

**INCREASING CONSUMER SAFETY FOR FOOD SERVICE WEB APPLICATIONS BY
ANALYZING GOVERNMENT REGULATIONS**

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Bachelor of Science in Major

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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Americans consume less home cooked meals and increasingly choose time-saving food options, such as fast food restaurants and prepackaged meals, even though these foods are less nutritious. Alkerwi, Crichton, and Hébert (2014) conducted research that linked this decline in home-cooked meals as a contributing factor to increasing obesity rates in the U.S. (Discussion section, para. 1). According to Carroll, Fryar, Hales, and Ogden (2017), adult obesity rates in the United States have increased by almost 10% from 1999 to 2016 (p. 5). In 2016, 39.6% of adult Americans and 18.5% of youth Americans were considered obese (Carroll, Fryar, Hales & Ogden, 2017, p. 5). Obesity rates have risen to dangerous levels not only in the US but globally; the World Health Organization (2020) found that worldwide obesity has nearly tripled since 1975, partly caused by an increased intake of energy, saturated fats, and sugars (Facts about overweight and obesity section). Alkerwi, Crichton, and Hébert's (2014) study further confirmed that ready-made meals are detrimental to one's health since they "contribute to excess energy intake and poor nutritional quality of the diet, in terms of excessive amounts of fat and low levels of dietary fiber" (Discussion section, para. 5). Obesity can lead to other major health concerns such as cardiovascular disease, diabetes, and various cancers, which means a significant amount of the United States population is at risk for several health problems.

As part of the technical project, the seven-person, capstone team has developed a web application, called HomeEats, that would allow at-home chefs to create an account and post their menu on the platform for customers to view. Customers would then be able to order home-cooked meals to be delivered to them. The technical project hopes to facilitate access to home-cooked meals in order to improve nutrition because American families have become too busy to prepare meals for themselves (King, Kinsey, Phumpiu, & Senauer, 1996, p. 5). Since the 1950s, more American families are dual-income households, causing families to prioritize saving time

over saving money (King, Kinsey, Phumpiu, & Senauer). HomeEats differs from current food delivery service applications, such as DoorDash and GrubHub, that work with restaurants to deliver food to customers because it can appeal to at-home chefs by providing them the opportunity to pursue their passion for cooking while making a profit.

The STS topic uses the Actor Network Theory framework, developed by Callon (1986), to analyze government food regulations and previous problems in food industries in order to apply these laws and scenarios to food delivery service applications. Actor Network Theory helps to identify the actors involved and determine how the actors should interact with one another. The STS and technical topics are tightly coupled, so that the STS research can help to make the technical project safe for end users. The STS research can use health safety measures from restaurants, food processing plants, at-home businesses, and other food delivery services to best protect customers. If customers were to be harmed by contaminated, unsafe, or poor quality food products, the HomeEats engineers and product owner could be found liable, resulting in financial loss and damage to credibility.

COMPLICATIONS WITH GOVERNMENT FOOD REGULATIONS

Federal agencies, such as The Food and Drug Administration (FDA) and the United States Department of Agriculture (USDA), oversee food safety and hygiene of restaurants, food processing plants, and other food-related industries. Even though these departments are meant to protect the public, food safety is a continuing problem. Examples of food safety problems are E.coli and salmonella outbreaks. These dangers persist because food industries do not follow the government regulations in place, current government regulations do not adequately protect

consumers, and consumers are not well-informed or aware of food quality. This STS research paper will use Actor Network Theory to investigate necessary regulations and actions for home-based businesses to adopt in order to ensure that end food products are safe for consumers. The ANT framework will help to determine and analyze the actors that impact the technology being developed. These findings directly relate to the food delivery service application, HomeEats, being developed as part of the technical thesis. By protecting consumers from danger, HomeEats would also be protecting its product owner and employees who could lose their jobs and credibility if the application produced unsafe results.

