A USER-CENTERED APPROACH INTEGRATING AN INTERACTIVE PRODUCT SYSTEM INTO THE DESIGN OF A GROCERY SHOPPING EXPERIENCE

by

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Abstract

Health conditions in the United States are continuing to rise. Many of these health conditions can be resolved or suppressed by making healthier food decisions. People rely on Nutrition Fact Labels to give them information about what they are eating. For many people, Nutrition Fact Labels are not easy to understand sources of nutritional information. The increase in interactive smart technologies allows information to be communicated in new ways. This purpose of this thesis is to explain how an interactive smart technology system can be applied to a grocery shopping experience to provide people with specific, meaningful information about what they are purchasing. The paper will focus on those individuals with health conditions who have strict nutritional guidelines that they have to follow. If an individual is unable to easily understand nutritional information, and they purchase a product with a specific ingredient that they have been instructed to avoid, their health condition may be aggravated. This study includes research about they way people shop. The study also includes research identifying what nutritional information is important to people with health conditions. The result of this research is an interactive system that provides people with more meaningful information about their experiences while grocery shopping.

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CHAPTER 1: INTRODUCTION TO PROBLEM

Opportunity Statement

Health conditions have grown rapidly in the United States in the past few decades. Obesity is one of the fastest growing epidemics in the United States. “In 2008, only one state (Colorado) had a prevalence of obesity less than 20%” (Centers For Disease Control and Prevention, 2009). The Centers for Disease Control and Prevention (2009) describes the United States as “obesogenic”, meaning a society that is “characterized by environments that promote increased food intake, non-healthful foods, and physical inactivity” (Centers For Disease Control and Prevention). In 2004, a national survey revealed “…one-third of adult Americans, or 71 million, are currently on a diet” (Calorie Control Council). Studies in the 1990s revealed “...on any given day, almost half of the women in the United States are on a diet…(and) one in four men are on a diet” (“The Average American,” 2009). The Food Allergy and Anaphylaxis Network (2009) has determined that “more than 12 million Americans have food allergies” (The Food Allergy & Anaphylaxis Network). The National Diabetes Information Clearinghouse (2007) estimates that 23.6 million Americans have diabetes.

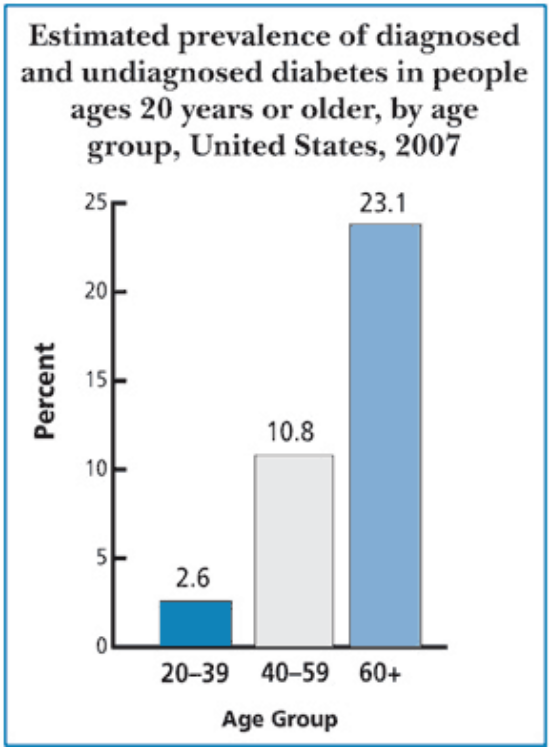


Figure 1. Estimated Prevalence of Diabetes (National Diabetes Information Clearinghouse, 2007)

Many experts conclude that these health conditions can be exacerbate and even caused by poor diet. Nutrition fact labeling has been standardized and enforced by the federal government on all food packaging, yet statistics show that many Americans are confused when reading nutrition labels. A study conducted to find out how well Americans comprehend nutrition fact labels revealed that “Only 32 percent could correctly calculate the amount of carbohydrates consumed in a 20-ounce bottle of soda that had 2.5 servings in the bottle. Only 60 percent could calculate the number of carbohydrates consumed if they ate half a bagel when the serving size was a whole bagel” (Reinberg, 2006). Meaningful information about nutrition is not accessible to Americans.

Need for Study

There is a need to create a product that can provide people with easy to understand, meaningful nutritional information that relates to their health conditions and dietary needs. People need to be able to easily access this information during their shopping experience. People cannot be expected to rely exclusively on their memory of appropriate proportions of nutrients that they need. With new technologies in product packaging developing, there is an opportunity to make meaningful information available. Packages and products have the potential to "talk" to consumers, giving them information during the shopping experience and throughout the life of the product. Products have the potential of becoming interactive instead of passive, benefiting the manufacturer, retailer, and consumer.

Objectives of Study

The objectives of this thesis are to:

- Research health problems that are linked to the consumption of unhealthy foods.
- Examine the effectiveness of current product labeling systems.
- Define modern product packaging and examine the future of product packaging.
- Examine a "talking" product system and look at how this technology could benefit people and change the shopping experience.
- Look at existing technologies that could make a "talking" product system possible.

- Design a device that could exist in a “talking” product system.

Definition of Terms

Product Packaging - a container designed to provide information to the user, protection to the product during transportation through the supply chain, a surface for marketing and advertising, security, ease of transportation, protection from theft, and protection from environmental damage.

Modern Packaging - packaging that is more informative, interactive, and influential than packaging developed before the early twentieth century.

Personality – an individual’s actual self that is not obstructed by false personas.

Personas – false representations of a person’s personality that allows the individual to appear more socially acceptable and help them achieve their internal intentions. Carl Jung, a Swiss psychologist, developed this term.

Individuation – a process developed by Carl Jung that allowed individuals to project their true personalities instead of false personas.

Consumer Confidence – a shopper’s trust in a product and/or brand

Brand Standardization – a consistent visual language used by a company to define its product line(s) that allows a consumer to identify a product as belonging to a particular brand.

Universal Product Code (UPC) - a code developed in 1969 to act as an "interindustry product code" (GS1 US, 2006). The code is used by retailers to keep track of their inventory. It also helps move consumers through lines faster.

Brand – a company's identity communicated through standardized visual cues and marketing techniques. The brand becomes a representation of who the company is.

Quick Response Code – a visual code that is used as a way to store information. A cell phone camera can decode it.

Automatic Identification technologies – technologies that allow one individual to be specifically identified and differentiated from other individuals.

Optical character reader - a device used to scan a code and translate its information into text.

Biometric technologies - technologies that allow biometric data to be collected (i.e. finger print scanning devices, retinal scans).

Retinal scans – biometric technology that scans a person's retina as a way of identifying him or her.

Electronic Product Codes (EPCs) – tracking technology used by retailers or manufacturers to locate goods through the supply chain.

Optically Scanned – a way of taking a visual code and translating it into information that can be utilized by a computer. This task is performed by an optical reader.

Biometric Data – information that identifies and individual, like a photograph of a fingerprint, without revealing the individual's name.

Transponder – the antenna of a Radio Frequency Identification chip.

Tag – another term used to refer to the antenna of a Radio Frequency Identification chip.

Uniform Code Council/GS1 US – an organization that creates international standardized coding systems with a goal to optimize supply chains.

European Article Number- a barcode created by the Uniform Code Council/GS1 US used to differentiate products and track them through the supply chain.

Auto-ID Center – a department at Massachusetts Institute of Technology that is developing Radio Frequency Identification (RFID) Technology and RFID chips.

UHF Spectrum – a system where products and a Radio Frequency Identification chip are attached to the pallet allowing the pallet to be scanned while moving through a dock.

Product Authenticity – a guarantee to consumers that the product's stated manufacturer has actually fabricated the product.

Smart Packaging – packaging that has an information tag, like an RFID tag, attached to it, allowing the consumer and the product to interact.

Internet of Things – an idea that if all packaging were smart packaging, consumers would be able to keep a household or personal inventory of everything they own.

Self-Service Store – way of modern shopping where a consumer is able to collect all of the items he or she needs by themselves without needing an attendant to retrieve certain behind-the-counter items.

Groceteria – another term for a self-service store.

United States Department of Agriculture (USDA) – a government agency responsible for food and agriculture policy.

Food Labeling to Advance Better Education for Life (FLABEL) – a European organization dedicated to researching the effectiveness of nutrition fact labeling.

Nutrition Fact Label- a government-enforced product label required on food packaging. The Nutrition Fact Label was part of the Nutrition Labeling and Education Act that was passed in 1990.

Air Interface Protocol - guidelines for how RFID tags and the reader communicate.

Obesity- having a Body Mass Index (BMI) of 30 or higher.

Body Mass Index (BMI) – a height-to-weight ratio that is used to determine overall health.

Obesogenic- a society that is inflicted with unhealthy eating habits and a lack of physical activity.

Anaphylaxis- allergic reaction induced by the consumption of a food that the body rejects. The reaction is often rapid and can be fatal.

Sedentary- a lifestyle defined by inactivity.

The Four Food Groups - nutritional guidelines released by the United States government after World War II. The guidelines included the following four groups: meat, vegetables, dairy, and grains.

The Hassle-Free Daily Food Guide - nutritional guidelines released by the United States government in the late 1970s to early 1980s. The guide listed seven food groups: vegetables and fruit; bread and cereal; milk and cheese; meat, poultry, fish, and beans; and fats and sweets.

MyPyramid- the most recent nutritional suggestions made by the United States government and displayed in a graphical format. MyPyramid was released to consumers in 2005.

Diabetes - a group of diseases marked by high levels of blood glucose resulting from defects in insulin production, insulin action, or both (Center for Disease Control).

Pre-diabetes – increased blood glucose levels that are not high enough to be considered diabetes; this stage of diabetes can be managed by making healthy food choices.

Calorie - a unit of measurement used in determining the nutritional value of a food.

Type 2 Diabetes – a condition where the body does not produce enough insulin; this lack of insulin has to be replaced with synthetic insulin to keep blood sugar levels at a normal level.

Immunity Factor – the idea that the more saturated the network becomes, the more likely that people will avoid the network because of its lack of genuine connection.

Fax Effect - the idea that the more people you have in a given network, the more valuable that network becomes.

Literature Review

RFID technology and other smart technologies are gaining popularity in new markets. Smart technologies are beginning to be considered in grocery store and food-related applications. Most existing smart technology applications in a grocery store system or a food-related system primarily benefit the company selling the products to the consumer. Smart technology applications that directly benefit the user are not as prevalent in the market.

RFID Integration

"Food safety is a top-of-mind issue around the world today. In the U.S. alone, the Centers for Disease Control estimates that 76 million Americans become ill, more than 300,000 are hospitalized, and 5,000 die each year from food-borne illness" (InSync Software Collaborates With IBM to Improve Food Safety, 2009).

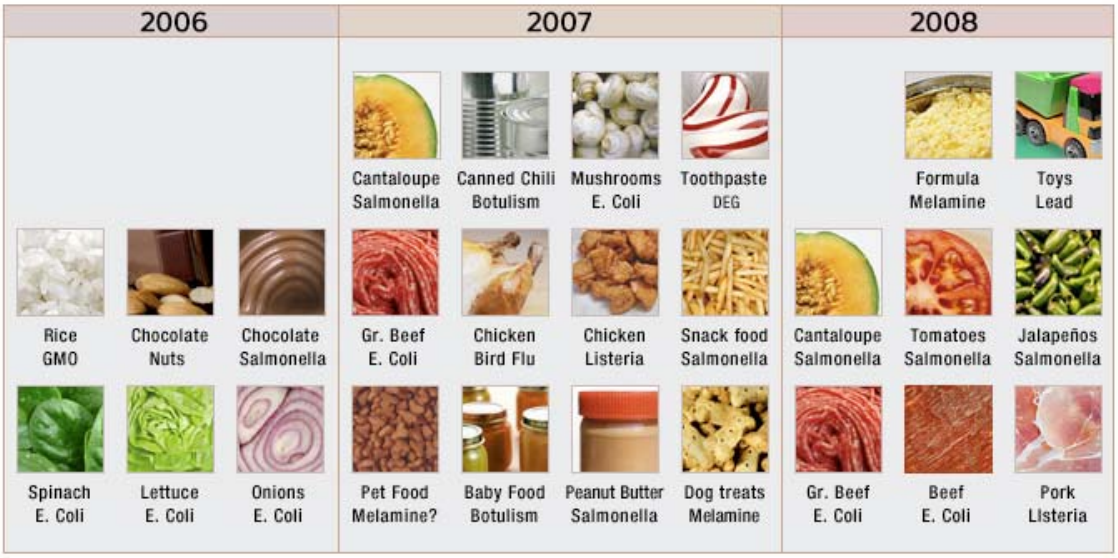


Figure 2. Samples of Consumer Products Contamination and Recalls (*Do You Know Where That's Been?*)

IBM is using RFID technology to track food through the supply chain (InSync Software Collaborates With IBM to Improve Food Safety, 2009). The food tracking system is intended to reduce waste, create more efficient supply chains, and provide people with safer food (A Healthy Appetite for Innovation). "Consumers are hungrier than ever for information about their food. They are better informed about nutrition and more aware of the environmental and societal impacts of everything they buy" (A Healthy Appetite for Innovation, para. 2). RFID technology will allow IBM's Smart Food system to provide a more efficient supply chain and give consumers the information they need to make safe food decisions (A Healthy Appetite for Innovation). The Smart Food System gives consumers reassurance that their food is safe; however, it does not provide consumers with nutritional information or give them a way of making more healthful decisions.

A Changing Grocery Shopping Experience

The grocery store shopping experience is changing. New technologies and systems are available to create a more interactive experience. The general manager of the Advertiser and Publisher Solutions Group at Microsoft has stated, “Digital advertising opportunities are expanding rapidly into new areas, as many of consumers’ daily activities, such as shopping, become increasingly ‘connected’” (Mediacart, 2008). Some grocery stores are adopting biometric technologies. “The smart-shopper program at the Green Hills Supermarket in Syracuse, N.Y., has…speeded up checkout by allowing customers to pay by touch with a finger-scan system” (abcNEWS.com, 2007).

Grocery Cart Innovations

Grocery carts have been redesigned to accommodate shoppers and new technologies, providing an enhanced shopping experience. In 1998, IDEO re-designed the grocery shopping cart (IDEO.com, 1998). The shopping cart concept considered “maneuverability, shopping behavior, child safety, and maintenance cost” (IDEO.com, 1998, para.1). The concept utilized plastic baskets that a shopper could take with him or her to the shelf, fill with items, and then return to the cart (IDEO.com, 1998). The cart also featured hooks for the shopper to hang grocery bags from when checking out (IDEO.com, 1998). The cart also featured a UPC scanner that the shopper could use to obtain information about a product (IDEO.com, 1998).

Figure 3. IDEO Shopping Cart (IDEO.com, 1998)

The IDEO shopping cart was built in the late nineties (IDEO.com, 1998). The scanning device and the barcode system does not allow the user to interact with product information after leaving the store. Smart technologies have advanced and allow for a more interactive product system.

Microsoft and MediaCart have joined “to offer in-store ad targeting that is both behavioral and takes the concept of ‘location-based services’ to the store aisles using RFID tag” (Sterling, 2008, para.1). MediaCart is a “next-generation computerized shopping cart” (Mediacart, 2008, para.1). The grocery shopping cart features an attached computer screen and scanning device. The cart allows the shoppers to “save time and money…by obtaining electronic coupons, locating products in the store, performing comparative price checks, viewing store specials in aisles as they shop, viewing recipes and nutritional information, shopping using an electronic shopping list that is presented in aisle order, totaling the cost of the items in their baskets before checkout, and expediting

the checkout using the cart-level checkout feature" (Sterling, 2008, para. 3). The cart uses a UPC scanning device, allowing the shopper to scan an item's UPC code to obtain information about it (Mediacart, 2008). MediaCart would exist in a system where RFID scanners would be strategically positioned throughout the store to detect the presence of the cart and then tell the screen on the MediaCart to display an advertisement relevant to the aisle the cart is in (Mediacart, 2008).

Figure 4. Mediacart (The Hi-tech Shopping Trolley That Tells You Where To Find Things in a Supermarket, 2008)

The MediaCart gives consumers the most user-centered information; however, the scanning device relies on UPC barcode scanning. Scanning a barcode requires a more precise scan than scanning a smart technology chip. Also, the barcode limits the window of time that a consumer has access to product information. The consumer can only interface with advanced product information in the store. The barcode does not allow the

products to function in a more interactive product system that can live in an individual's ecosystem.

Intelligentz has created CartMotion (Figure 5), a shopping cart monitoring system that uses RFID technology to generate marketing data (Intelligentz Corporation, 2009). "Sensors are positioned strategically and discreetly around the store perimeter to locate shopping carts within six inches of its precise location" (Intelligentz Corporation, 2009, para.2). These sensors can tell the store how long people stay in a particular aisle, or what path the shopper takes to navigate their way through the store (Intelligentz Corporation, 2009). The system can also protect the store from losing shopping carts. "The loss of shopping carts has been an ongoing problem that can cost stores thousands of dollars a year. Typically, the cart costs between $150 and $200 each" (Swedberg, 2006, para. 2).

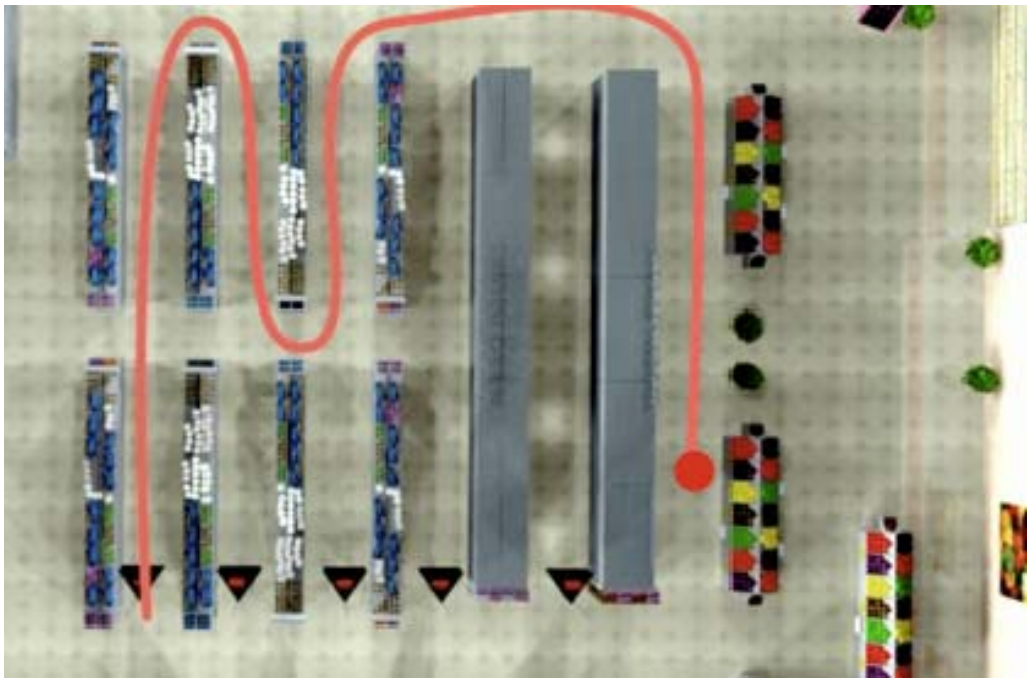


Figure 5. Cart Motion Map (Intelligentz Corporation, 2009)

This type of smart technology application allows the store to see how effectively the strategically placed displays are marketing information to customers. However, it does not provide any value to the consumer.

