy Act in 1974, less than 50 years from the time this paper was written (U.S. Department of Health and Human Services). Most families have parents and grandparents that remember a time in which the U.S. did not feel the need to address this privacy concern, as it did not exist in the time in which they grew up. In modern-day society, however, issues such as the San Bernardino shooters case, personal privacy can be a very controversial issue. The trial encapsulated the nation, especially the drama that ensued between Apple and the FBI to attempt to uncover pertinent data to the case, as Apple did not want to release the data to the FBI as they hoped to keep intact their user privacy policy, whereas the FBI wanted to use the phone to mine data regarding one of the shooters involved (Nakashima, 2016). Given that the context of the shooter case revolved around multiple murders, it may be easy to recognize why the FBI pushed

so aggressively to acquire the information stored in that device, but once the privacy policy rules have been breached, that inevitably means that under the proper circumstances, they can, and will, be breached again. Making an exception for a law inherently creates a gray area in the process, which is already a problem in terms of how much of a role each company should play in protecting the privacy of its consumers.

While the United States' issues with acquiring data from private companies may exist in cases such as Apple, the Chinese Communist Party (CCP) does not have this issue. The CCP's connection with TikTok is likely the reason for the "alarm bells" for the app to be sounding so loudly, and potentially one of the driving factors for Congress to have passed a multi-million dollar research-and-development-based package aimed at fighting the war on technology with China last June (Tomwfranck, 2021). The CCP "exercises power through TikTok," allowing them to both monitor its users and control the flow of information that the platform outputs (Melin, 2021). TikTok makes lots of money from providing full insights of the users on their platform with everything from location data, to language used, to comments on a video, and everything in between (*"Is TikTok"*, 2020). It is not the exception, however. Many companies will take advantage of the idea that consumers need the "best new smart products" that with each iteration, get a little bit smarter, and therefore are able to create a more comprehensive picture of each user that interacts with the hardware and software (Moscaritolo, 2021). These may include smart locks, outdoor security cameras, connected thermostats, even robot vacuums. Consider the IoT and its ability to connect a user's collection of smart devices, such as the ones just mentioned (Zheng et al., 2018). All of these smart technologies are able to observe an individual's tendencies one way or another, and therefore are able to complete a more comprehensive network of aspects that exist within the scope of the device's monitoring ability. Furthermore,

the advances in the IoT market outpace current regulations, signaling that personal data of consumers might be being breached even more than previously conceived (Petrescu & Krishen, 2018).

Such insight invokes the appearance of Actor-Network Theory (ANT) to further the conversation of interconnectedness. ANT defines the notion that everything can be considered an actor and a network, with one's perspective defining which is which in a given scenario (Cressman, 2009, p. 3). Scientists and engineers are typically the "network-builders" that will help to create a structure for the network, and this is no different in terms of smart technologies (Cressman, 2009, p. 3). Some of the actors within the scope of smart technologies are developers, stakeholders, users, but also software like an app, hardware like a phone, and walls of a house, if the device needs to be hung somewhere. By understanding that this complex web of actors acts to both contribute to a positive experience for the user but also drive profit margins as high as possible illustrates the complexity of the problem. Even though similar actors may be involved in every sub category of the network, these similar groups may have very different goals in mind, demonstrating the convoluted nature of the privacy topic. ANT does have its limitations, however, as not all actors will be of equal importance to understanding the issue (Cressman, 2009, p. 11-12). For instance, a developer may have huge influence on the limit to which data mining occurs, but a company representative might only be involved because they profit from the product. These inequalities are not highlighted by ANT, but will still be taken into account.

Methodologies

Research Question: How has TikTok and other personal data technologies influenced the sociotechnical relationship between enhancing the user experience versus infringing personal privacy?

Wicked Problem Framing and Policy Analysis methodologies will be used to answer the research question posed above. To begin with providing background information, sources will be collected that describe the friction between TikTok and several federal governments, such as China and the United States. Given the political nature of the relationships between private corporations and national governments, the Policy Analysis methodology will be very useful in providing insight into how these relationships develop positively or negatively depending on the goals of each stakeholder. The Policy Analysis methodology will also undoubtedly reveal the conflicting interests that exist between the foundations of two massive user groups with TikTok, highlighting the Wicked Problem Framing methodology. Since the root cause of the privacy issue has conflicting interests at its source, the solution to finding a balance between privacy versus interconnectivity may not be solvable, and given that society already uses smartphones, it may have already been solved - in favor of interconnectivity. While the benefits of interconnectivity will be highlighted, the trade-offs that exist with having such easy access to comprehensive data about an individual may cast a dark shadow over the tone of the analysis.

Conclusion

While the expansion of smart technologies like TikTok have provided a new form of engagement to the user, its potential overreach in terms of data collection limits the upside to its breakthrough in social media platforms. Furthermore, the Gerling-streaming service capstone project's ability to provide useful information to its users will most likely also rely on this collection of personal data to provide relevant recommendations to the user. Both this research

and this project will contribute to the overall improvement of the customer experience in terms of smart technologies providing a cool service to users, but also allowing those same users to understand the drawbacks of smart technology so that they can take the necessary precautions that they deem necessary for themselves and their well-being.

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