Food products continue to pose a threat to end users because food industries go through a linear process for development and safety procedures, as seen in Figure 1 below. The linear

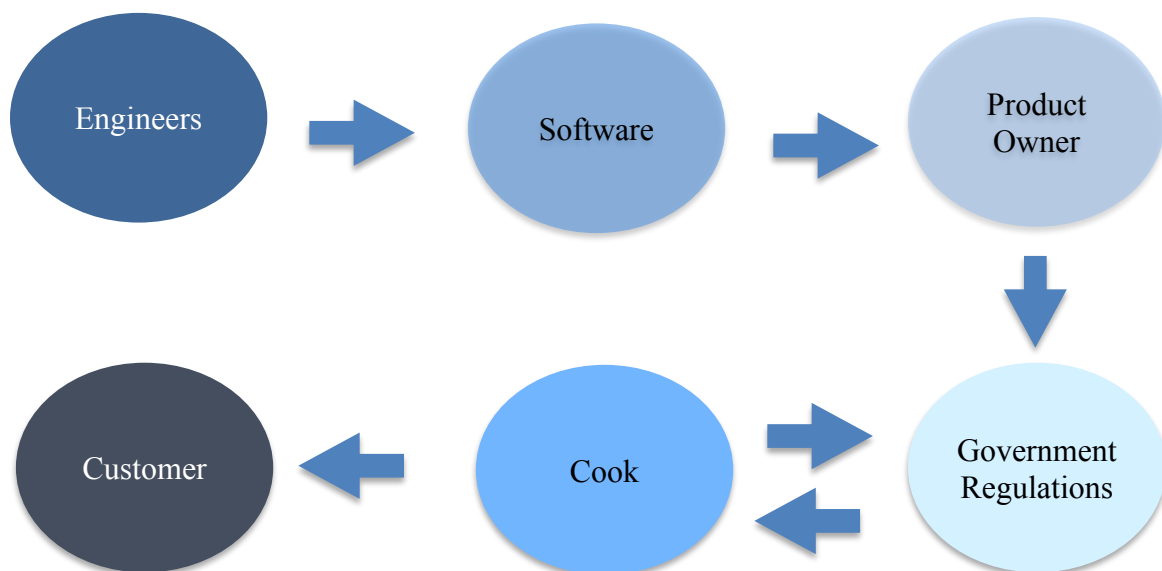


Figure 1: Hand-off model of problem with food industry design process: Shows the progression of actors that the food service software must go through before reaching the end user, the customer. There is an arrow going from the cook back to government regulations because cooks need to obtain the proper kitchen and chef licenses in order to register an account on the application. There is an arrow from government regulations to cook because the cook is still a user of the food service application so the government needs to approve the application before the cook can signup. (Adapted by Isabel Kershner(2020) from B. Carlson, 2009)

nature of this design and approval process poses a problem because government regulations and safety are not considered throughout the whole process. Based on the linearity of the diagram, ANT helps to show that these actors could be affected by silo mentality. Each actor, represented by a circle, is likely to keep information to those that belong to their group. As a result of this silo mindset, the development process is at risk for miscommunication or lack of communication between the actors. Therefore, agencies are not completely aware of all of the features or possible problems with the software. The agencies cannot adequately and efficiently test software, inspect at-home kitchens, and interview cooks as one step of the process. The departments cannot completely ensure that the product sufficiently protects consumers from harm. Therefore, consumers are still risk because food standards are not strong enough to protect them to the fullest extent. Industrial food companies should conduct research and implement features that can protect consumers beyond what is required.

GOVERNMENT REGULATIONS DO NOT ADEQUATELY PROTECT CONSUMERS

Even though food industries follow the required food regulations, these standards do not adequately protect consumers. According to the U.S. Centers for Disease Control and Prevention (CDC) (2020), “salmonella bacteria has caused about 1.35 million infections, 26,500 hospitalizations, and 420 deaths in the United States every year” (para. 1). However, the United States Department of Agriculture (USDA) deems these strains of salmonella bacteria legal (Kindy, 2020). Additionally, USDA data shows that about every 1 in 10 chicken products are contaminated with salmonella, resulting from contact with animal feces. These meat products are still USDA certified despite the dangers posed to the public. There is no law that outlaws these

dangerous strains. According to Katie Rose McCullough, a scientist at the North American Meat Institute, salmonella can naturally be found in animal flesh, where E.coli is not (Kindy, 2020). Therefore, salmonella cannot be completely removed, but additional testing could greatly reduce contamination. The government should require additional testing during meat processing to reduce the amount of bacteria and work to broaden legislation in order to better protect the public.