Stop and Shop has incorporated a barcode scanning device (Figure 6) into its stores. “Many of Stop and Shop’s 376 stores feature a variety of digital devices that let customers weigh their own veggies, order deli meats by using a video touch screen, and pay their bills without human assistance. Users weigh, scan, and bag their own purchases, preferably in reusable cloth bags…Good for the environment, and for the bottom line” (Bray, 2008, para. 3).

Figure 6. Stop and Shop UPC Scanner (Flash, 2008)

Assumptions of Study

It can be assumed that in this study, any information derived from books, journals, lectures, and the Internet is accurate. It can also be assumed that the authors or lecturers of this information are reliable and verifiable. It can be assumed that consumers have an innate relationship between meaningful information and making more informed decisions. Also, it is presupposed that the technology required to create a device that could give users meaningful information will be more readily available in the future. It is also presumed that health conditions like obesity, heart disease, cancer, and allergies are largely a result of poor diet.

Scope and Limits

This study has an expected scope of research. This study focuses on developing a device that can be used in the grocery store. However, the application of this technology and product system is relevant to other types of shopping experiences. This study is limited, in that any surveys or observational focus groups will be conducted in Auburn, Alabama, and Waukesha, Wisconsin. Auburn, Alabama, and Waukesha, Wisconsin, are small samples of the world and they do not represent a universal view. To broaden the study, other resources were utilized, including books, journals, lectures, and the Internet.

Procedures and Methods

The study was executed with the following procedures and methods:

- Research health problems and statistics.

- Examine national statistics posted online by government organizations that post census information about disease.

- Study the relationship between health problems and the consumption of food.

- Research the effectiveness of product labeling.
    - Study the nutrition fact label and other standardized product labeling designed to inform consumers.
    - Conduct surveys on how people make food-buying decisions when grocery shopping.
- Research modern product packaging and future trends.
    - Define modern product packaging and develop predictions for future product packaging.
- Research the grocery shopping experience.
    - Look at how people shopped for items in the past and how they currently grocery shop.
    - Describe a future grocery shopping experience in a “talking” product system.
- Research smart technologies.
    - Research existing smart technologies including RFID technology.
    - Explain the user benefits of smart technologies.
- Design development.

    - Sketch preliminary design concepts of a device that can provide users with meaningful information during their grocery shopping experience.
    - Finalize sketches and create a computer model of device.
- Evaluation and review.
    - Examine the effectiveness of the device in an interactive product system.

Anticipated Outcome

This study demonstrates the development of a device designed to be used in a "talking" product system with capabilities of bringing meaningful information to the user. The study establishes a method of research for a new product that does not exist, using unique research methods. It also shows how a smart packaging system accompanied by a scanning device can provide a way to give people with health conditions more comprehensible information that can help them make better decisions. This study also serves as a resource to assist others in designing new products that are developed from observing people's behavior and experiences.

CHAPTER 2: INTRODUCTION TO RESEARCH

Overview

Thomas Hine (1995) states “the combination of containers with preparation and information makes them packages” (p.17). Product packaging is complex in definition. And its definition has changed as society and technology has advanced. Chapter 2 is an introduction to product packaging, providing many definitions of product packaging. This chapter examines the development of product packaging since its inception. It also explores the regulations placed on product packaging by the government to provide users with obligatory information.

Product Packaging

Product packaging is not easily defined. Berger (2002) states that packaging has four purposes: to contain products, to protect products from theft or environmental damage, to assist in the transportation of the product, and to display information. DuPuis and Silva (2008) describe packaging as having six functions: “containment, security, protection, convenience, information, (and) marketing” (p.106). Some may argue that it also needs to instill confidence in the consumer. DuPuis and Silva (2008) define packaging as “something that holds, protects, and stores its contents” (p.10). They believe that packaging “occurs naturally, as in the protective covering of a banana, the cocoon of a butterfly, and an oyster” (Dupuis and Silva, 2008, p.10). Dupuis and Silva (2008)

explain that as societies became more advanced, more information was necessary for people to understand what the package contains. Hine (1995) (Figure 7) believes that packaging's job is to "preserve and protect…they are potentially expressive…they help those who use the item feel good about it" (p.3). The U.S. Government also attempts to define packaging. "The label and packaging on products you (the manufacturer) create and/or sell are forms of advertising" ("Product Labeling," 2009).

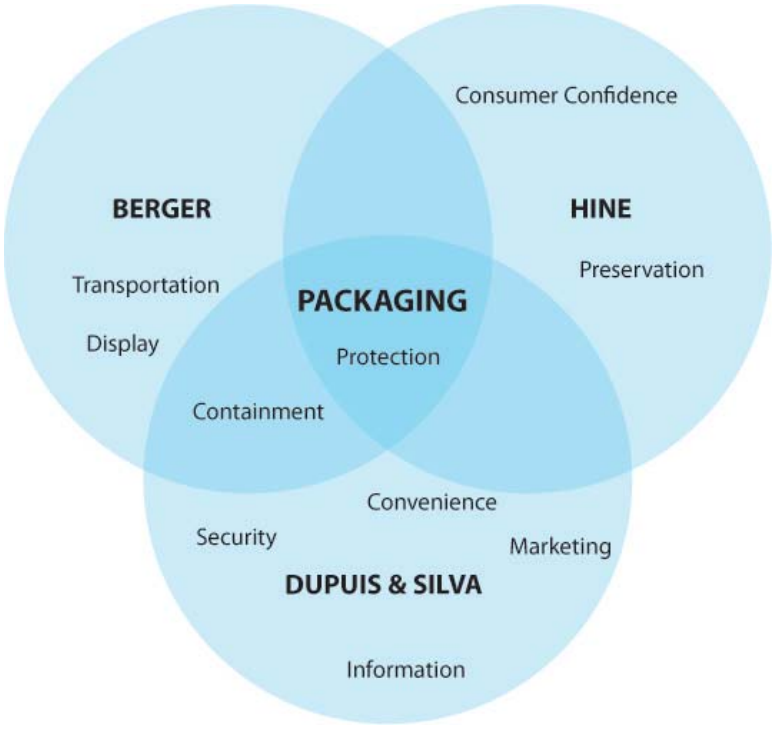


Figure 7. Packaging Definition Summary

Communicating Product Information

One of the most important functions of packaging is to communicate information about the product to the consumer. Packaging tells consumers the brand name, the

contents of the package, and the features of the product. Most non-food packaging includes product manuals that explain how the product is to be used, how it is to be assembled, and who to contact if there is a problem. Many manuals include phone numbers and website information that consumers can use to obtain more information about the product or the brand. Product packaging also contains information that can be utilized by the store.

History of Product Packaging

The origins of product packaging are not clearly defined. Berger (2002) explains that initially, people did not need packaging because people used all of the food that they caught or gathered. If something was needed to be stored it could be carried in "gourds, shells, and leaves" (Berger, 2002, p. 1). Later, people used "hollowed logs, woven grasses, and animal organs" (Berger, 2002, p.1). When new materials were discovered, people made containers from clay and metal (Dupuis & Silva, 2008). In 1500 B.C. the Egyptians started making glass jars (Dupuis & Silva, 2008). Some consider this the first form of packaging. Glass making was a protected secret that aided in trade (Dupuis & Silva, 2008). Trade allowed societies to prosper and later inspired the creation of monetary systems (Dupuis & Silva, 2008). The need for packaging of goods increased, and societies recognized the need to give products perceived value through package form and labeling (Dupuis & Silva, 2008). Governments recognized that creating packages to preserve food gave them a military advantage (Dupuis & Silva, 2008). Nicolas Appert developed an airtight seal for glass jars in 1810 (Dupuis & Silva, 2008). In the same year, England patented the tin can, giving its armies the ability to carry food with them into

battle (Dupuis & Silva, 2008). The United States used tin cans in the Civil War; afterwards, tin cans became available to the public (Dupuis & Silva, 2008). During the Industrial Revolution, many farmers left their land to work in the cities, and people began to depend on store-bought goods (Dupuis & Silva, 2008). In 1817, the cardboard box was invented (Dupuis & Silva, 2008). In 1844, England developed the first commercial paper bags (Dupuis & Silva, 2008). When germs were discovered, packaging began to advertise its hygienic qualities (Dupuis & Silva, 2008). People began to trust packaging's promising graphics to protect them from contamination (Dupuis & Silva, 2008). In 1858, New York faced "a massive milk contamination problem from cows too close to the city (Dupuis & Silva, 2008, p.13). Gale Borden lived outside of the city, canned his cows' milk, and sold it to the public. (Dupuis & Silva, 2008). Condensed milk was perceived as "clean and pure" (Dupuis & Silva, 2008, p.13). The tin can packaging gave the public a sense of security and safety from disease (Dupuis & Silva, 2008). Henry Parsons Crowell, founder of Quaker Oats Company, recognized the public's concern and responded by creating packaging that described Quaker Oats as *pure* (Dupuis & Silva, 2008). The Quaker Oats Company printed easy recipes on the back of boxes to show the public that their product was easy to prepare (Dupuis & Silva, 2008). In the early twentieth century, grocery stores changed from a clerk behind a desk who would give the consumer the requested product to self-service stores. This greatly influenced packaging. Now, consumers would interact with a product's packaging more than they ever had before. It became important for a product's packaging to be informative, interactive and influential. This "modern packaging" (Frost, 2005) reduced human interaction and required the package to be the source of communication. This new way of shopping

reduced the overall time a shopper spent in a store. Shopping also became "less of an emotional drain when shoppers no longer felt compelled to share personal information with the grocer each time they visited his store" (Frost, 2005). The new way of shopping also instilled more trust in the shoppers. Shoppers who were moving into the cities during the Industrial Revolution could trust a labeled package more than shopkeepers who were strangers to them. In 1930, Clarence Birdeye began distributing frozen food products (Dupuis & Silva, 2008). In 1937, the first shopping card was created (Dupuis & Silva, 2008). Swanson introduced the first frozen TV dinner to the public in 1950 (Dupuis & Silva, 2008). By the early 1970s, California introduced the recycling symbol to identify packaging that was made from recyclable materials (Dupuis & Silva, 2008). Soon after, Ohio introduced the first bar code on a Wrigley's gum package (Dupuis & Silva, 2008). In 1974, Fall City Brewing Company introduced the stay-on tab on the aluminum soda can (Dupuis & Silva, 2008). In 1977, PETE, polyethylene terephthalate plastic, was first used in the manufacturing of soda bottles (Dupuis & Silva, 2008).

Walter Landor is considered the founder of corporate identity ("Pioneer of Branding," 2004). Landor was responsible for conducting extensive research on consumers and how packaging influences their purchasing decisions ("Pioneer of Branding," 2004). He believed (Figure 8) that a package "had to satisfy more than the accepted basic needs: protection of product, shelf impact, memorability, strong communication of product and brand – to be truly consumer oriented" ("Pioneer of Branding," 2004).

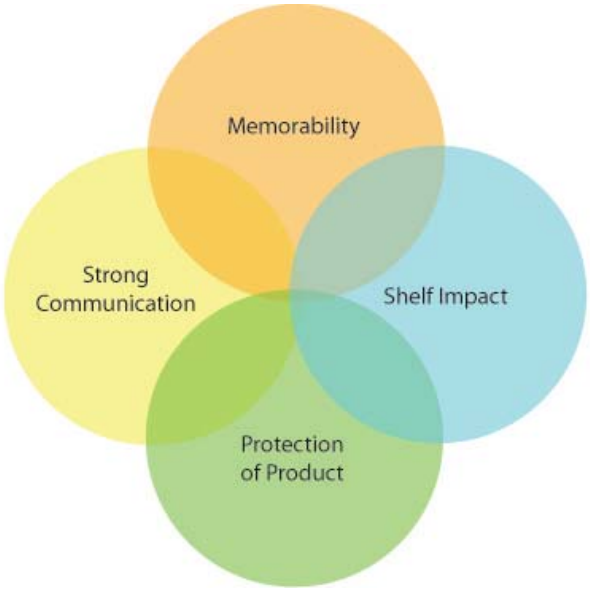


Figure 8. Definition of a Brand

Walter Landor thought that the "brand personality expressed by the package should be the same personality that reached the consumer through other media" (Frost, 2005). Waltor Landor, along with others, believed that packaging is the same as product branding. Branding and packaging consultant Richard Gerstman says "packaging is branding" (Frost, 2005). Gerstman believes that brand identity leads to brand promise (Frost, 2005). He believes that the reason people buy a brand is "value, acceptance, and loyalty" (Frost, 2005). Packaging plays a large role in creating the brand's image. It is the core of the brand experience, and ultimately leads to a customer's brand loyalty. (Figure 9)

Figure 9. The Role of Packaging in Creating a Brand

Others believe packaging and branding are separate entities. Darrel Rhea, Principal CEO of Cheskin, says "Packaging and branding are different things… (packaging) is a very important element and may even be the primary way people interact with the brand..." (Frost, 2005). Rhea believes that packaging should be used to reinforce the brand definition (Frost, 2005).

In the beginning of the twentieth century, Carl Jung, a Swiss psychologist, began to define the differences between personality and persona (Frost, 2005). Jung believed that people create personas, false representations of their personality, that are more socially acceptable and help them achieve internal intentions (Frost, 2005). Jung also believed that people were at risk of thinking that their personas were their true personality (Frost, 2005). He used a process he called individuation to help patients project their true personalities instead of false personas (Frost, 2005). Jung said,

> "If man were an individual he would have an unvarying character. By identifying with the moment, he deceives others and himself about his real character. He wears a mask that he knows corresponds with his conscious intentions, and which meets the opinions and requirements of his environment. The mask is the persona. The mask is not he same as individuality" (Frost, 2005).

Jung's explanation of personalities and personas is applicable to packaging. While contents of packages remained the same, the persona masks of the packaging changed often to compete with other products (Frost, 2005). Consumers began to be bombarded in the grocery store by packages that "seemed to be shouting across the aisles at each other" (Frost, 2005). Hine thought "that putting faces on packages at the beginning of the 1900s (e.g., Aunt Jemima) was part of a transition from judging people based on true personality to judging them based on persona" (Frost 2005). Hine believes that this gave people who felt lost in an early twentieth century society a way of interacting with packages without revealing too much of their self (Frost, 2005).

The evolution of consumer's interaction with a product (Figure 10) begins with consumer confidence. Once shoppers began to trust packaging and consumer confidence was prevalent, packaging began to target consumer emotions. For example, "breakfast foods…were now marketed to make parents feel good when serving them to their children" (Frost, 2005). Later, brand standardization became a concern. Packages needed to consistently communicate the brand's personality everywhere that there was a consumer interaction.

Figure 10. Evolution of Consumer Confidence

Standardizations in Product Packaging

Government laws and regulations have been enacted to ensure that consumers are aware of what a package contains. In the United States, the Fair Packaging and Labeling Act (FPLA) requires "all consumer commodities to be labeled to disclose net contents, identity of the product, and name and place of business of the product's manufacturer, packer, or distributor" ("Product Labeling," 2009). Government laws call for the textile Industry to label all clothing items with care instructions and information regarding the type of fibers in the garment ("Product Labeling," 2009). The United States Government also regulates the appliance and electronic industries, making sure that they are in compliance with "energy efficiency labeling requirements" ("Product Labeling," 2009).

The Universal Product Code

Norman Joseph Woodland and Bernard Silver invented the UPC (Universal Product Code) in 1949. They patented "the concept of a symbol and reader" ("History of the UPC Bar Code"). In 1970, McKinsey & Company worked with the Uniform Grocery Product Code Council (UGPCC) to create the modern UPC bar code ("History of the UPC Bar Code"). George Laurer, who worked for IBM, came up with the design of the bar code ("History of the UPC Bar Code"). The UPC label is used for "tracking, stocking, and pricing" (Dupuis & Silva, 2008, p.133). It can be scanned with infrared light that can decode the pattern of vertical bars. The first item to use the UPC system was a pack of Wrigley's Juicy Fruit in 1974. The use of the UPC changed the shopping experience. It sped up the checkout, giving the store the ability to move more shoppers through the grocery store line, faster.

Nutrition Labels

In order to provide consumers with nutritional data, The Food and Drug Administration (FDA) has stringent requirements for food and drug labeling in the United States. In 1990, The Nutrition Labeling and Education Act (NLEA) was signed into law. This required food packaging to "disclose the fat (saturated and unsaturated), cholesterol, sodium, sugar, fiber, protein and carbohydrate content in their products" (American Heart Association, 2009). In 1993, the FDA and the USDA defined the format of the nutrition label. Most recently the FDA has required trans fat to be listed on the nutrition fact label (Figure 11).

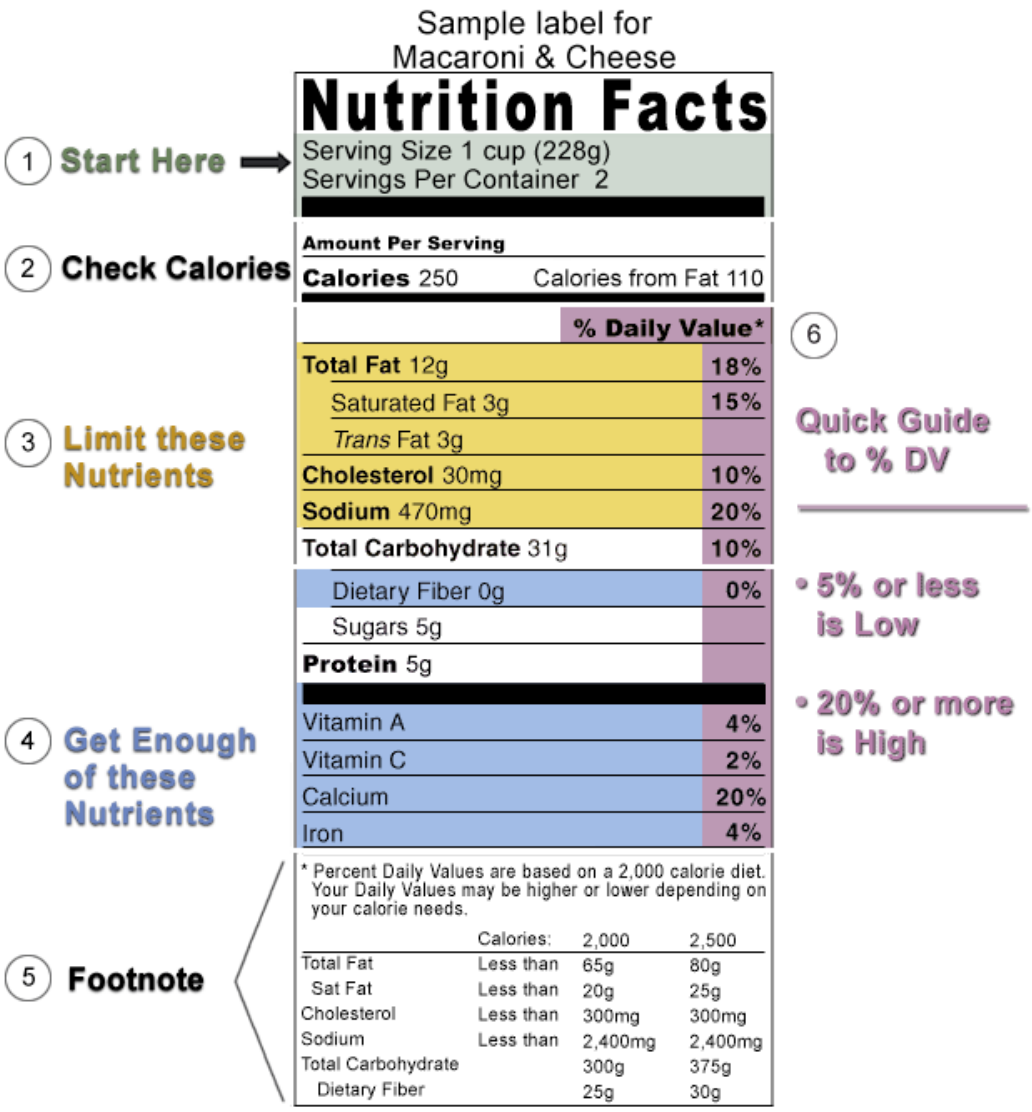


Figure 11. Nutrition Fact Label, (U.S. Food and Drug Administration, 2004)

Challenges with Understanding Nutrition Fact Labels

Studies have been conducted to determine if people are able to understand the information on nutrition labels. In 2006, studies conducted by Vanderbilt University Medical Center were released that showed the difficulty that people have with reading nutrition fact labels ("Having Difficulty Reading Foods' Nutrition Labels," 2006).

