Socially Distanced Dispenser
(Technical Paper)

Consumer Shopping Habits in the Post-COVID Era
(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
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Introduction

In a world where COVID-19 is instilling fear into people's minds all across the globe it is important to consider how engineers can help everyday citizens feel safer while performing everyday tasks. One of these tasks is the act of purchasing groceries, as more than 62 million people go to the grocery store every week (Mitova, 2020). This becomes an uncomfortable task since it may be possible that a person can get COVID-19 by touching a surface or object that has the virus on it and then touching their own mouth, nose, or possibly their eyes (U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, 2020), and since many surfaces in a grocery store are touched by multiple consumers, high-contact surfaces become a large risk for contracting COVID-19.

This leads to the development of my team's technical project: a device that completely eliminates the high-contact surface when it comes to dispensing food in grocery stores. This device will permit users to specify how much of a food they would like (via their smartphone), put down their bag/cup, and receive the adequately dispensed food. The main goal of this project is to eliminate the need for contact-heavy food dispensing, thus making the user more comfortable with their grocery shopping experience.

This brings me to my thesis topic: the study of how in the post-pandemic world people will continue to rely on technology for their goods and services rather than reverting back to their in-person consumption habits. Figure 1 depicts statistics regarding how average consumers feel regarding shopping in different stores (Russell, 2020).

Figure 1: Consumer Comfort Statistics

While grocery stores are currently the "safest" place to shop in regard to consumer sentiment, the fact that only 54% of consumers are comfortable shopping at grocery stores means that these people are currently looking to obtain their goods online (Evans, 2020). My thesis will examine how this change in consumer behavior has led to changes in how companies attempt to incorporate more and more technology in their businesses. This research question will examine the Social Construction of Technology framework, which discusses the influence of social factors in the development of technology. For this particular scenario, consumer behavior and sentiment impact businesses' usage of technology for curbside pickups, online shopping, and other consumer habits.

Socially Distanced Dispenser

As a Computer Engineering major, my team's project involves the development of a product that incorporates embedded systems, circuit boards, and software. Myself and three other Computer Engineering students will be creating a product that eliminates high-contact surface interaction when dispensing food in grocery stores. This system will replace existing bean, cereal, rice, and other small-food dispensers that currently incorporate a manually-operated handle and replace it with an automatic dispensing mechanism. Our product will permit users to specify how much they would like via their smartphone, place their bag/cup under the dispenser, and receive the adequately dispensed product. This device will be engineered by utilizing software application development, a bluetooth module, a microcontroller chip, motor driver, physical motor, a hall-effect sensor, and a dispenser. A diagram depicting the components' interactions is shown below in Figure 2.

Figure 2: Technical Project Block Diagram
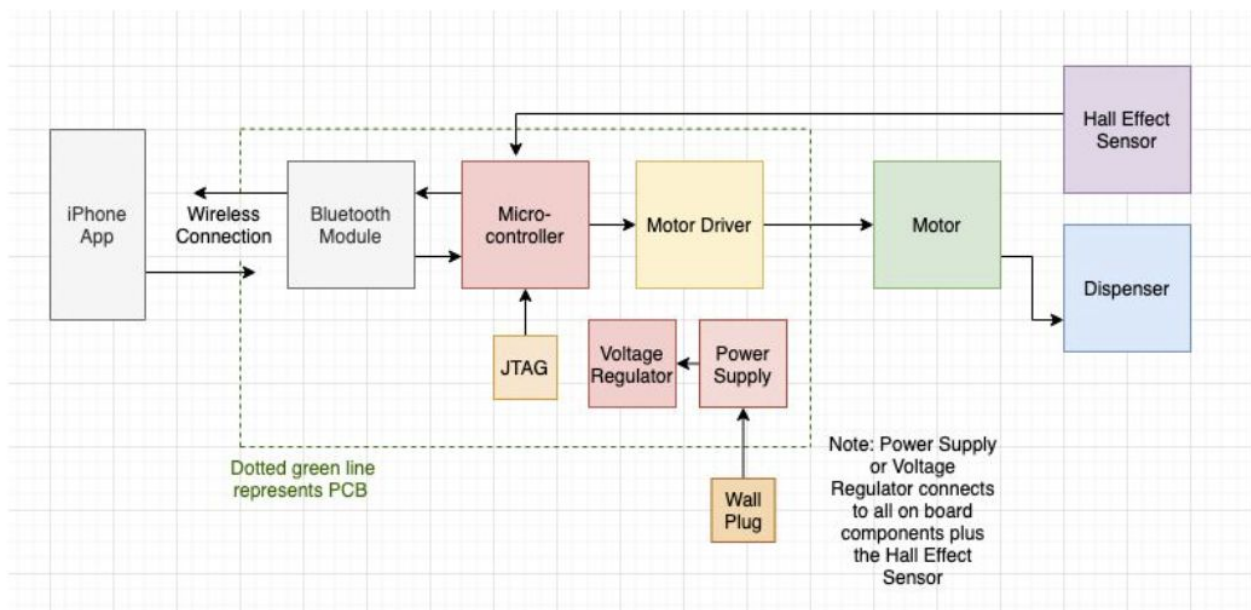
My team believes that this product will help consumers feel more comfortable shopping in grocery stores by eliminating the potential risk involved with interacting with a high-contact surface— handle on the dispenser. Overall, we feel like this product will be impactful to society due to easing one's grocery shopping experience.