Additionally, in the past, food companies were not legally required to list nutrition facts or the ingredients, which misled their customers. According to Boyce (2016), a peanut butter company called Jif wanted to market peanut butter that was only 75% peanuts (p. 62). The peanut butter also contained an extraordinarily high percentage of hydrogenated cottonseed and soybean oil. This ingredient composition begged the question whether the product could still be advertised as peanut butter. Homemade peanut butter consists of ground peanuts and salt, so consumers would not expect chemical additives in such a simple food (Boyce, 2016, p. 64). This 1960s peanut butter debacle shows the importance of informed consent by allowing consumers to know exactly what they are eating. Informed consent prevents food industries from taking advantage of their customers by hiding important information from them.

Food companies, consumers, and the government often argue about safety rules because food companies often complain that developing technology to make safer products will bankrupt their business (Kindy, 2020). In the article “He helped make burgers safer. Now he’s fighting food poisoning again”, Kindy (2020) interviewed Seattle lawyer Bill Marler, who represented hundreds of victims in the Jack in the Box food poisoning case in the 1990s. Marler used media attention from these cases to petition for stronger USDA regulations to outlaw dangerous strains of E.coli in meat. Now, he has continued to fight for stronger government regulations to further

restrict and eliminate salmonella strains in meat. His clients are victims of salmonella food poisoning from consuming meat legal strains of salmonella. Even though food industries argued against the increased regulations to prevent their business from bankruptcy, when the USDA passed the petition to outlaw dangerous strains of E.coli, meat companies did not go out of business; meat only got safer for consumers. In President John F. Kennedy's 1962 special message to Congress, he stated that the consumer had four rights: to be safe, to be informed, to be heard, and to choose (Boyce, p. 58). Consumers often do not fully understand food labels and claims, such as the USDA organic label or "good source of calcium". Many consumers believe the USDA organic stamp mean the product is completely safe to consume simply because it is organic or they believe that high levels of calcium mean a food product is healthy when it could be loaded with sugar. According to the USDA, the "USDA Organic" label means that the organic food produced was produced without excluded methods listed in the "Policy on genetically modified organisms" (Organic labeling section). These excluded methods include genetic engineering, ionizing radiation, or sewage sludge. The product was also "produced using allowed substances from the National List of Allowed and Prohibited Substances, and was overseen by a USDA National Organic Program-authorized certifying agent, following all USDA organic regulations" (USDA, Organic Labeling section). These labels and claims are misleading because consumers do not understand that these food stamps do not eliminate all risk. Given the confusion surrounding food legislation and labels, consumers cannot truly consent and feel safe. Therefore, it is important for food companies to be transparent with their customers and try to develop better tests to reduce or eliminate risk.

Food delivery services are legally required to follow government mandated regulations, such as acquiring proper licenses and undergoing health inspections. Companies must abide by

current food safety regulations in order to avoid monetary fines. However, these measures do not fully protect customers. Food safety is an ongoing problem because the law does not encompass all possible food hazards. Though some food hazards are considered legal, food service companies could suffer from damaged reputations, especially if a customer became gravely ill or died. This research aims to find ways to best protect food delivery application's users from health hazards. Figure 2 below describes the HomeEats technology as a system in context in order to demonstrate that continuously considering safety and health hazards as a social context