"Vanderbilt University Medical Center surveyed 200 primary care patients from a wide socioeconomic range" ("Having Difficulty Reading Foods' Nutrition Labels," 2006, para. 2) to understand how well people are able to translate the information on nutrition labels. They gave each patient a Nutrition Label Survey (NLS) that included two parts ("Having Difficulty Reading Foods' Nutrition Labels," 2006). The first part asked patients to "interpret food labels, such as determining carbohydrate or caloric content of an amount of food consumed. The other part asked patients to choose which of two foods had more or less of a certain nutrient…Over 40% (of the patients) had a chronic illness for which specific dietary intervention (was) important, and 23% reported being on a specific diet plan" ("Having Difficulty Reading Foods' Nutrition Labels," 2006, para. 2 &3). The results showed that patients were not able to easily understand what the nutrition fact labels meant. "Only 32% of patients could correctly calculate the amount of carbohydrates consumed in a 20-ounce bottle of soda that had 2.5 servings in the bottle. Only 60% of patients could calculate the number of carbohydrates consumed if they ate half a bagel, when the serving size was a whole bagel. Only 22% of patients could determine the amount of net carbohydrates in 2 slices of low-carb bread, and only 23% could determine the amount of net carbohydrates in a serving of low-carb spaghetti" ("Having Difficulty Reading Foods' Nutrition Labels, 2006," para. 4). Mark Kantor, IFT (Institute of Food Technologies) member and Associate Professor in the Department of Nutrition and Food Science at the University of Maryland, explains, 'Many consumers admit to having trouble understanding the current Nutrition Facts label, or they don't have time to read it' (Frederick, 2009, "Nutrition Labels: Here, There, and Everywhere," para.1).

Solutions to Help Consumers Understand Nutrition Labels

Nutrition fact labeling has been confusing for many consumers. In response, some stores have tried to help customers make more healthy decisions by trying to simplify the nutrition fact label's information. Supervalu has developed Nutrition IQ (Frederick, 2009). Nutrition IQ is a system that uses color-coded tags to designate a food's nutritional content (Frederick, 2009), for example, "orange tags for high-fiber foods, green tabs for low sodium, and blue labels for foods with high calcium" (Frederick, 2009, "Nutrition Labels: Here, There, and Everywhere," para.2). NuVal Nutritional Scoring System is a system that uses numbers from 1 to 100 to rank the nutritional value of a product (Frederick, 2009). "The score is calculated using the Overall Nutritional Quality Index (ONQI), a patent-pending algorithm for measuring the nutritional quality of foods and beverages based on the influence they have on overall dietary goals" (Frederick, 2009, "Nutrition Labels: Here, There, and Everywhere," para. 3).

Summary of Chapter

Chapter 2 defines product packaging. It explains the development of product packaging throughout history. Examining the meaning of product packaging helps establish user expectations of what product packaging does and can be. The standardizations represent user needs so pertinent that government has mandated them. Comprehension of definition and background provides a thorough foundation for new product development.

CHAPTER 3: SMART TECHNOLOGIES

Overview

"…It's possible to look at a can of peaches, for example, and learn precisely what quantities of nutrients it contains and how much of your recommended daily intake it provides. There might even be some suggestions about what else you ought to eat to achieve a healthy diet. A fresh peach may be juicier, but it does not begin to tell you so much" (Hine, 1995, p.21). Chapter 3 examines smart technologies that can be incorporated into product packaging. The future of product packaging seems to be inevitably more interactive. These types of technologies can make that possible.

Future Trends in Packaging Design

Packaging is continuing to change as new materials and manufacturing processes are developed. The role of packaging in the brand and the brand experience is also changing. Packaging is playing a bigger role in marketing. New technologies are emerging that can provide the user with meaningful information. More and more it seems as though when someone is shopping in a grocery store, they are less likely to have a prepared shopping list, and more likely to "walk down the aisle, and let the packages speak to them" (Hine, 1995, p. 20). New trends in product packaging may actually allow products to "talk" to a user. Most smart technologies require a chip or a code to be placed in the packaging of a product. An electronic device then scans the chip or code. Most of

the smart technologies that currently exist have been implemented to benefit the manufacturer or retailer during the inventory process.

Available Technologies

There are a variety of different smart technologies available. Each technology functions a little differently. However, all the technologies are designed to give consumers more information than they are capable of seeing by looking only at the product packaging or advertisement. Most of the smart technologies require the user to scan a symbol with a handheld device, most often a cell phone, and decode its message. The variety of codes available requires companies to choose which code they will incorporate into their product or advertisement. This forces the user to choose an exclusive reading device or application that only allows them to read one type of code. The talking product system does not have a universal code.

Checkout Smartshop

Checkout Smartshop is a new way of providing the consumer with product information through packaging. *Checkout Smartshop* is an iPhone application that allows users to enter the UPC and "get Amazon reviews, varied online and retail store prices along with locations and phone numbers of stores nearby" (Apptism.com, 2009, para. 3). Users can easily access product information from their phones so they can make more informed buyer decisions.

Red Laser

Occipital has released an application called *Red Laser* (Figure 12) that allows users to take a picture of a barcode with their cell phone (Redlaser.com, 2009). The picture of the barcode allows the user to "check online prices for a DVD player, scan movie at the store and beam them to your TiVo, scan a book and check for reviews, (and) scan the milk and add it to your grocery list" (Redlaser.com, 2009, para.1).

Figure 12. Redlaser UPC Scanner (Occipital, LLC, 2009)

Quick Response Codes

Quick Response is a visual code that is used as a way to store information (Blackwell, 2008). The code is applied to a product, sign, billboard, or advertisement (Blackwell, 2008). A consumer can use his or her cell phone's camera to read the code.

The company's website appears when the code is scanned (Blackwell, 2008). The code's popularity began in Japan (Blackwell, 2008).

ScanLife Codes

ScanLife uses a 2D barcode that can be placed on a package or advertisement (Biggs, 2008). "The company…is dedicated to making 2D barcodes a mainstay of the modern experience" (Biggs, 2008, para. 5). The codes give the user access to more information about the product or service being advertised (Figure 13) (Biggs, 2008). It can also locate products on a virtual map and then give directions of how to get there (Biggs, 2008).

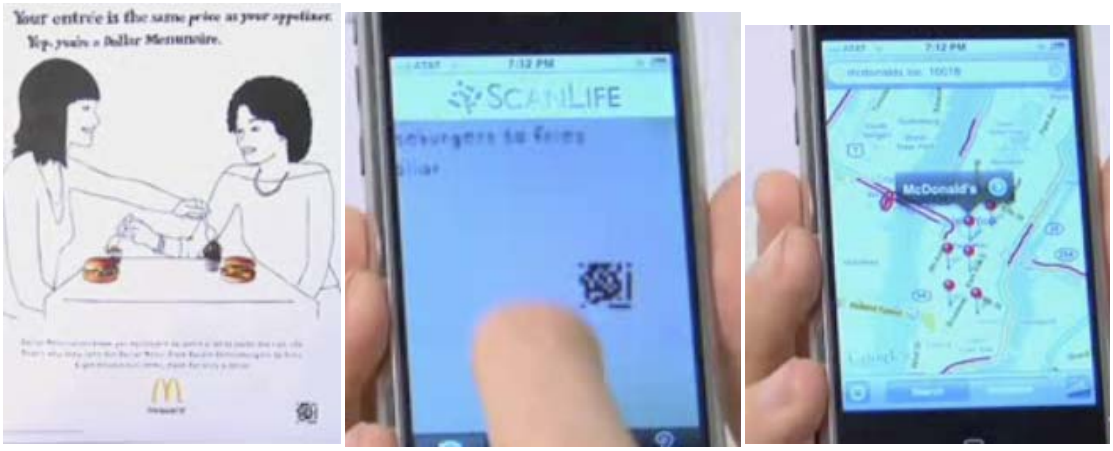


Figure 13. ScanLife Codes with Quick Response Codes (Biggs, 2008)

RFID (Radio Frequency Identification) Technology

Radio frequency identification is "a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves" (RFID Journal LLC, 2009, para.1). "RFID devices have

three primary elements: a chip, an antenna, and a reader. A fourth important part of any RFID system is the database where information about tagged objects is stored" ("RFID Information," 2009, para. 3).

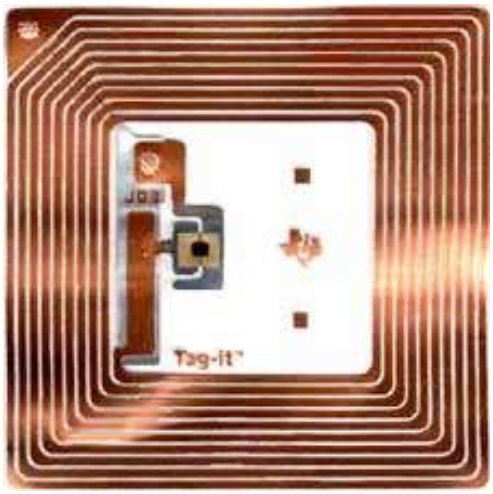


Figure 14. RFID Chip

Radio Frequency Identification is part of a group called the Automatic Identification technologies. These technologies include "bar codes, optical character readers and some biometric technologies, such as retinal scans" (RFID Journal LLC, 2009, para.2). RFID chips have the capability of storing up to two kilobytes of information (RFID Journal LLC, 2009). Chips can contain Electronic Product Codes (EPCs) (RFID Journal LLC, 2009). Retailers or manufacturers often use EPCs to "track authenticity and location of goods throughout the supply chain" ("RFID Information," 2009, para.4). The EPC is similar to a bar code except it is read using radio frequency instead of being optically scanned ("RFID Information," 2009). EPCs connect to an internet database that can relate an unlimited amount of information to the EPC ("RFID Information," 2009). The information is stored online. RFID chips can also contain

biometric data that can identify an individual, like a photograph of a fingerprint, without revealing the individual's name ("RFID Information," 2009). Some RFID chips are not used to carry information ("RFID Information," 2009). Instead they are placed on products to prevent shoplifting. These types of chips are part of Electronic Article Surveillance Systems (EAS) ("RFID Information," 2009).

Each chip has an antenna (RFID Journal LLC, 2009). "The chip and antenna (…) are referred to as a transponder, or tag" (RFID Journal LLC, 2009, para.6). The antenna is what transmits the information to the reader (RFID Journal LLC, 2009). The length of the antenna determines how far the chip can transmit information (RFID Journal LLC, 2009). The reader is "a device that has one or more antennas that emit radio waves and receive signals back from the tag" (RFID Journal LLC, 2009, para. 5). The reader communicates with a computer system to translate the data. The reader does not have to "see" the chip to be able to communicate with it (RFID Journal LLC, 2009). The reader can communicate with multiple RFID chips at one time (RFID Journal LLC, 2009). The reader communicates with a database, and the database carries information about the RFID chips (RFID Journal LLC, 2009).

The cost of RFID has limited its use. Prior to 1999, tags cost approximately a dollar (RFID Journal LLC, 2009). The Uniform Code Council and the European Article Number (EAN) worked with companies including Gillette, Proctor & Gamble, Kimberly-Clark, Metro, Target, Tesco, Unilever, and Wal-Mart to bring the cost of RFID chips down (RFID Journal LLC, 2009). Their goal was to create a chip that would cost five cents, allowing for "the potential of offering supply chain visibility – the ability to know

the precise location of any product anywhere in the supply chain at any time" (RFID Journal LLC, 2009, para. 9) Today, chips cost twenty to forty cents. IDTechEx predicts that the cost of chipless tags could be reduced to 0.1 cents (RFID Journal LLC, 2009). Chipless tags are tags that "do not integrate a microchip…(they) use materials that reflect back a portion of the radio waves beamed at them. A computer takes a snapshot of the waves beamed back and uses it like a fingerprint to identify the object with the tag" (IDLogistics Inc., para. 10). IDTechEx projects that the number of RFID tags sold annually will increase from "40 million in 2009 to 624 billion in 2019" (IDTechEx, 2009, para. 3). They predict that by 2019 the price of an individual tag will be one cent (IDTechEx, 2009).

The Auto-ID Center created the Electronic Product Codes (RFID Journal LLC, 2009). It also developed the air interface protocol, the guideline for how RFID tags and the reader communicate (RFID Journal LLC, 2009). The Auto-ID Center has given its technology to EPCglobal, a developing a network for companies to share real-time data (RFID Journal LLC, 2009). "The potential efficiencies created by this visibility (network) are enormous. Companies would be able to reduce inventories while ensuring a product is always in the right place at the right time. And because no humans would have to scan the tags, labor costs and errors would also be greatly reduced" (RFID Journal LLC, 2009, para. 12).

Wal-Mart and RFID

Wal-Mart was the first retailer to require suppliers to use RFID tags on product pallets (RFID Journal LLC, 2009). The introduction of RFID chips into Wal-Mart's

supply chain has increased the popularity of the tags (RFID Journal LLC, 2009). This has helped the industries “chicken-and-egg-problem” (RFID Journal LLC, 2009, para. 16). The chicken-and-egg-problem (Figure 15) for RFID chips is the idea that the cost of chips will not come down unless more companies buy them, and more companies will buy them if the cost of the chips comes down (RFID Journal LLC, 2009). Wal-Mart required suppliers to use tags that operated in the UHF spectrum (RFID Journal LLC, 2009). UHF systems are best for supply chain applications because products can be scanned on a pallet while moving through a dock (RFID Journal LLC, 2009).

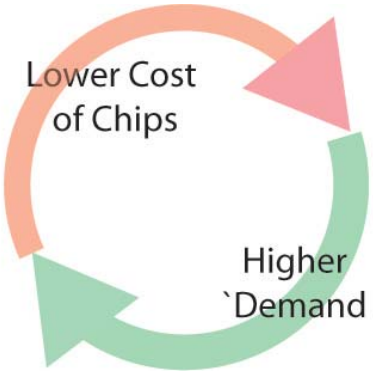


Figure 15. Chicken-and-Egg Problem

Supply Chain and RFID

The supply chain can greatly benefit from RFID technology. Presently, products leave the manufacturer on a truck and are shipped to the distributor. Manufacturers do not have a way of knowing exactly when the distributor receives the product. Most of the time, the manufacturer has to call the distributor to find out if the product was received. Sometimes, the distributor has to call the manufacturer to find out where the product is in

transit, especially if it is late to arrive. This process requires a lot of unproductive communication between the manufacturer and the distributor. There are also challenges when it comes to precise inventory in the manufacturer's warehouse. A distributor may need a certain amount of products from a manufacturer's warehouse. The manufacturer may have the amount of product that the distributor needs; however, a different distributor may already need the amount, or a portion of the amount. The distributor does not have a real-time way of knowing exactly what the manufacturer has and if it is accessible.

If RFID tags were introduced into the supply chain model (Figure 16), efficiencies of inventory and shipping would greatly increase. RFID tags would give manufactures and distributors a way to see exactly where products are when they are being shipped in real-time. "It is this ability to share information about the location of products anywhere in the supply chain that makes RFID a potentially powerful technology" (RFID Journal LLC, 2009, para. 20). Store shelves could have readers on them that could keep track of how many products are on the shelf. When a product is almost out, it could wirelessly signal to a reader that would tell employees that a product needs to be restocked with an exact amount of items. The reader in the store could signal to the manufacturer when the stock was low and order a specific amount of product to be shipped on the next truck. This would save on labor costs for a store because the restocking process would become much more efficient.

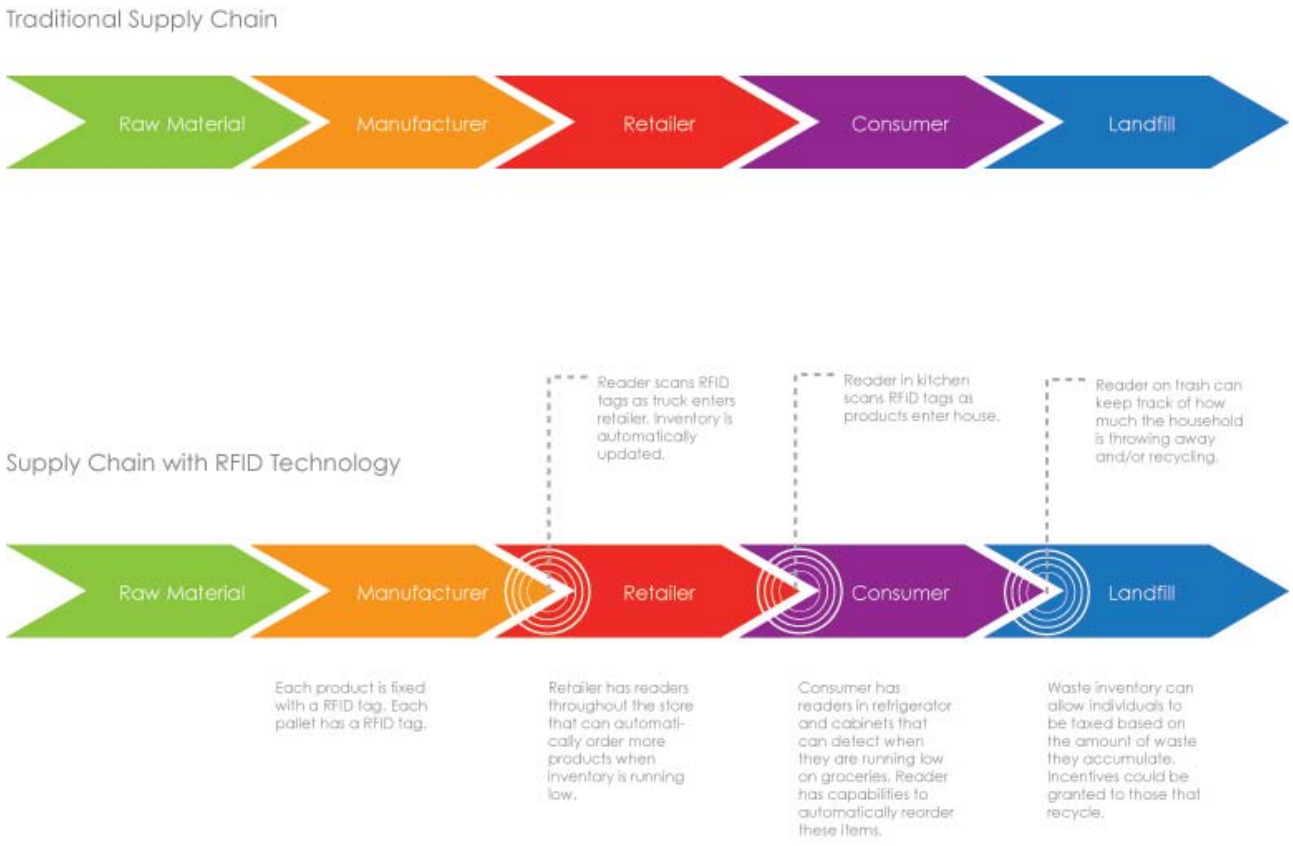


Figure 16. Supply Chain with RFID Technology vs. Traditional Supply Chain

Product Authenticity and RFID

A growing concern with product purchasing and shipment is the authenticity of the product being received by the distributor, and ultimately by the consumer. For example, in 1982 it was discovered that a number of bottles of Tylenol had been laced with cyanide in the Chicago area. This scare led to safety sealed packaging (Meyers & Gerstman, 2005, p 216). Meyers et al. write, “If we had had RFID technology back then, we would have known where the product was made, distributed and purchased. Johnson & Johnson (Tylenol’s manufacturer) would have quickly been able to recall the products

that needed to be recalled, rather than having to take the time and expense to pull out all the products nationwide" (Meyers & Gerstman, 2005, p 216).