There are 3 main components of this product: the software development, the microcontroller system development, and the interaction between the motor and the physical dispenser. The software development portion of this project consists of developing an easy-to-use user interface whereby the consumer can easily connect to the bluetooth module on the dispenser, a list of possible dispensing sizes, and feedback regarding the order once the dispensing has been completed. The main challenges involved in this component of development circles around the interactions with the bluetooth, as the actual user interface construction will be purely dependent on the knowledge of the engineers working on it, however the bluetooth interactions will be dependent on the work done on the microcontroller itself. We want to ensure that only necessary data is passed between the bluetooth and the smartphone, so as to not put the user at risk of having sensitive or private information taken from a nearby device. The second main component of this project involves the development of the microcontroller connections and ensuring that all the sub-components: the bluetooth module, MSP430 chip, motor driver, hall effect sensor, and power regulation, are all able to effectively communicate with one another. By the end of this project all of these subcomponents should be able to effectively communicate one another: when the bluetooth receives a connection it will wait for an amount specified, once the amount is specified the motor driver will be signaled to begun a certain number of turns, once the hall effect sensor signals the motor has stopped turning the bluetooth will send a signal back to the smartphone. The difficulties with these

subcomponents is that each subcomponent will need to be tested individually before integration of these devices can take place.

The last major component of this project consists of ensuring that the physical motor will be adequately attached to the dispenser, and while that consists of less individual components, one could argue that this section of the product could make or break the user experience. If the motor is inadequately attached to the dispenser then the amount dispensed could be fairly inconsistent and could even result in problems with the automation of the dispenser. In order to combat these potential issues, we will be 3D printing our motor-to-dispenser mechanism so as to ensure that the attachments are "custom fit". The diagram illustrating the 3D printed device is illustrated in Figure 3 below (Mendelson, 2020).

Figure 3: Motor Mounting Mechanism
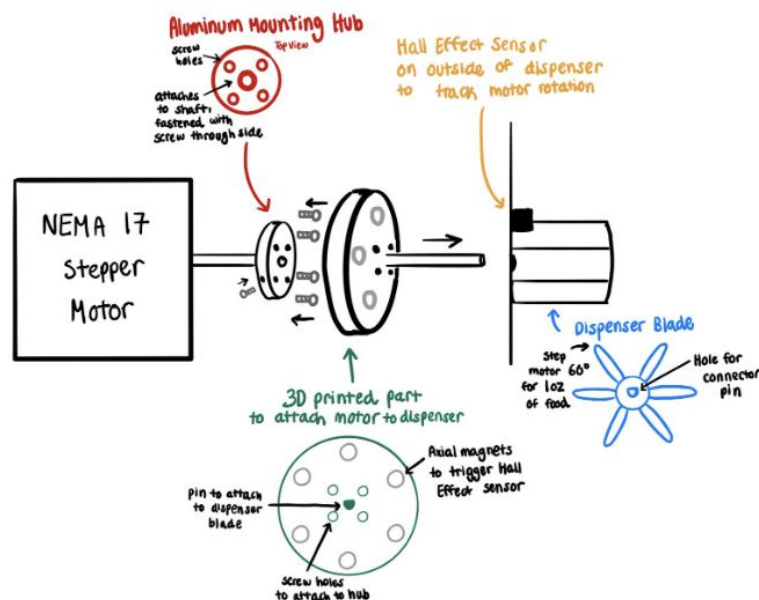
In conclusion, the goal of this project is to create an automated dispenser which will make consumers more comfortable when shopping in public areas, as there will be less risk of COVID-19 transmission through surface contact. There are multiple factors that will determine

the success of this project, and in order to ensure that this innovation reaches its potential it is essential that all of the components function cohesively, so as to maximize user satisfaction.