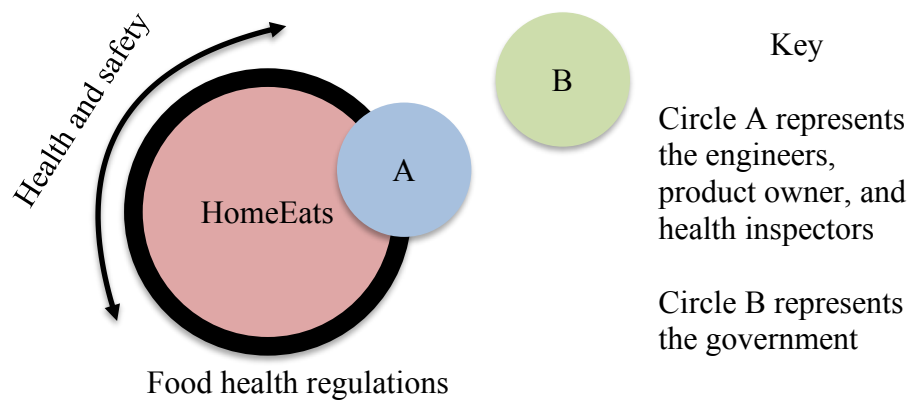


Figure 2: HomeEats as a System in Context: Shows that HomeEats is bound by food health regulations because those laws are required. The engineers, product owner, and health inspectors, represented by Circle A, are the gatekeepers for the HomeEats product because they directly control how the product should work. The government, represented by Circle B, is an outside actor that the engineers, product owner, and health inspectors must interact with. The legislation that the government enacts affects HomeEats; however, the government does not directly act with the system. (Adapted by Isabel Kershner (2020) from B. Carlson, 2009)

will make HomeEats a safer and better product. Defining the social context for HomeEats as health and safety concerns prioritizes consumer safety throughout the development process rather than as a single step tacked on at the end of development. This Actor Network Theory analysis shows how the actors, HomeEats, engineers, product owner, health inspectors, and government, should interact with each other in order to create a safe end product for consumers. Following government mandated safety regulations would protect the product, its engineers, and

its product owner from legal liability; however, these regulations are often not enough to protect consumers from danger, emphasizing the importance for prioritizing safety rather than solely meeting minimum requirements.

POTENTIAL WAYS THAT FOOD SERVICE APPLICATIONS CAN PROMOTE HEALTH SAFETY

The government has regulations for at-home businesses that work to keep the public safe, while also recognizing that these businesses do not need to be handled in the same way as restaurants. The Food and Drug Administration (FDA) and respective state and local health departments regulate home-based businesses. To be considered a home-based business, the business must be registered under the FDA as a home-based business, which depends on the food product itself. The FDA District office and state and local regulatory agencies advise food business owners on how to register their food business and whether to register their business as a home-based business or a facility (“How to Start a Food Business”, 2018, Introduction section). Home-based businesses follow different laws than other food industries, such as restaurants and facilities. For example, home-based businesses cannot partake in interstate commerce, meaning that their food product cannot be created with interstate goods and cannot be sold across state lines (“How to Start a Food Business”, 2018, Home-Based Business section). If a food business uses interstate goods or sells their product as an interstate good, then the food business must be registered as a facility. Additionally, Tarr (2011) stated that the equipment used by home-based businesses must be licensed, and cooks must have a permit (p. 54). Having these regulations and licenses prevents food borne illness outbreaks or unsanitary conditions caused by a home-based

chef's inability to meet health standards. To ensure that the food is properly prepared, at-home chefs must have the legally required chef licenses to prove that they are professionally trained. Additionally, the at-home kitchens must also pass the legally required health inspections. Home-based businesses must meet the current requirements set forth by local, state, and federal agencies in order to meet minimum safety regulations.