Counterfeiting is a growing concern for retailers. "In China, pirating is prevalent, and people in garages make products that look like some of the brand names we're all familiar with, such as Tylenol, Lego, Polo" (Meyers & Gerstman, 2005, p.217). Product authenticity would allow retailers to guarantee to consumers that the product's stated manufacturer had actually made the product.

Consumer Advantages & Smart Packaging

Consumers could greatly benefit from smart packaging, or packaging that has RFID tag capabilities. It could revolutionize what we now think of when we think of going to the store and shopping. If every product had an identification tag they would create a sort of "Internet of Things" (Treblicock, 2007, para. 6). Just as readers would be able to keep track of inventory in warehouses and on store shelves, readers in a person's home would be able to tell them if they were low on bread, if milk was expired, if the oil in the car needed changed, or if a light bulb needed replaced (Treblicock, 2007). "In the future, the packaging will help you remember. As you open the bottle (a prescription bottle, in this case), a little chip in the cap will signal to you, possibly by changing color or even by talking to you, reminding you that you need to renew the prescription, instead of using what you have (if it is expired)" (Meyers & Gerstman, 2005, p218).

The United States government estimates that "foodborne diseases cause approximately 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths in the United States each year" (Center for Disease Control, 2009). Even though food has

expiration dates on its packaging, it is not clear to consumers what happened to the food during the shipment process from the manufacturer to the retailer. Smart packaging may have censors that could alert retailers or consumers if food was exposed to temperatures that could spoil its contents, or censors that could even detect pathogens on the product (Meyers & Gerstman, 2005).

Smart packaging may also be able to accommodate different languages. Companies could communicate the brand to the consumer without text. Text could be kept on a database that the user could access in their language of preference when interacting with the product (Meyers & Gerstman, 2005).

Marketing Benefits and Smart Packaging

Although seemingly intrusive to some, there is potential marketing strategy in smart packaging. If furniture and appliances in your home had readers in them, it may be possible for furniture to communicate with other furniture or appliances. As Meyers and Gerstman (2005) explain,

> "Your refrigerator communicates with your television, and your refrigerator says: 'This guy drinks 12 liters of Diet Coke a week and he's about to run out.' And the television network says: 'Who wants to advertise to this guy? We have his favorite show, which he always watches, and we know he drinks a lot of Coke. Who wants to buy advertising time?' (p. 219).

This type of communication could allow companies to market to specific individuals rather than to the masses. This would save companies money because commercials could

be targeted to the individual instead of being targeted to the assumed demographic that would be watching that particular show at that particular time.

Smart Packaging and Consumer Responsibility

Smart packaging may allow products to be tracked after they are thrown away. This idea may have interesting consequences. In the United States, people pay for waste management services. If it was possible to track exactly how much waste an individual was throwing away, it may allow for alternative accountability policy. You could be charged or taxed according to the amount you throw away or recycle. People may become more responsive to how wasteful they are if they can see a real value and compare that real value to a socio-economic norm.

Consumer Disadvantages and Smart Packaging

Many consumers are concerned that smart packaging may be intrusive to their privacy. They fear that companies will have access to what products they are purchasing and how they are being used. RFID tags have been called “spy chips”. The Auto-ID Center at Massachusetts Institute of Technology is aware of the growing concern. They are examining ways “to disable the tags after the product is purchased” (Meyers & Gerstman, 2005, p. 225). However, completely disabling the tag may limit the potential user benefits of the tag.

Consumers Against Supermarket Privacy Invasion and Numbering

Consumers Against Supermarket Privacy Invasion and Numbering (C.A.S.P.I.A.N.) was founded in 1999. They encourage consumers to oppose grocery

store cards and RFID tags. They feel that a consumer should be informed whether or not a product has a smart packaging tag on it (Albrecht & McIntyre, 2007). The organization feels that the adoption of RFID tags "will have chilling effects on consumers' ability to escape the oppressive surveillance of manufacturers, retailers, and marketers. …Government and law enforcement will be quick to use the technology to keep tabs on citizens" (Albrecht et al., 2007, "RFID: Tracking Everything, Everywhere," para. 13).

Smart Packaging and The Shopping Experience

Smart packaging has the potential to change the shopping experience for consumers. The inclusion of digital devices that have the ability to communicate with consumers would create a new interactivity and connectivity for consumers. Packages could have the ability to sense the profile of the person walking through the aisle. The items could respond with sound or light. Items could signal their exact location in a store, saving consumers' time and wasted energy searching. Some stores are beginning to implement an interactive shopping experience that could be greatly enhanced by the incorporation of smart packaging. A test was conducted in Chicago to enhance consumers' shopping experiences (Meyers et al., 2005). Customers who had store cards were given scanners to carry with them during their shopping experience (Meyers et al., 2005). The scanners gave the customers the ability to scan the UPCs of their groceries as they added them to their cart (Meyers et al., 2005). The scanner also contained digital coupons and a running total of the groceries in the cart (Meyers et al., 2005). When the shopper went to checkout, they simply hooked the scanner up to the self-checkout and were able to pay quickly (Meyers et. al., 2005, p.228). M.I.T.'s Professor Sarma has

proposed that “Shopping in the store of the future could theoretically mean going once a month, scanning items, and deciding which should be delivered, and when, to your home over the next several weeks” (Meyers & Gertsman, 2005, p. 228).

Summary of Chapter

Understanding the capabilities of smart technology helps provide a guideline for what is possible in product packaging. It is important to understand that there are a variety of smart technologies out there that could work in an interactive product system. The final outcome of this study demonstrates the use of RFID technology in a handheld device; however, new technologies may be developed that could serve the function more effectively. This study also reveals concerns that users may have with smart technologies and their privacy. These are all legitimate concerns to be taken into consideration in the design of the device.

CHAPTER 4: HEALTH STATISTICS

Overview

Health conditions continue to grow in the United States, and many of these health conditions are related to food consumption. The Center for Disease Control (2009) found that "healthy eating is associated with reduced risk for many diseases, including the three leading causes of death: heart disease, cancer, and stroke" (para. 1). The American Diabetes Association (2009) recognizes that "Reading labels (nutrition fact labels) can help you make wise food choices" (para. 1). When Nutrition Fact labels were introduced, they were intended to provide consumers a way to understand what they were eating. They were introduced in the early 1990s, but the information that they were based on was from about three decades before the first nutrition fact labels were implemented. Nutrition fact labels confuse many consumers. The labels are dated, and the information is in need of a more intuitive labeling system. Chapter 4 looks at the ability of consumers to understand nutrition fact labeling. It also examines health condition statistics in the United States and looks at other health recommendation tools available.

Do Consumers Understand Nutrition Fact Labels?

The effectiveness of the Nutrition Facts label is not clearly determined. Some studies show that many people do not understand how to use the nutrition fact label. A

study released from Vanderbilt University Medical Center (2006) revealed the confusion in reading nutrition fact labels.

> "…200 participants from a wide socioeconomic range, asking them to interpret food labels for nutrient content by the amount of food consumed. Another segment of the study asked participants to identify which foods had more or less of a certain nutrient. Going into the study, most participants (89%) felt confident they understood nutritional labels and could use them to make healthy choices. But the study's results, published in the American Journal of Preventive Medicine, showed otherwise. The study uncovered a significant gap in the general public's understanding of nutrition-label information. And while poor label comprehension did correlate with lower literacy and mathematic skills, even better-educated participants sometimes stumbled. Only 37% of participants could correctly calculate the total grams of carbohydrates in a 20-ounce bottle of soda that contained 2-1/2 servings. And when given the nutrition data on a whole bagel, only 60% could figure how many grams of carbohydrates they would consume if they ate only half a bagel. Many participants were confused by the complexity of the nutrition label, the researchers found, and were unable to find the facts they needed to answer researchers' questions. Some subjects confused the nutritional values given for the product they were eating with the recommended values for the whole day, or mistakenly incorporated the percentage of the product's values as part of a 2,000-calorie recommended daily allowance" (RDA) (para. 4-6).

Statistics show that consumers are looking at nutrition fact labels to make better decisions; however, some believe that "Many people don't have the reading and math skills to correctly interpret the nutrition labels on food packages" (Reinberg, 2006, para. 1). Dr. David Katz, the director of the Prevention Research Center at Yale University, believes that "We need an objective assessment of the overall nutritional quality of foods. We need that translated into simple, interpretable-at-a-glance symbols on the front of every packaged food" (Reinberg, 2006, para.18).

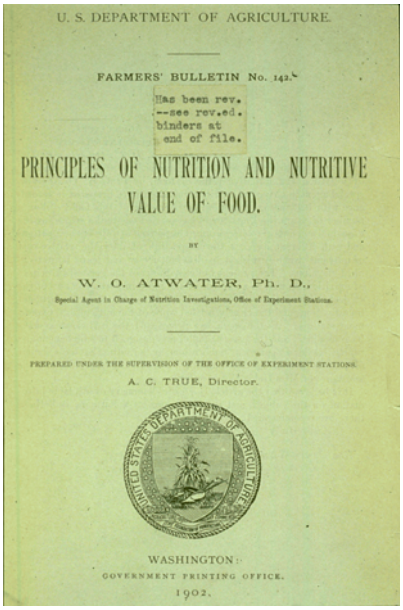
Food Labeling to Advance Better Education for Life (FLABEL)

FLABEL is a group dedicated to researching the effectiveness of Nutrition Facts labels. Their objective is "to understand how nutrition information on food labels affects dietary choices and consumer habits" (Flabel.org, 2009, "About Flabel"). Their research is a three-year project that began in 2008 and will end in 2011 (Flabel.org, 2009). FLABEL is the first European organization to investigate the effectiveness of nutrition labels (Flabel.org, 2009). They plan on examining how many people actually read nutrition fact labels and what meaning is associated with these labels (Flabel.org, 2009). There is no research available now; however, this is one of the few organizations to conduct this type of extensive research related to the comprehension of nutrition fact labels (Flabel.org, 2009).

Food Pyramid

Guidelines for food consumption began in the early twentieth century (United States Department of Agriculture (USDA), 2002). Food recommendations have changed over the decades to adjust to consumer perceptions, government agendas, and even war

(USDA, 2002). Towards the beginning of the twentieth century, Wilbur Olin Atwater, Ph.D., wrote the "Principles of Nutrition and Nutritive Value of Food" (Figure 17) (USDA, 2002). This was the first nutritional guideline (USDA, 2002). Atwater is responsible for the application of the calorie as a way of measuring food intake ("USDA Food Pyramid History, 2008).



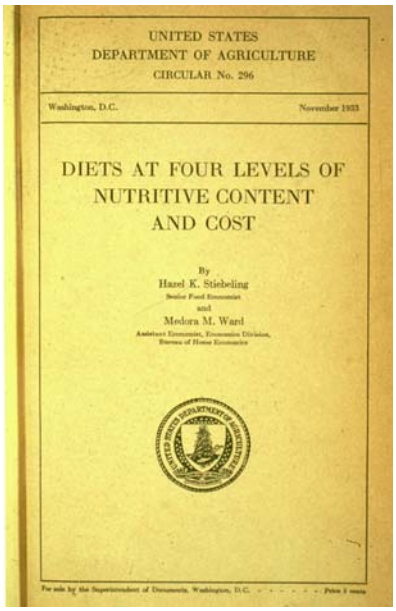


Figure 17. Early U.S. Nutrition Guides (U.S. Food and Drug Administration, 2009)

Early nutritional propaganda tried to encourage people to incorporate healthy food choices into their diets at an early age. It was understood that fats and sugars should be limited (USDA, 2002).

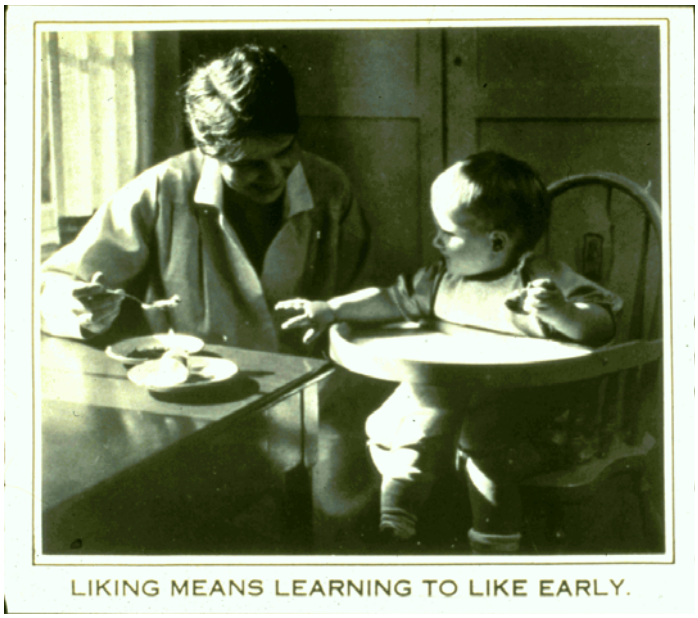
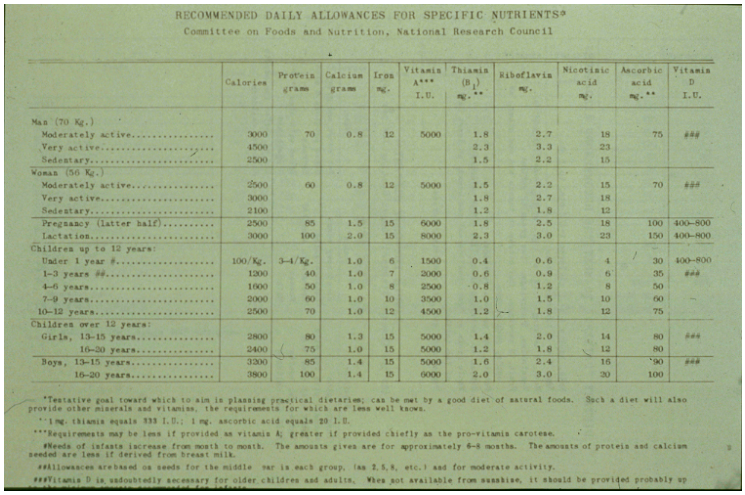


Figure 18. 1894-1940 Nutritional Propaganda (U.S. Food and Drug Administration, 2009)

Pre-World War II guides suggested that Americans eat more fruits and vegetables (USDA, 2002). Advertisements (Figure 18) in newspapers demonstrated how people could make healthier food decisions (USDA, 2002). When World War II began, Americans were encouraged to grow their own food, eat less, and preserve their food (Figure 21) (USDA, 2002). Rationing influenced the USDA to divide food groups into seven categories milk, meat, fruit, vegetables, fats, sugars, and grains (Figure 19). After the war was over, the food groups were reduced into "the Four Food Groups" (Figure 22) (Danielson, 2008) which included: meat, vegetables, dairy, and grains. Recommended caloric intake was substantially higher than today's suggestions (Danielson, 2008). Sedentary men were advised to consume 2500 calories (Figure 20). Sedentary women were advised to consume 2100 calories (Danielson 2008). (USDA, 2002). In 2005, the

Surgeon General's suggestion for sedentary men is 2,000 to 2,400 calories per day depending on age, and for women 1,600 to 2,000 calories per day depending on age (USDA, 2002). People are realizing that it now takes fewer calories than were initially assumed for people to function.

Figure 19. Early World War II Food Guide (U.S. Food and Drug Administration, 2009)



RECOMMENDED DAILY ALLOWANCES FOR SPECIFIC NUTRIENTS*
Committee on Foods and Nutrition, National Research Council

	Calories	Protein grams	Calcium grams	Iron mg.	Vitamin A*** I.U.	Thiamin (B_1) mg.**	Riboflavin mg.	Nicotinic acid mg.	Ascorbic acid mg.**	Vitamin D I.U.
Man (70 Kg.)										
Moderately active	3000	70	0.8	12	5000	1.8	2.7	18	75	###
Very active	4500					2.3	3.3	23		
Sedentary	2500					1.5	2.2	15		
Woman (56 Kg.)										
Moderately active	2500	60	0.8	12	5000	1.5	2.2	15	70	###
Very active	3000					1.8	2.7	18		
Sedentary	2100					1.2	1.8	12		
Pregnancy (latter half)	2500	85	1.5	15	6000	1.8	2.5	18	100	400-800
Lactation	3000	100	2.0	15	8000	2.3	3.0	23	150	400-800
Children up to 12 years:										
Under 1 year #	100/Kg.	3-4/Kg.	1.0	6	1500	0.4	0.6	4	30	400-800
1-3 years ##	1200	40	1.0	7	2000	0.6	0.9	6	35	###
4-6 years	1600	50	1.0	8	2500	0.8	1.2	8	50	
7-9 years	2000	60	1.0	10	3500	1.0	1.5	10	60	
10-12 years	2500	70	1.0	12	4500	1.2	1.8	12	75	
Children over 12 years:										
Girls, 13-15 years	2800	80	1.3	15	5000	1.4	2.0	14	80	###
16-20 years	2400	75	1.0	15	5000	1.2	1.8	12	80	
Boys, 13-15 years	3200	85	1.4	15	5000	1.6	2.4	16	90	###
16-20 years	3800	100	1.4	15	6000	2.0	3.0	20	100	

*Tentative goal toward which to aim in planning practical dietaries; can be met by a good diet of natural foods. Such a diet will also provide other minerals and vitamins, the requirements for which are less well known.