Consumer Shopping Habits in the Post-COVID Era

Throughout this pandemic we have seen consumer habits shift from in-person consumption to purely internet or pick-up based shopping. The world was already moving to be more internet reliant, as shown in the growth of Amazon, GrubHub, and other internet-based companies, and now since in-person eating and shopping is somewhat feared due to the virus, people have begun to rely on this technology even more. More than ⅓ of consumers shop online weekly since coronavirus hit (Evans, 2020), but the question then becomes what will happen after coronavirus has been eradicated? In response to the pandemic people have asked for more curbside pickup options— 64% of people want curbside pickup options for stores (Evans, 2020) and companies are responding as 44% of retailers are now offering contact-free pickup options (Berthene, 2020). Thus, it is apparent that companies are responding to consumer wants by increasing their development of technology so that customers are comfortable when buying products from them, but in the post-covid era will this technology be abolished? Will consumers return to pre-COVID habits and their routines of in-person grocery shopping and dining or will the growth of consumer consumption technology continue as it has during the pandemic. I will be researching these changes in consumer consumption habits and how they will impact the technological products created by retail shops, grocery stores, and restaurants.

This research will be conducted through the lenses of the Social Construction of Technology framework which argues that technological innovation is a complex process of co-construction in which technology and society, to the degree that they could even be conceived

separately of one another, negotiate the meaning of new technological artifacts, alter technology through resistance, and construct social and technological frames-of-thought, practices and action (STS Wiki, 2018).

Further delving into the Social Construction of Technology framework, we find that its main definition is derived from the fact that human beings dictate what type of technology is innovated. Wiebe Bijker and Trevor Pinch (Wiki, 2020), two distinguished professors of Social Technology Sciences, came up with this theory which aimed to contradict the traditional theory that technology influences social behaviors. Within this theory, Bijker and Pinch point out that in order to understand the reasons for acceptance or rejection of a technology should look to the social world (Wiki, 2020). It is not the "best" technology that influences society but yet the best technology that exists is the one whose formation is due to human actions. This makes sense in today's society, as the most influential pieces of technology are those that constantly take in feedback from their consumers and understand how to make their product more consumer friendly.

This directly relates to my research question, which discusses how humans' fear of Coronavirus has greatly changed consumption patterns, which in turn has led to an increase in technology usage within these businesses (Berthene, 2020). While my research question focuses more on the future of these technological advancements, as it is completely dependent on potential consumer habits post-pandemic, this pattern reflects the SCOT theory as depicted by Bijker and Pinch. The original development of these technologies used so widely in the pandemic— shopping online expansion, curbside-pickup for restaurants, increased mobile applications for restaurants — was due to the *needs* of the consumers who would ordinarily shop/eat at these places. Thus in order to keep their customers, restaurants were forced to utilize

more technology so as to make people feel safer in their consumption experience with the store. This trend directly correlates with the relationship that Bijker and Pinch theorized, and is expanded to say that in the post-COVID world, these businesses will once again prepare their stores in ways that make their customers feel the most comfortable and satisfied; whether that be with incorporating technology utilized during the pandemic, or setting up the stores similar to how they were before the pandemic occurred.

In order to properly conduct this research, I intend to survey people on Grounds as to their pre-COVID, during COVID, and potential post-COVID consumption habits, in order to better understand how social behaviors have changed due to this virus, and to relate that to the technological innovation and business changes that have occurred during the course of this virus. In addition to these surveys, I will be examining statistical reports regarding in-person vs online shopping via multiple sources (Washington Post, CNN, digitalcommerce.com) and connecting that to my survey results. By the end of my research, I fully expect to be able to relate business habits and use of technology as a result of consumer sentiment and shopping habits.

Conclusion

In conclusion, my thesis will consist of examining the effects of COVID-affected consumer shopping habits on the technology utilized by businesses around the United States, and how in the post-pandemic world people will continue to rely on technology for their goods and services rather than reverting back to their in-person consumption habits. Through the lenses of the Social Construction of Technology STS I will be able to effectively describe businesses' dependencies on social behaviors of humans and analyze how this relationship could impact consumer behaviors in the post-COVID world. Through this research I hope to be able to give

insight into how consumer sentiment directly impacts the technology utilized by grocery stores, restaurants, and small businesses, and determine how in the post-COVID era these internet-based technologies will be relied upon.

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