Kitchen inspections are important for maintaining hygiene standards and preventing chefs or restaurants from misrepresenting their business. Depending on the region, the state or local government might not have enough resources to send inspectors to a kitchen multiple times a year. A possible solution would be for HomeEats to hire a private company to inspect the cook's kitchen. This solution would be more expensive however, it would be beneficial in ensuring that kitchens maintain proper health codes. Food service companies could also hire inspectors to randomly inspect the at-home chefs. Choi, Kuznetsova, Luca, and Seok Kang's (2013) research on food inspection laws in Los Angeles, California confirms that more frequent unannounced inspections per year improves the hygiene quality of the restaurants and decreases food borne illness risks (p. 1443). In the restaurant industry, some establishments may clean specifically toward a health inspection and fall into old habits once the establishment receives a grade (Murphy & Tarca, 2014, p. 24). Random inspections would prevent at-home chefs from deceiving customers and HomeEats from their true hygiene conditions. Without time to prepare for an inspection, at-home chefs will feel more pressure to keep their kitchens up to mandated hygiene standards.

Food delivery services, such as HomeEats, should post each at-home kitchen's health inspection grade in order to inform consumers about the hygiene status and reduce the number of food borne illness outbreaks. High inspection grades are also an economic incentive for chefs. In

1998, Los Angeles implemented required health and safety inspections in restaurants. Inspectors would then award restaurants a letter grade based on a points threshold. Restaurants had to post this inspection score at a maximum of five feet away from the entrance so that consumers could easily view the score and make an informed choice (Choi, Kuznetsova, Luca, & Seok Kang, 2013, p. 1443). Murphy and Tarca (2014) concluded that the grading system assisted in reducing hospitalizations for food borne illnesses by 13% (p. 22). Los Angeles and New York City required “restaurants to post their inspection grades at their premises, which have shown to affect the revenue of the business substantially, thereby motivating restaurants to improve their sanitary practice” (Choi, Kuznetsova, Luca, & Seok Kang, p. 1443). There is an economic incentive to have a high inspection grade. Los Angeles restaurants with an A rating earned 5% more in one year than they did before the rating system (Badger, 2013). Customers prioritize food safety and hygiene and will reward food establishments accordingly. Especially now!

Food delivery web applications should implement a customer review feature to allow customers to inform one another about the quality of their experience. According to Badger (2013), modern consumers verify the quality of a restaurant by “[checking] out menus, reviews, even photos ahead of time, online.” Consumers trust each other more than they trust companies that might be guilty of misrepresentation. Including a customer review feature would help to build consumer trust and provide more transparency to that customers could be more informed. Health inspection reviews are posted to government websites; however, these websites can be difficult for users to understand or use. Companies, such as Yelp, scrape this data and reformat the data for a consumer platform that is better maintained and easier to interact with (Badger). HomeEats could use this technique to publish trusted, official government data to their own web application. According to Chau, Wang, and Yan (2013), “people share their opinions voluntarily

on the website, and write contents about products or services. They're judgements about consumption experiences, which means information they provided have a high level of authenticity" (p. 647). Engineers at HomeEats could also benefit from customer reviews by using machine learning to monitor reviews. Based on the quality of reviews for a dish or cook, HomeEats could review the cook or send an inspector in order to ensure that the kitchen is hygienic and food products are safe for consumption. Researchers Choi, Kuznetsova, Luca, and Seok Kang (2013) developed an algorithm that can predict a restaurant's hygiene trends based on the connotations of online customer reviews (p. 1447). This algorithmic technique could be applied to online food service applications and help to more easily monitor the quality of chefs. Incorporating customer reviews of chefs and dishes and machine learning techniques could help HomeEats to monitor and police the quality of the application.

Food service applications need protect their employees, owners, and above all their customers. It is the duty of these companies to prioritize the safety of their customers. The government creates legislation to order to protect the public's safety; however, this is often not enough. Consumers are still at risk for eating contaminated foods that can result in illness. The Actor Network Theory framework analysis shows that the product owner, engineers, government, and health inspectors must continuously work together through the entire development process to create a safe product for the end user. It is not enough for the government to make cursory inspections or tests at the end of the process. Food companies can take extra measures to protect their customers by creating and using private health inspections, random health inspections, extra food testing, customer reviews, and machine learning algorithms. These solutions go beyond federal protocol but would act in the consumers' best interest. Protecting the public's health should be the food industry's primary concern, and

therefore, the government, engineers, and product owners need to work together to build safe products.

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