**1 mg. thiamin equals 333 I.U.; 1 mg. ascorbic acid equals 20 I.U.

***Requirements may be less if provided as vitamin A; greater if provided chiefly as the pro-vitamin carotene.

#Needs of infants increase from month to month. The amounts given are for approximately 6-8 months. The amounts of protein and calcium needed are less if derived from breast milk.

##Allowances are based on needs for the middle year in each group, (as 2, 5, 8, etc.) and for moderate activity.

###Vitamin D is undoubtedly necessary for older children and adults. When not available from sunshine, it should be provided probably up

Figure 20. Early Recommended Daily Intake Guide (U.S. Food and Drug Administration, 2009)

Figure 21. 1943-1955 Food Guide (U.S. Food and Drug Administration, 2009)

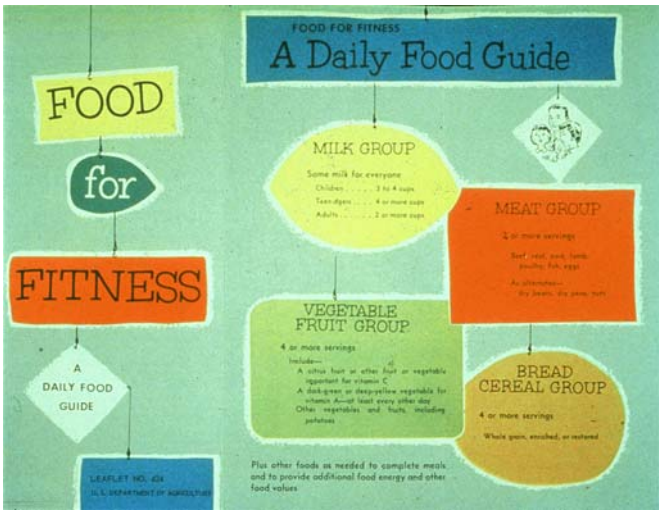


Figure 22. 1956-1979 Food Guide (U.S. Food and Drug Administration, 2009)

The Hassle-Free Daily Food Guide (Figure 23) was used in the late 1970s and early 1980s (USDA, 2002). The Hassle-Free Daily Food Guide was similar to the Four Food Groups with the addition of the fats, sweets, and alcohol category (USDA, 2002). The incidences of heart disease and stroke were increasing (USDA, 2002).

Figure 23. 1979-1984 Food Guide (U.S. Food and Drug Administration, 2009)

In the late 1980s and into the early 1990s, graphics (Figure 24) were attempted to best portray current nutritional guideline recommendations (Healthy-Eating-Politics.com," 2008). In 1992 the Food Guide Pyramid was released (Healthy-Eating-Politics.com," 2008).

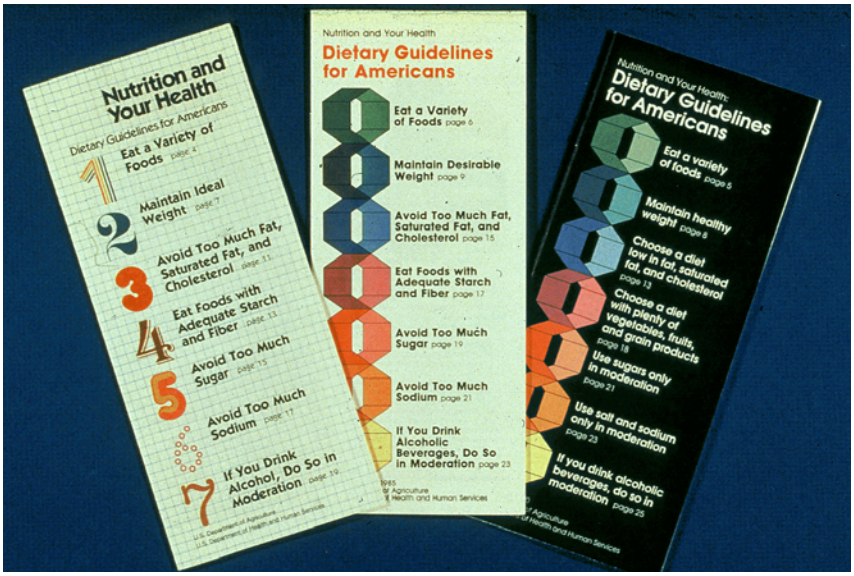


Figure 24. 1990 Dietary Guidelines (U.S. Food and Drug Administration, 2009)

The 1992 version of the Food Guide Pyramid (Figure 25) was inspired by Sweden's food pyramid (Healthy-Eating-Politics.com, 2008). This food pyramid is believed to be graphically deceptive as it seems to emphasize the "Bread, Cereal, Rice, & Pasta Group" as the most important group because of the area it takes up on the food pyramid (Healthy-Eating-Politics.com, 2008).

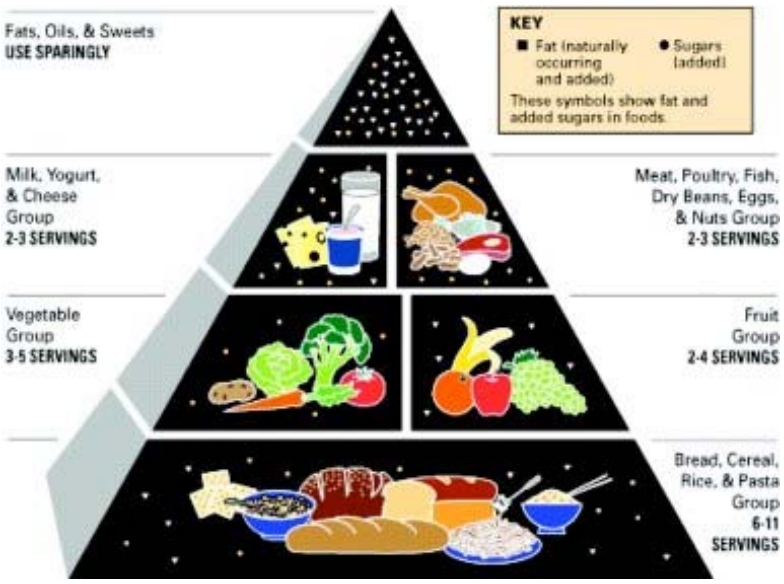


Figure 25. Food Pyramid (Healthy-Eating-Politics.com, 2008)

In 2005, the U.S. government released a new Food Pyramid, called MyPyramid (Figure 26), after recognizing that "more than two-thirds of Americans are overweight or obese" ("Government Releases New Food Pyramid", 2007, para. 6). A person climbing stairs is incorporated into the food pyramid to stress the importance of exercise in addition to eating healthy ("Government Releases New Food Pyramid", 2007). MyPyramid recommends that people consume, "6 ounces of grains, 2.5 cups of vegetables, 2 cups of fruit, 3 cups of milk, 5.5 ounces of meat or beans, and only a small amount of fats and oils" ("Government Releases New Food Pyramid", 2007, para, 4).

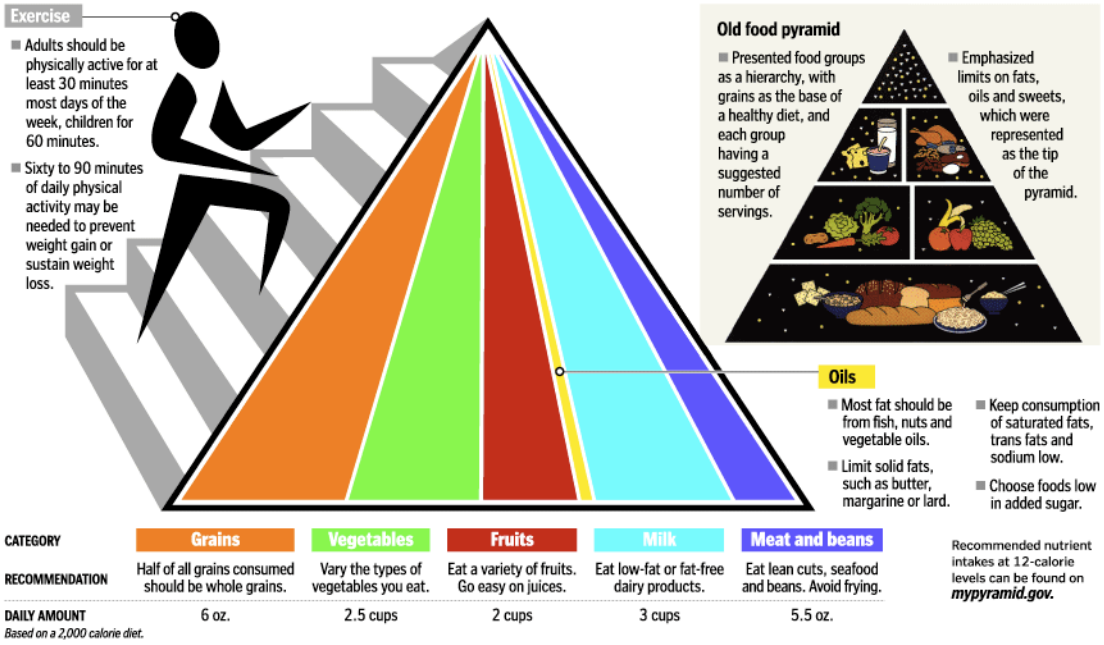


Figure 26. MyPyramid (The New Food Pyramid, 2009)

Dietary guidelines have regularly changed over the past century. As new knowledge is obtained and consumer's lifestyles change, nutritional guidelines have to adjust to accommodate these factors. A nutritional system that could support frequent changes and communicate those changes to consumers in a quick and effective method would be ideal. At this point there is no adaptive system to communicate nutritional and dietary guidelines.

Population Averages

Americans have faced an increasing number of health conditions over the past few decades. The American diet has become increasingly nutrient deficient and substantially high in caloric content. The National Health and Nutrition Examination Survey released recommendations after surveying more than 15, 000 Americans about

their health conditions, diet, and exercise (Hendrick, 2009). They concluded that obesity is increasing, and "the prevalence of diabetes, hypertension, obesity, and cardiovascular disease has increased over the past 18 years" (Hendrick, 2009, para. 12). These conditions result in a low quality of life. They also concluded that "More emphasis is needed on the importance of healthy lifestyle habits" (Hendrick, 2009, para.14).

Every five years the Surgeon General releases a report with dietary recommendations for Americans (Figure 27). The report "is intended to be a primary source of dietary health information for policymakers, nutrition educators, and health providers" ("Dietary Guidelines for Americans", 2005, p. 3). The document gives caloric suggestions to Americans, stating that a moderately active adult female may need anywhere from 1,600 to 2,200 calories depending on age, and a moderately active male may need anywhere from 2,000 to 2,400 depending on age ("Dietary Guidelines for Americans, 2005).

TABLE 3. Estimated Calorie Requirements (in Kilocalories) for Each Gender and Age Group at Three Levels of Physical Activity[a]

Estimated amounts of calories needed to maintain energy balance for various gender and age groups at three different levels of physical activity. The estimates are rounded to the nearest 200 calories and were determined using the Institute of Medicine equation.

		Activity Level[b,c,d]		
Gender	Age (years)	Sedentary[b]	Moderately Active[c]	Active[d]
Child	2–3	1,000	1,000–1,400[e]	1,000–1,400[e]
Female	4–8	1,200	1,400–1,600	1,400–1,800
	9–13	1,600	1,600–2,000	1,800–2,200
	14–18	1,800	2,000	2,400
	19–30	2,000	2,000–2,200	2,400
	31–50	1,800	2,000	2,200
	51+	1,600	1,800	2,000–2,200
Male	4–8	1,400	1,400–1,600	1,600–2,000
	9–13	1,800	1,800–2,200	2,000–2,600
	14–18	2,200	2,400–2,800	2,800–3,200
	19–30	2,400	2,600–2,800	3,000
	31–50	2,200	2,400–2,600	2,800–3,000
	51+	2,000	2,200–2,400	2,400–2,800

[a] These levels are based on Estimated Energy Requirements (EER) from the Institute of Medicine Dietary Reference Intakes macronutrients report, 2002, calculated by gender, age, and activity level for reference-sized individuals. "Reference size," as determined by IOM, is based on median height and weight for ages up to age 18 years of age and median height and weight for that height to give a BMI of 21.5 for adult females and 22.5 for adult males.

[b] Sedentary means a lifestyle that includes only the light physical activity associated with typical day-to-day life.

[c] Moderately active means a lifestyle that includes physical activity equivalent to walking about 1.5 to 3 miles per day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life

[d] Active means a lifestyle that includes physical activity equivalent to walking more than 3 miles per day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life.

[e] The calorie ranges shown are to accommodate needs of different ages within the group. For children and adolescents, more calories are needed at older ages. For adults, fewer calories are needed at older ages.

Figure 27. U.S. Caloric Requirements (U.S. Department of Health and Human Services and the U.S. Department of Agriculture, 2005)

Even though the Surgeon General releases these suggestions, Americans are still struggling to understand how to make good choices. The following statistics will outline the growing health epidemics in the United States and show the relationship between diseases and food.

Diabetes

The Center for Disease Control (2007) defines diabetes as "a group of diseases marked by high levels of blood glucose resulting from defects in insulin production, insulin action, or both. Diabetes can lead to serious complications and premature death, but people with diabetes can take steps to control the disease and lower the risk of complications" (para. 1). In 2007, it was estimated that 23.6 million people in the United States have diabetes, and 5.7 million of those are undiagnosed (Figure 28) (National Diabetes Information Clearinghouse, 2007).

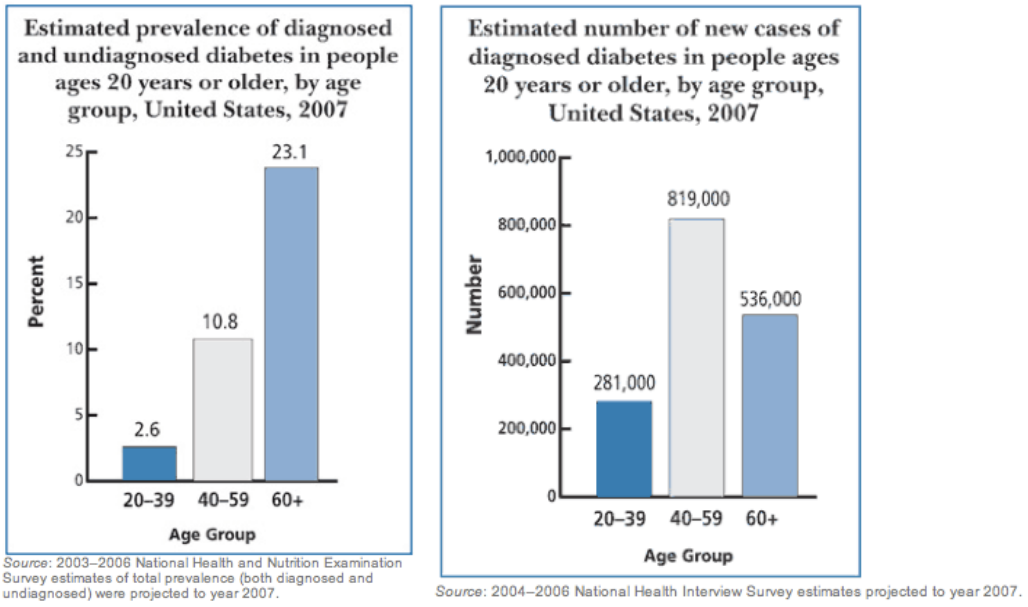


Figure 28. Estimated Diabetes Prevalence (National Diabetes Information Clearinghouse, 2007)

According to the American Diabetes Association (2009), pre-diabetes can be treated. "People with pre-diabetes can prevent the development of type 2 diabetes by making changes to their diet and increasing their level of physical activity" (American

Diabetes Association, 2009, para. 1). The American Diabetes Association (2009) also recommends that those with diabetes or pre-diabetes should read nutrition fact labels and try to adhere to the following guidelines:

> "• Eat lots of vegetables and fruits. Try picking from the rainbow of colors available to maximize variety. Eat non-starchy vegetables such as spinach, carrots, broccoli or green beans with meals.
>
> • Choose whole grain foods over processed grain products. Try brown rice with your stir fry or whole wheat spaghetti with your favorite pasta sauce.
>
> • Include dried beans (like kidney or pinto beans) and lentils into your meals.
>
> • Include fish in your meals 2-3 times a week.
>
> • Choose lean meats like cuts of beef and pork that end in "loin" such as pork loin and sirloin. Remove the skin from chicken and turkey.
>
> • Choose non-fat dairy such as skim milk, non-fat yogurt and non-fat cheese.
>
> • Choose water and calorie-free "diet" drinks instead of regular soda, fruit punch, sweet tea and other sugar-sweetened drinks.
>
> • Choose liquid oils for cooking instead of solid fats that can be high in saturated and *trans* fats. Remember that fats are high in calories. If you're trying to lose weight, watch your portion sizes of added fats.
>
> • Cut back on high calorie snack foods and desserts like chips, cookies, cakes, and full-fat ice cream.

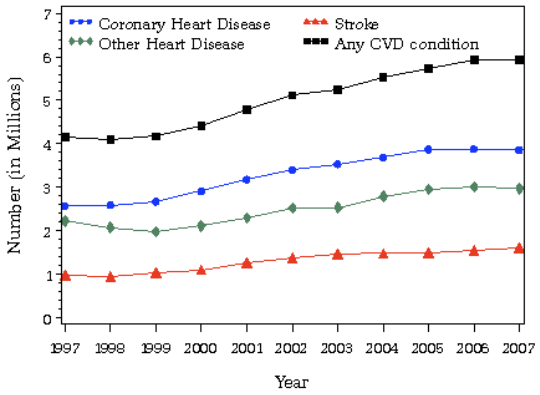
• Eating too much of even healthful foods can lead to weight gain. Watch your portion sizes." (para. 2).

Cholesterol

The American Heart Association (2009) estimates that "…about 98.6 million adults in the United States have total blood cholesterol values of 200mg/dL and higher" (para. 1). Cholesterol levels over 220 are considered unhealthy (American Heart Association, 2009). The American Heart Association (2009) states that cholesterol levels can be managed by eating a healthy diet. They suggest eating twenty-five to thirty grams of fiber each day, limiting sodium intake, and eating "a diet rich in vegetables and fruits, with whole grains, high-fiber foods, lean meats and poultry, fish at least twice a week, and fat-free or 1 percent fat dairy products" (American Heart Association, 2009, para.6).

Heart Disease

Heart disease is the number one cause of death in the United States (Centers for Disease Control, 2009). "In 2003, approximately 37% of adults reported having two or more of six risk factors for heart disease and stroke (high blood pressure, high cholesterol, diabetes, current smoking, physical inactivity, and obesity)" (Figure 29) (Centers for Disease Control, 2009, para. 12).



Year	Coronary Heart Disease	Stroke	Other Heart Condition	Any CVD Condition
1997	2.6	1.0	2.2	4.2
1998	2.6	0.9	2.1	4.1
1999	2.7	1.0	2.0	4.2
2000	2.9	1.1	2.1	4.4
2001	3.2	1.3	2.3	4.8
2002	3.4	1.4	2.5	5.1
2003	3.5	1.5	2.5	5.3
2004	3.7	1.5	2.8	5.5
2005	3.9	1.5	2.9	5.7
2006	3.9	1.6	3.0	5.9
2007	3.9	1.6	3.0	5.9

Figure 29. Millions of People with Diabetes Aged 35 Years and Older with Self-Reported Cardiovascular Disease Conditions, United States, 1997-2007 (U.S. Center for Disease Control and Prevention, 2009)

The Center for Disease Control (2009) lists eight things people can do to prevent heart disease. One of those things is diet and nutrition. “An overall healthy diet can help to lower blood pressure and cholesterol levels and prevent obesity, diabetes, heart disease, and stroke. This includes eating lots of fresh fruits and vegetables, lowering or cutting out added salt or sodium, and eating less saturated fat and cholesterol to lower these risks” (Center for Disease Control, 2009, para. 9).

Food Allergies

Food allergies are increasingly more common among Americans (Figure 30). According to The Food Allergy and Anaphylaxis Network there are eight foods that are responsible for ninety percent of all food allergies (2009). Those foods are milk, eggs, peanuts, tree nuts, fish, shellfish, soy, and wheat (The Food Allergy and Anaphylaxis Network, 2009, para. 1). Approximately 12 million people have food allergies in

America (The Food Allergy and Anaphylaxis Network, 2009, para. 1). Some people may outgrow their food allergies; however, most people have to monitor the ingredients of the food they consume to prevent anaphylaxis (The Food Allergy and Anaphylaxis Network, 2009).

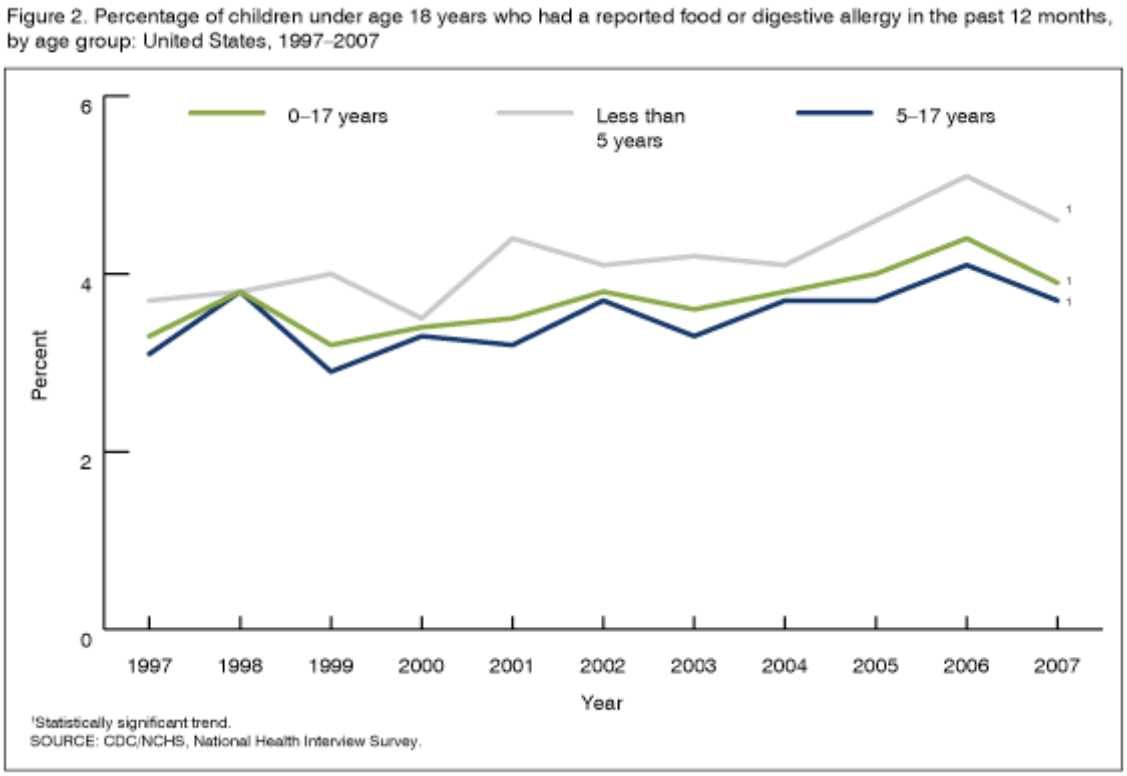


Figure 30. Percentage of Children with Reported Food Allergy (Center for Disease Control and Prevention, 2008)

Dieting

Many Americans are confused by the constant and changing recommendations on what people should eat. Television, magazines, and other media outlets promote the latest and most effective diet of the week. Many people believe that the newest diet must be the solution they have been waiting for. In reality, diets may prove to be effective for a few weeks or months. People can lose weight, but when the individual goes off the diet they often gain back the weight that they lost and some additional weight. This is the result of losing a combination of muscle tissue and adipose tissue during the dieting process. Muscle tissue is responsible for a person's metabolism. The more muscle tissue an individual has, the more they can eat. When the individual loses muscle tissue from dieting they are actually decreasing their metabolism. When they go off of the diet and return to their old eating habits, they have a lower metabolism than when they started the diet and their weight can increase to a level higher then when they first began the diet. A survey conducted by the American Institute for Cancer Research (2000) found that "Americans are seizing on 'quick-fix' strategies with little regard for how much food they actually consume. Americans…are concentrating too exclusively on cutting fat, or going on fad diets that restrict carbohydrates, sugar, or some other factor." (American Institute for Cancer Research, 2000, para.3). Statistics have also revealed that "On any given day, almost half of the women in the United States are on a diet, (and)…one in four men are on a diet" (American Institute for Cancer Research, 2000, para.1). While dieting may not be a long-term solution to a healthy weight, it is inevitable that people will continue to do it. A survey released in 2000 reveals that Americans spend over $50 billion on dieting and diet-related products ("Statistics of Eating Disorders").

Cancer

The National Cancer Institute (2009) says “diet is an important part of cancer treatment” (para.1). There is no specific guideline for what an individual with cancer should or should not eat; however, it is suggested that people who have cancer try to eat food with essential nutrients, specifically “vitamins, minerals, protein, carbohydrates, fat, and water” (National Cancer Institute, 2009, para.1). The number of people with cancer in the United States has increased over the past fifty years (Figure 31) (National Cancer Institute, 2009).

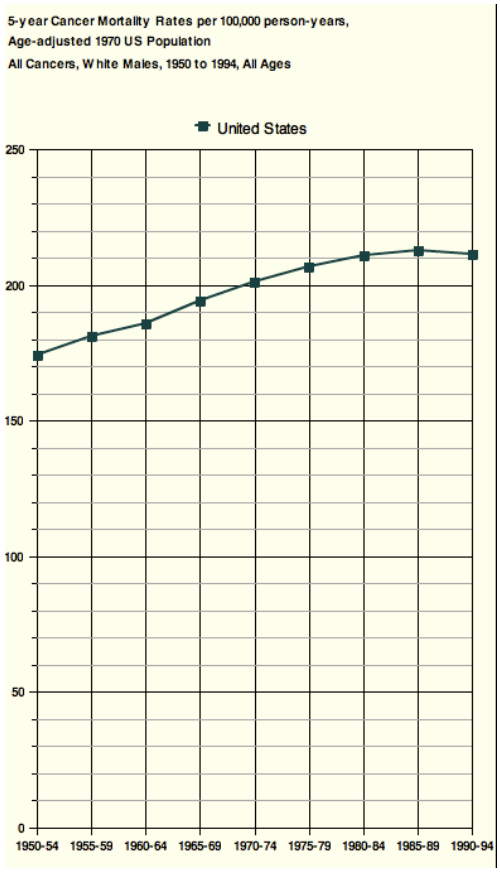


Figure 31. Cancer Mortality in the U.S. (National Cancer Institute, 2009)

Obesity

The Office of the Surgeon General stated that in 1999, “61% of adults in the United States were overweight or obese” (U.S. Department of Health and Human Services). Since 1995, the percentage of obese adults in each state has increased (Figure 32) (Centers for Disease Control and Prevention, 2009). “For the first time in history, the majority of Americans (Figure 33) – an estimated 55 percent – are clinically overweight, while one of every four Americans is obese. This means that most Americans are now at increased risk of obesity-related diseases like cancer, coronary heart disease, stroke, diabetes, high blood pressure, gallbladder disease and osteoarthritis” (American Institute for Cancer Research, 2000, para. 5).

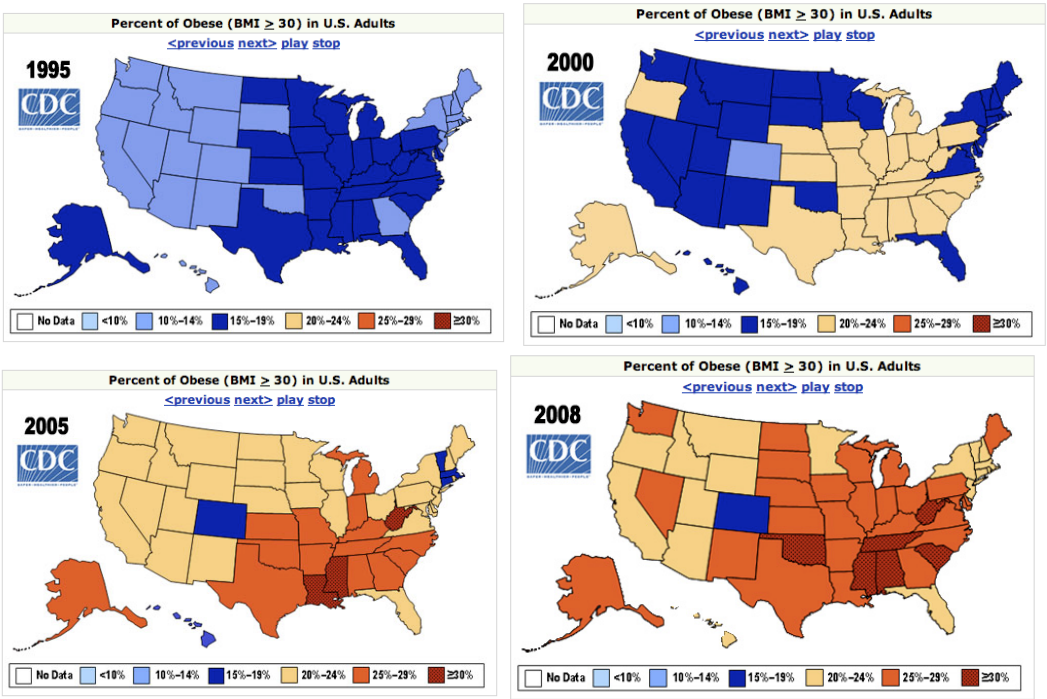


Figure 32. Percentage of Obesity in U.S. Adults (Centers for Disease Control and Prevention, 2009)

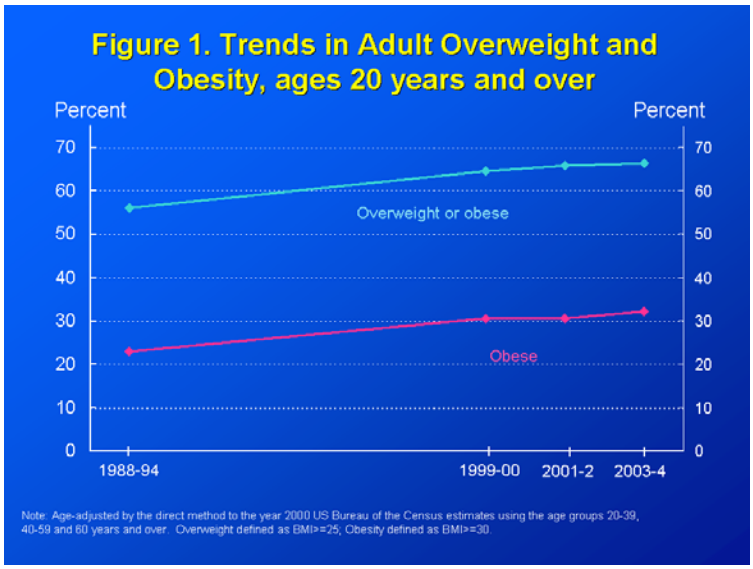


Figure 33. U.S. Adult Obesity (Center for Disease Control and Prevention, 2006)

The Mayo Clinic staff (2009) has made suggestions for the prevention of obesity. Those suggestions include:

> "**Eat healthy meals and snacks.** Focus on low-calorie, nutrient-dense foods, such as fruits, vegetables and whole grains. Avoid saturated fat and limit sweets and alcohol. Remember that no one food offers all the nutrients you need. Choose a variety of foods throughout the day. You can still enjoy small amounts of high-fat, high-calorie foods as an infrequent treat. Just be sure to choose foods that promote a healthy weight and good health more often than you choose foods that don't" (para. 3).

Food intake is the primary cause of obesity. Individuals can manage their weight by monitoring the nutritional content in the food they are eating.

Summary of Chapter

Examining the increasing number of health conditions in the United States that have a substantial correlation with diet is important to understand the need for more simplistic and personalized nutritional information on product packaging. Studying the government's dietary guidelines over the past century displays the constant change in what is believed to be the appropriate amount of nutrients. By making these two points evident, it is easy to see why the compliance and comprehension of nutrition fact labeling is waning at best. People simply do not know what to eat, and they do they do not know how that information relates to the current nutrition fact label. There is a need for a meaningful interpretation of the seemingly confusing product labeling system.

CHAPTER 5: GROCERY SHOPPING EXPERIENCE

Overview

The grocery store and the way people shop has changed significantly since the first general store opened in the beginning of the twentieth century. Consumers now experience an exposure to thousands of competing product packages when they enter a grocery store. Chapter 5 will examine the change in the grocery shopping experience. It will look at the way grocery stores market to their customers. It will also illustrate the idea of overexposure to brands and how product packaging marketing may exist in the future.

History of the Grocery Store

General stores were the first retail stores where people could buy what they needed. They were first opened in the beginning of the twentieth century. Early general stores included food, textiles, tools, and medicine. Most items were purchased in bulk and measured out for the customer. Farm equipment, appliances, and tools could be special ordered for customers. General stores functioned as a centralized location where people gathered to meet each other and socialize. General stores did not sell produce or fresh meat. Most of the items sold were preserved items. Shoppers had to go to separate vendors to buy fresh fruit, vegetables, and meat. During the Industrial Revolution, people began to move from rural areas into cities. People who were used to growing the food

they needed now depended on others to grow it for them. In 1916, Piggly Wiggly (Figure 34), the "first true self-service grocery store, was founded in Memphis, Tennessee…by Clarence Saunders" (Piggly Wiggly, para. 1).

Figure 34. First Self-Service Grocery Store (Piggly Wiggly)

The self-service style grocery store allowed shoppers to collect all of the items they needed by themselves (Piggly Wiggly). They no longer had to wait on a general store attendant to weigh out the amount of coffee or flour that they needed. Self-service stores became known as "groceterias" because they were similar to the cafeterias that were growing in popularity. In the 1920s, "small regional chains, like Kroger, American Stores, and National Tea" became popular (Gwynn, para. 3). Most of them did not sell produce or meat (Gwynn). In California, some chain grocery stores began incorporating butchers, bakers, grocers, and produce vendors in the area so customers could get all of their items in one general location (Gwynn). In 1930, Michael Cullen opened the first supermarket in Queens, New York (Gwynn). The grocery store was named King Kullen

Grocery Company. “By 1936, there were 17 King Kullen supermarkets doing approximately $6,000,000 annually” (“Michael J. Cullen”, 2009, para. 4). “Merchandise was sold out of packing cartons and little attention was paid to décor. The emphasis was on volume, with this one store projected to do the volume of up to one hundred conventional chain stores” (Gwynn, para. 6). By the 1950s, almost all grocery stores had transitioned to supermarkets (Gwynn). Over the past few decades, supermarkets have begun to split into two groups: discount stores and upscale grocery stores (Figure 35) (Gwynn). Natural food stores that specialize in organic foods have emerged, including Whole Foods and Trader Joes (Gwynn).

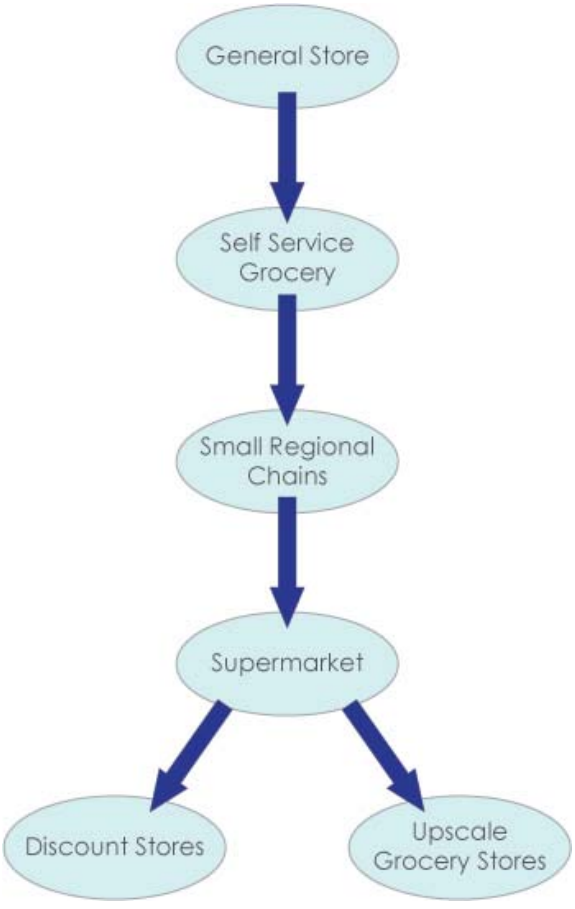


Figure 35. Evolution of Grocery Stores

Trends in Grocery Shopping

The way people shop has changed greatly in the past few years. Emerging discount stores like Wal-Mart, Costco, Sams, and Target are increasing in popularity. A recent CBS poll revealed "six in ten Americans bought groceries at a low price mega-store" (Alfano, 2005, para. 7). It is estimated that 10,000 supermarkets have shut down in the past twenty years (Alfano, 2005). Consumers are demanding either discounted prices or a better shopping experience (Alfano, 2005). Whole Foods has grown rapidly. The founder, John Mackey, says that Whole Foods' goal is to "reeducate people…(about) a whole art and culture around preparing food, enjoying food" (Alfano, 2005, para. 14). "In a country where so many people are looking for such different things, the mass marketing is probably a thing of the past" (Alfano, 2005, para. 25).

Ways of Targeting Consumers in the Grocery Store

As general stores have evolved into supermarkets, stores have had to come up with ways to connect with their shoppers. In the days of the general store, the owner of the store had a face-to-face connection with the shopper. They could advise the shopper on what to buy, tell them what is on sale, or what the store just got in. Shoppers had a personal connection with the person they were purchasing items from. Brands were kept behind the counter, and it was up to the sales clerk to suggest the product. Today, the shopping experience is very different. All brands are displayed for the shopper to see. It is rare that a shopper has a face-to-face connection with anyone in the grocery store. Grocery stores still have a need to market to their customers. Because the sales clerk-to-

customer interaction no longer exists, grocery stores have used other ways of marketing to connect with their customers.

Coupons

Coupons have been a marketing approach to connect the consumer with a brand or product. They give consumers information about new items and can give a consumer a reason to try a product they wouldn't normally purchase. In 1894, Asa Candler developed the first coupon (Tresbesch). He owned the Coca-Cola formula, and gave out coupons for a free sample of this new drink (Tresbesch). By the 1960s it was estimated that fifty percent of Americans were using coupons. By 2003, it was estimate that seventy-seven percent of American households were using coupons (Flash, 2008). Consumers have traditionally cut coupons from advertisements found in newspapers or magazines. Recently, grocery stores have begun to print coupons out with the customer's receipt when a customer checks out.

Store Cards

Grocery store discount cards have been another way of targeting customers. Discount cards keep an electronic profile of the customer, tracking what the person purchases and how often they shop in the store. This record of past purchases can be used to give customers coupons, or offer them discounts that non-card holders don't receive. Some people object to discount cards, saying that they are an invasion of people's privacy, and that a grocery store does not need to keep a record of every item a customer purchases. Either way, grocery store discount cards have had an increasing prevalence in the grocery shopping experience.

Interactive Marketing Effectiveness

Marketing is most effective when it encourages consumer interaction. “In just the past decade, the time devoted to advertisements in a typical hour of network television has grown from six minutes to nine minutes…the average American is now exposed to 254 different commercial messages in a day” (Gladwell, 2002, p. 98). Consumers are exposed to an increasing number of advertisements. If an advertisement can get a consumer to interact it is more likely that the consumer will remember the brand. In the 1960s, Howard Levanthal, a social psychologist, conducted studies to find out if he could convince college age students to get a tetanus shot. (Gladwell, 2002, p. 96) He gave half of the students a booklet that used graphic descriptions and fear tactics to persuade students to go to the Medical Clinic and get a tetanus shot (Gladwell, 2002). The other half of the group got a booklet that did not use graphic images or fear to convince students to get a tetanus shot (Gladwell, 2002). Neither booklet had a strong influence on the students to get a tetanus shot (Gladwell, 2002). Levanthal revised the booklets and incorporated a map that showed students exactly where the Medical Clinic was on the campus and what hours they were open (Gladwell, 2002). The map gave the students a tool to plan exactly when they could get a shot (Gladwell, 2002). Twenty eight percent of students who received the second version of the booklet got a shot, compared to three percent from the first versions (Gladwell, 2002, p. 96). When consumers get a chance to participate in advertisements, they feel like they are playing a part in the process. If consumers had a more interactive connection with product packaging, they may be able to make better decisions. For example, if a package could not only advertise itself as

being trans-fat free, but also tell you why reducing your trans-fat intake is important if you have high cholesterol, you might be more inclined to make a more healthful decision.

The "Immunity Factor"

Malcom Gladwell (2002) explains that, "When people are overwhelmed with information and develop immunity to traditional forms of communication, they turn instead for advice and information to the people in their lives whom they respect, admire, and trust" (p. 275). What he is referring to is Kevin Kelly's "fax effect" (Gladwell, 2002). The fax effect is the idea that in today's economy people believe that the more abundantly you infiltrate people with an advertisement or information the more powerful it becomes (Gladwell, 2002). This is exactly opposite of how a traditional economy works. "In the traditional economy, after all, value comes from scarcity. The conventional 'icons of wealth' – diamonds, gold – are precious because they are rare" (Gladwell, 2002, p. 272). Gladwell (2002) explains that the "fax effect" is not effective (p. 272). When email first started in the mid-1990s he would receive a few emails each day (Gladwell, 2002). Gladwell explained that he would rush home and check his email and write lengthy, well thought-out responses to everyone who wrote to him (2002). "Now, of course, I get up in the morning and go to my computer and I have sixty-four messages, and the anticipation I once felt has been replaced by dread. …I compose very, very short emails – seldom more than two lines long – and I often take two to three days to get back to people; and lots of email I don't answer at all" (Gladwell, 2002, p. 274). What Gladwell (2002) is describing is the immunity factor. The idea is that when a virus begins to spread it creates an epidemic, but eventually enough people are exposed to the

virus, immunity is developed, and the virus disappears (Glawell, 2002). The Immunity Factor is relative to the grocery store because at one time people had to go into a general store and buy their goods. They had to have a face-to-face connection with an attendant who could answer their questions and advise them on what to buy. As supermarkets began to grow, people had less face-to-face connection. Consumers began to be bombarded by thousands of packages on grocery store shelves every time they went grocery shopping. Thomas Hine writes, “No wonder a significant percentage of people who need to wear eyeglasses don’t wear them when they’re shopping, and some researchers have spoken of the trancelike state that pushing a cart through the environment induces” (Hine, 1995, p. 5). This package inundation has created an environment in which people can simply not sort through what they should buy and what they shouldn’t and what is a healthy choice and what isn’t. Consumers have become immune to the traditional communication of product packaging.

Specifically Targeted Marketing in an Isolated Society

Gladwell (2002) explained a more personal connection that people turn to when they are overwhelmed with information. This becomes a point of contention when examining current methods of product packaging. Product packaging can only be as personal as its passive message. However, rethinking the grocery shopping experience may lead to new approaches of personalization and connection. Incorporating smart technologies in the grocery experience may allow for product packaging to actively interact with the user, instead of the current passive interaction. Individualistic marketing has become more popular. Marketing tools like store cards have allowed shopping

records to be kept on consumers. This allows companies to look at what an individual is purchasing and create a specific marketing strategy around their shopping habits. More types of consumer tracking systems may create more strategic and individualistic marketing. If smart technologies are incorporated into the grocery system, it is possible to not only keep track of what people buy and send them coupons accordingly, but to also program product packages to interact with consumers during their shopping experience. Items on the shelves could signal (through sound or color) to the consumer based on the consumer's profile and their past shopping patterns. This type of marketing may prove more effective than current strategies because it is based on the individual's preferences, not on a demographic or other group that a consumer may be lumped into.

Summary of Chapter

Examining the grocery store shopping experience is pertinent in designing a device to be used in that environment. Looking at the history of grocery stores allows trends and themes to be identified. Understanding the new ways of targeting customers in grocery stores also helps predict future marketing strategies. Gladwell's Immunity factor furthers the idea that a new way of product packaging is needed to achieve the same effectiveness of previous marketing tactics.

CHAPTER 6: HOW PEOPLE SHOP

Overview

For this study, user research was conducted to better understand the needs of shoppers. Grocery shoppers were observed while shopping. Shoppers received a booklet with images and questions for them to answer after their shopping experience. The booklets featured a series of images that were taken of them during their grocery shopping. The participants were asked to write how they were thinking and feeling at that particular time. At the bottom of each page, the participants were asked to mark how they felt (Figure 36).

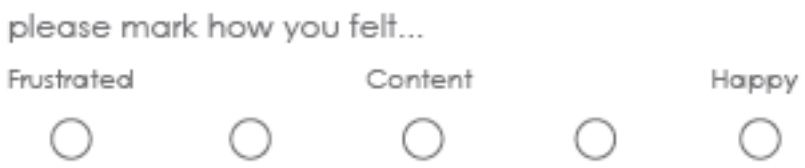


Figure 36. User Research Questionnaire

The booklets (Figure 37) were designed to be personal journals. Participants were asked to write their thoughts and feelings to evoke a more expressive response. Thinking bubbles were inserted into the photographs to try to get the participants to write their own comic book like story. The booklets attempted to take some of the seriousness out of the photographs and help the participants to see themselves and animate their own experience. The participants included Sarah, Johanna, Cathy, and Pat.

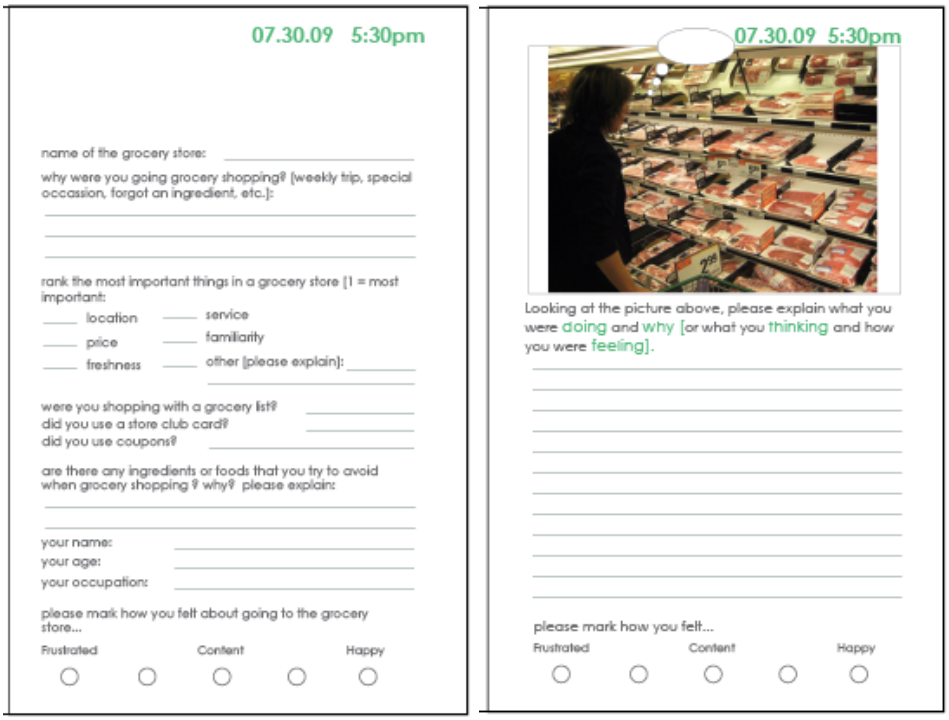


Figure 37. Complete User Research Questionnaire

Sarah

Sarah was asked the following questions:

1. Name of Grocery Store:

Pick ‘N Save

2. Why were you going grocery shopping? [weekly trip, special occasion, forgot an ingredient, etc]

Special ocassion, cooking dinner at girlfriend’s house

3. Were you shopping with a grocery list?

No (in my head)

4. Did you use coupons?

No

5. Do you have any sort of diet restrictions [health condition, watching weight, etc]? Please explain.

No diet restrictions, but did want something somewhat healthy.

6. Your name:

Sarah Strauss

7. Your age:

26

8. Your occupation:

Graphic Designer

Sarah was then asked to look at the following pictures and write what she was thinking and feeling at the time.

Question 1:

Figure 38. Sarah 1

Sarah marked frustrated/content. Sarah wrote, “I was trying to get to the hairspray and realized I had just ran out that morning. I was a little surprised at all the boxes and cartons on the ground; the store I normally shop at doesn’t have this. I felt a bit like I was at Sam’s Club or something, so instead of looking, I cruised past it.”

Question 2:

Figure 39. Sarah 2

Sarah marked happy. Sarah wrote, “I needed mustard and was walking through the aisle. The Newmans dressing caught my eye and I suddenly remembered that I am out of Rasberry vinagrette. So I just quickly grabbed it w/o even thinking twice about the price. I just know I needed it and used it.

Question 3:

Figure 40. Sarah 3

Sarah marked frustrated and wrote, “Ah, the spice aisle. This makes me crazy. You think being in alphabetical order it would be easy but it’s not. I needed chili powder, but I wanted a small container, cheap. So there are a couple of brands, but there are SO MANY SPICES it takes FOREVER; as you can see I was concentrating hard.”

Question 4:

Figure 41. Sarah 4

Sarah marked frustrated/content, and wrote, “Extra virgin olive oil. There are many types of them. But again size of the bottle mattered to me. I wanted a medium size but not pay an arm and a leg. I picked up one bottle but realized last minute – up top there was Roundy’s brand (with nice new packing – by the way) a bigger bottle AND $.20 cheaper. So I picked that one instead.”

Question 5:

Figure 42. Sarah 5

Sarah marked content, and wrote, “This is where I had the bottle for $3.89, 8oz. I was really ready to grab it, but decided to look up top. That’s where I saw the Roundy’s bottle. I didn’t recognize that bottle because Roundy’s has this new look, a re-branding/all natural look that LOOKS more expensive than it is. I picked that one instead. 8.5 oz. bottle for $3.69.”

Question 6:

Figure 43. Sarah 6

Sarah marked happy, and wrote, “I was at the checkout. I saw the gum and realized I had none. I thought, well I am going to be having drinks tonight, so I should have some gum, for my breath later. I always get one of two brands same flavor; it’s a no brainer to choose.

Johanna

Johanna was observed next. The questions asked in the booklet were fine-tuned. The following questions were asked:

1. Name of grocery store:

   Pick ‘N Save

2. Why were you going grocery shopping? [weekly trip, special occasion, forgot an ingredient, etc]:

   Weekly trip to the store

3. Rank the most important things in a grocery store [1=most important]:

   1 price; 2 freshness; 3 familiarity; 4 service; 5 location

4. Were you shopping with a grocery list?

   Yes

5. Did you use a store club card?

   Yes

6. Did you use coupons?

   Yes

7. Are there any ingredients or foods that you try to avoid when grocery shopping? Why? Please explain:

   As a rule, no. Periodically, I will search for tofu and lactose free items for certain guests.

8. Your Name:

   Johanna Ball

9. Your Age:

   51

10. Your Occupation:

    Marketing

Johanna was then given the following pictures and asked to describe what she was doing and how she was feeling.

Question 1:

Figure 44. Johanna 1

Johanna marked frustrated, and wrote, “I was checking the freshness of the apples, looking for firm, unbruised apples. I was a little frustrated because the quality was poor.”

Question 2:

Figure 45. Johanna 2

Johanna marked frustrated, and wrote, “I was looking for a specific cut of meat and a larger quantity, which they did not have and would not cut for me. That means an extra trip to the store, which is an inconvenience.”

Question 3:

Figure 46. Johanna 3

Johanna marked content, and wrote, “I was looking for certain frozen entrees which I use for lunch during the work week. I select based on calorie and fat grams, as well as price.”

Question 4:

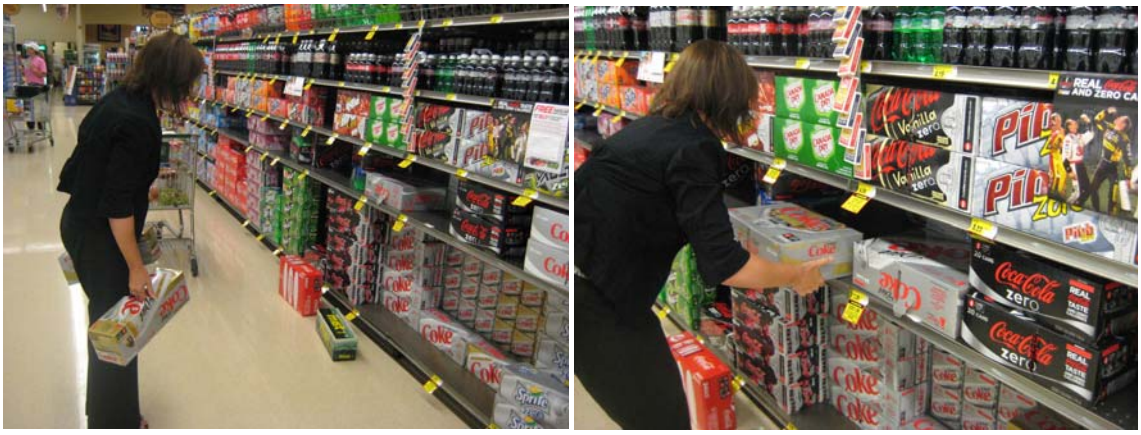


Figure 47. Johanna 4

Johanna marked content, and wrote, “I was checking the best offer because sometimes quantity deals can be misleading. This was 3, 12 packs versus 2, 24 packs for the same price…a little more for my money.”

Cathy

Cathy was asked the following questions:

1. Name of grocery store:

   Pick N Save.

2. Why were you going grocery shopping? [weekly trip, special occasion, forgot an ingredient, etc]:

   Weekly trip.

3. Rank the most important things in a grocery store [1=most important]:

   1 Location; 2 Price; 3 Freshness; 4 Familiarity; 5 Service

4. Were you shopping with a grocery list?

   Yes

5. Did you use a store club card?

   Yes

6. Did you use coupons?

   Yes, picked up in store.

7. Are there any ingredients or foods that you try to avoid when grocery shopping? Why? Please explain:

   Too much junk food, processed food to try to be more healthy.

8. Your Name:

Cathy

9. Your Age:

   28

10. Your Occupation:

    Marketing Manager

Cathy was then given the following images and asked to write what she was doing in the images and how she was feeling.

Question 1:

Figure 48. Cathy 1

Cathy marked ‘frustrated/content and wrote, “I have no clue how to select an eggplant! I squeezed them to compare the texture. I didn’t want a bad eggplant to ruin the

dish I was making, but since they all looked and felt similar, I felt that I had found one that would be okay. Maybe some sign or “buying tip” would have helped!

Question 2:

Figure 49. Cathy 2

Cathy marked ‘happy’ and wrote, “I realized I could save money purchasing the brand I normally buy anyway. I almost bought another brand on sale but I noticed the sell by date was soon approaching.”

Question 3:

Figure 50. Cathy 3

Cathy marked ‘happy’ and wrote, “ I was checking out the flavors and preparation steps, thinking, ‘How easy would this be to make at work?’ I remembered that I liked this brand when I last tried it, so I felt excited to try some more flavors.”

Question 4:

Figure 51. Cathy 4

Cathy marked ‘content’ and wrote, “I wanted to make sure I had the correct box of Minute Rice that requires twenty minutes to make. I had previously tried the five minute rice and was disappointed. I was a little frustrated until I figured out that the packaging had been updated a bit for something that I typically buy over and over again.”

Question 5:

Figure 52. Cathy 5

Cathy marked ‘happy’ and wrote, “Yes, I found pimento cheese to use in yummy hamburgers! I was happy since I couldn’t find it in another Pick N Save location.”

Question 5:

Figure 53. Cathy 6

Cathy marked ‘content’ and wrote, “I was checking to make sure I had the right thing. I had bought these before but in a slightly different package.”

Pat

Pat was asked the following questions:

1. Name of grocery store:

   Kroger.

11. Why were you going grocery shopping? [weekly trip, special occasion, forgot an ingredient, etc]:

    Weekly trip.

12. Rank the most important things in a grocery store [1=most important]:

    1 Familiarity; 1 Freshness; 2 Price; 3 Location; 4 Service

13. Were you shopping with a grocery list?

    Kinda.

14. Did you use a store club card?

    Yes.

15. Did you use coupons?

    Not that day. Cohort forgot them.

16. Are there any ingredients or foods that you try to avoid when grocery shopping? Why? Please explain:

    Not really.

17. Your Name:

    Patrick Philbin

18. Your Age:

    24

19. Your Occupation:

    Architect Grad Student

Pat was then given the following questions and asked what he was thinking and feeling.

Question 1:

Figure 54. Pat 1

Pat marked “happy” and wrote, “I was smelling the dish detergents because wanted to make sure it wouldn’t make my dishes smell weird.”

Question 2:

Figure 55. Pat 2

Pat marked “frustrated” and wrote, “Nothing is worse than the awkward end of aisle collisions. Two people on a journey neither caring about the agenda of the other. Classic grocery store – plus she was fat!”

Question 3:

Figure 56. Pat 3

Pat marked “frustrated/content” and wrote “Where the hell are my bagels? Supply and demand is a bitch. Who always suffers? …the consumer.”

Question 4:

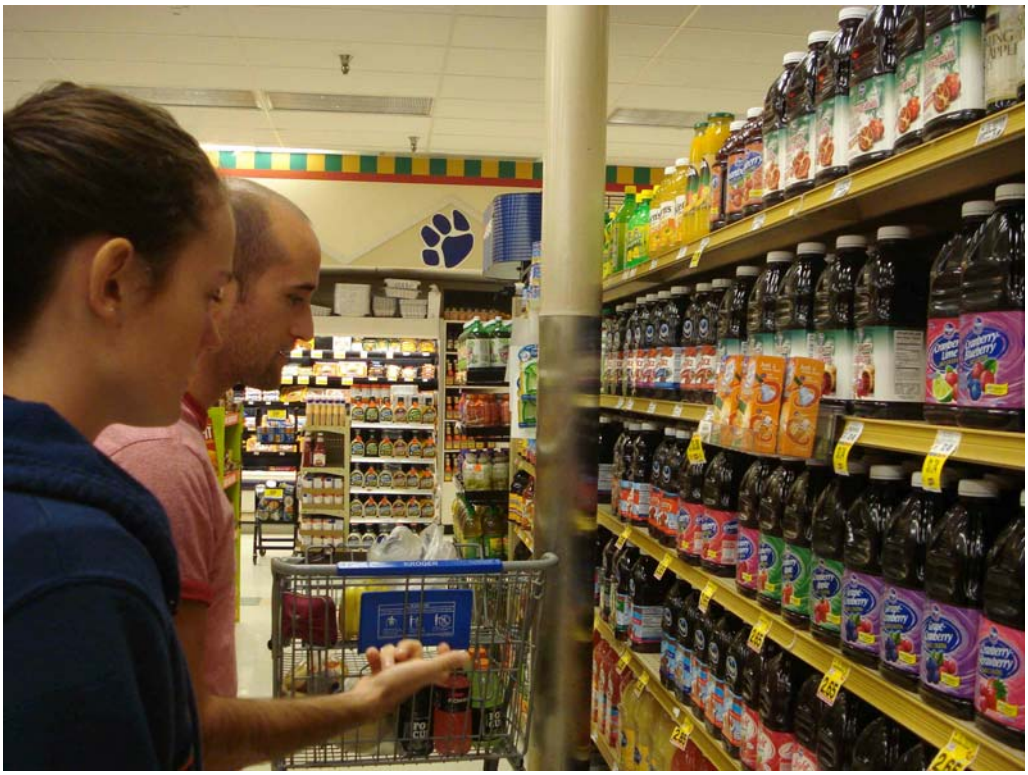


Figure 57. Pat 4

Pat marked “content” and wrote, “Wondering when white cranberries will come back into season. I guess I have to settle for regular cranberry.”

Question 5:

Figure 58. Pat 5

Pat wrote, “Searching for a pack of unbroken eggs. I wonder what they do with the broken containers?”

Question 6:

Figure 59. Pat 6

Pat marked “frustrated/content” and wrote, “I was thinking why can’t they carry my OH’s cereal…damn you Kroger. No my back hurt…everyone loves the stress of shopping.”

Interviews

Interviews were conducted with people who have specific diet restrictions to understand what people look at when they shop. One individual with food allergies was interviewed. She explained that when she shops she looks at the list of ingredients on food packaging, avoiding any wheat, dairy or animal products. The second interviewee has diabetes. He explained that he pays more attention to calories and grams of sugar

when he looks at food packaging. He has a specific caloric goal that he has to maintain to keep his blood sugar level.

Both participants have diet restrictions; however, both require different types of information. One needed more information from the nutrition fact label; the other needed information from the ingredient list. These interviews revealed the need for a personalized interface incorporated into the scanning device. The interface would require an individual to enter information about themselves that the device could then translate into specific, meaningful information.

Summary of Chapter

Observing the way people shop allowed for a more inclusive interface for the scanning device. In addition to personal health concerns, shoppers may also take into account the health concerns of their dinner guests. Shoppers may also have considerations like price or freshness that are important priorities.

CHAPTER 7: DESIGN DEVELOPMENT

Overview

Chapter 7 focuses on the design development of two solutions that could exist in a smart product system in a grocery store. Both solutions demonstrate how a scanning device could provide a user with more meaningful information, allowing them to make more informed decisions. Both devices incorporate an interface design that gives individuals with health conditions information that they can use.

Creating an Interface from User Research

The design of the interface grew from the findings in the user research. The user research was analyzed and for commonalities. The found commonality was when people go into the grocery store they are trying to make the “best decisions” (Figure 60) for them. Each person has “best decisions” that are unique to his or her individual needs. From the research, it was discovered that peoples’ “best decisions” include things like price, freshness, familiarity of the store, location of the store, preparation time of a product, and nutritional value. It was realized that peoples’ “best decisions” are not usually attained. These “best decisions” quickly become frustrations of the shopping experience. Shoppers’ frustrations include experiences like not being able to find something, not understanding how to choose between two items, not being able to tell which item is fresher, not being able to tell if the item they are purchasing is the same

item they purchased in the past, not knowing what to make for a meal, and not knowing what item is healthiest for them.

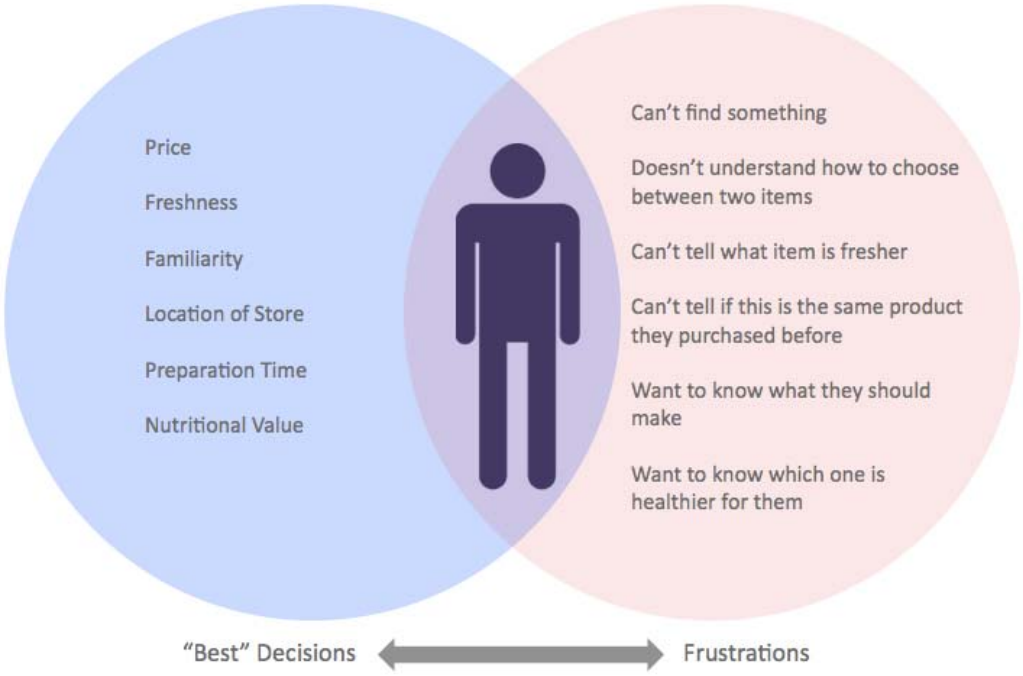


Figure 60. Shopper Desires vs. Shopper Frustrations

Shoppers' needs were identified from the user research and then interpreted into the core functions of the interface (Figure 61). The interface was specifically designed to help shoppers resolve their frustrations. Four scenarios were selected to demonstrate the capabilities of the interface. The four scenarios include a user with diabetes, a user on a budget, a user with a wheat allergy, and a user interacting with store marketing.

Figure 61. User Research to Interface

The four scenarios were then exhibited in two different interface vehicles (Figure 62). Both devices were designed to carry the same interface. The shared device is a grocery shopping cart with a computer screen integrated into the handle. The personal device is a hand-held portable device that a shopper would carry with him or her when he or she goes grocery shopping.

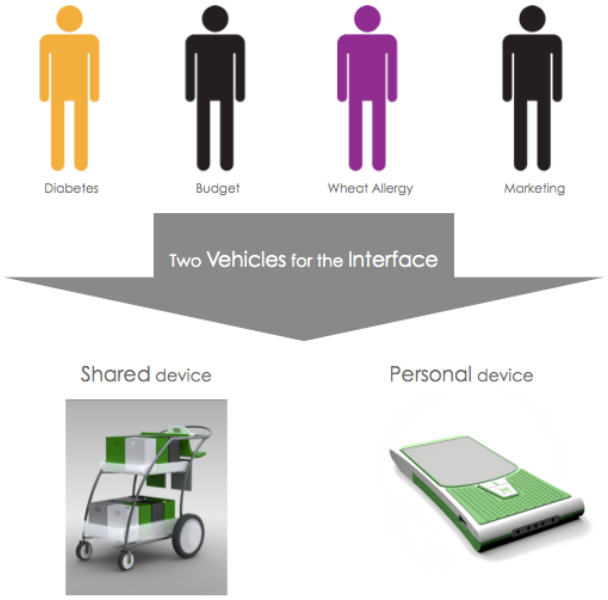


Figure 62. Scenarios to Interface Vehicles

Developing a Personal Interaction

Both devices give the user a more informed experience, mimicking the face-to-face relationship that shoppers had with store clerks in general stores (Figure 63). When people began to purchase items in grocery stores, they had direct contact with the store clerk. Shoppers had to ask the store clerk to get their items and package the items for them. The store clerk could tell the shopper what items were new in the store, what meals could be prepared with certain items, where items were located, what items were the freshest, etc.

Figure 63. Face-to-Face Personal Interaction

Modern day supermarkets do not allow for the face-to-face personal interaction that general stores once did. When shoppers enter a modern day supermarket, they are alone in their shopping experience. They no longer need to interact with a store associate to obtain the items they need (Figure 64). Shoppers have to rely on the printed information on the product's package for the information that they used to obtain from the store clerk.

Figure 64. Impersonal Grocery Store Interaction

Modern supermarkets have supplemented the impersonal interaction with a variety of marketing channels including store cards and coupons (Figure 65). Store cards and coupons create a rapport between the shopper and the store that a clerk used to create. These marketing channels give the shopper a sense of belonging.

Figure 65. Shopper-Marketing Channel Relationship

Modern marketing channels and product packaging are failing to provide shoppers with information that they can relate to. Both interactive product devices designed for this study provide the shopper with a more personal experience.

Interface Organization

The interface was organized according to users' needs (Figure 66). The interface allows the user to make a series of choices based on the user profile that he or she initially created for himself or herself. The user can quickly identify the information that is important to him or her when the product is scanned. Then, the interface suggests recommendations for the user in the instance that the user selects an item that conflicts with the user's profile. The user can choose to deny the device's recommendations or view the recommendations. If the user chooses to view the recommendations, a selection of alternative items appears on the screen. The user can then select the item that he or she prefers the most. The device automatically locates the item, displaying a map of the store with the item highlighted, so the user can find it.

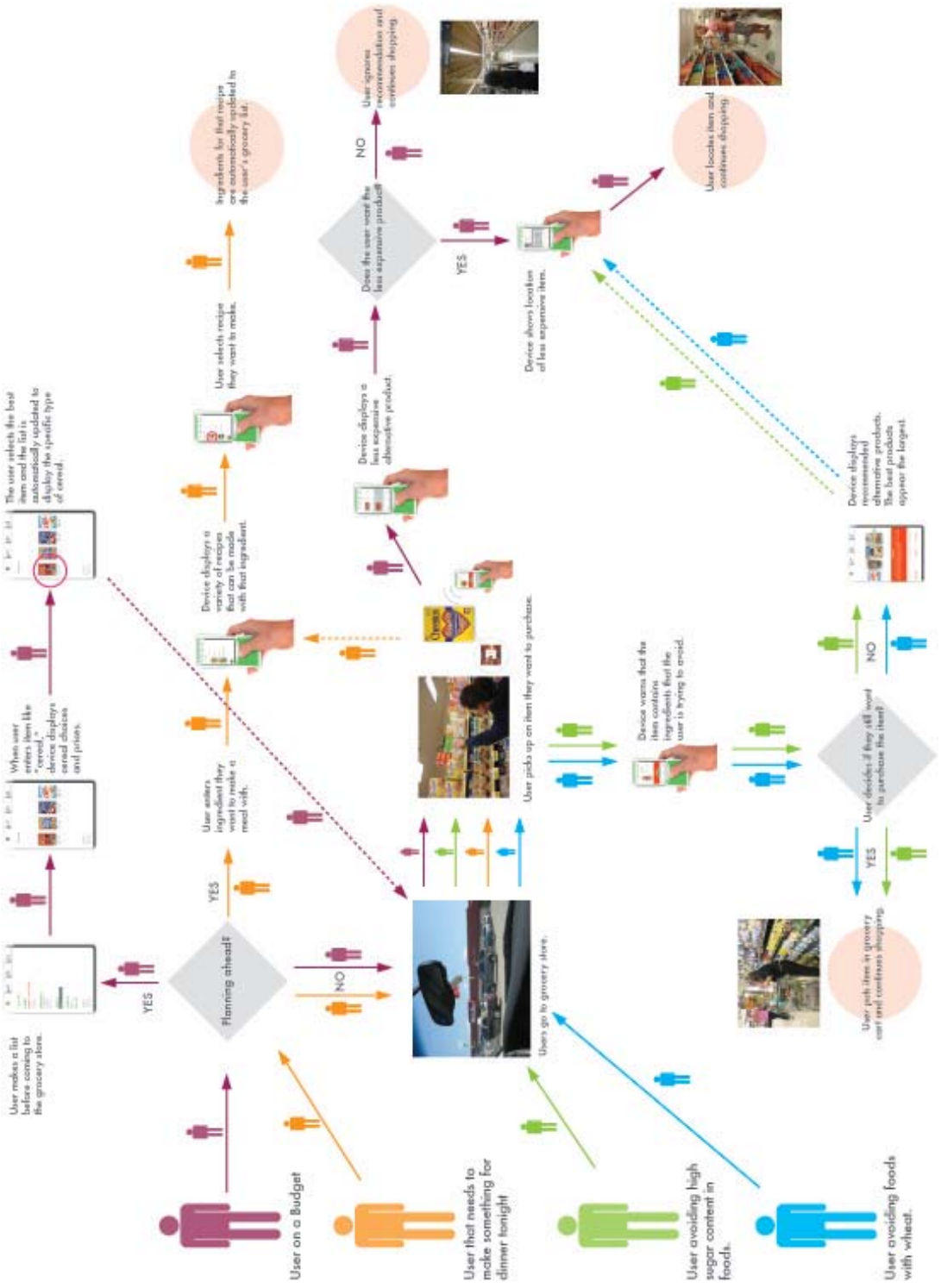


Figure 66. Interface Scenario Flow Chart

How the Interactive Product System Works

Both devices use a RFID scanner to transmit and receive a signal from a product (Figure 67). Both devices have Internet capabilities that allow the user to upload his or her profile. The user's profile includes information about his or her height, weight, age, health conditions, diet, and budget. Each item in an interactive product system contains a chip that carries information about the product's ingredients, nutrition facts, price of the product, and manufacturer.

Figure 67. How the Device Works

Interface Design

The interface design was developed from the user research. An adaptable interface was needed to fulfill all of the different needs that people with health conditions have. The interface features four tabs with icons on them, representing four main functions that are visible at all times.

The four main functions include the “Home” function, the “Tools/Settings” function (Figure 68), the “Checkout” function, and the “Profile” function. The “Home” function is the primary screen. When selected it displays whatever the user has programmed it to display through the “Tools/Settings” function. The user can select functions like “Grocery List”, “Coupons”, “Navigation”, etc. from the “Tools/Settings” tab.

Figure 68. Interface "Tools/Settings" Tab

The "Checkout" tab allows the user to pay for the items in his or her grocery cart. When he or she selects that button, he or she is given the option of choosing form of payment. For example, the user may select the "Checkout" tab and decide that he or she would like their total bill to be deducted from his or her Visa card or checking account. The screen would then ask the user to enter a password to verify that he or she agrees to

the payment. The device would then wirelessly transmit that information to both the store and the bank or credit card company.

The “Profile” tab (Figure 69) allows the user to select his or her profile in the instance that multiple users share the same device. The “Profile” tab also allows the user to edit information in his or her profile like height, weight, age, caloric goal, diet restrictions, etc. The “Profile” tab also allows the user to track his or her progress and view previous shopping trips.

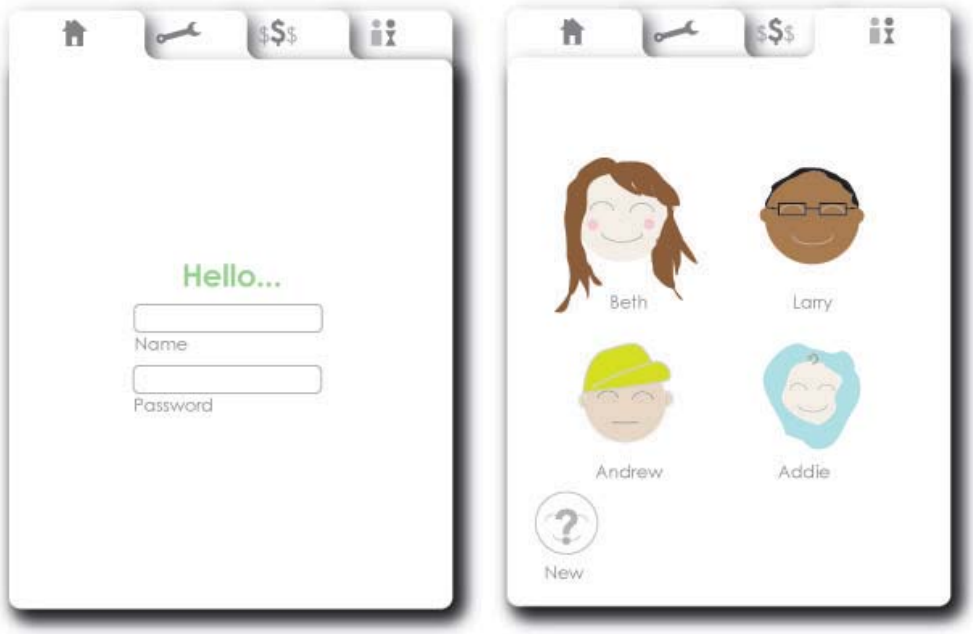


Figure 69. Device Interface “Hello Page” and “Profile Page”

When the user first turns the device on, he or she is greeted with the “Hello Page.” He or she is asked to enter a username and password. The user then goes to the “Profile” tab where he or she can select the profile of the people he or she is shopping for. Selecting the “New” icon allows the user to enter new profiles. When the user adds new

profiles (Figure 70), he or she enters his or her name, birth date, gender, height, weight, diet, and health conditions. The device allows the user to select from a list of diets or enter specific ingredients that he or she is trying to avoid. The user can also input any health conditions that he or she has, and the device will make suggestions based on that particular condition.

Figure 70. "New Profile Page" and "Select User Page"

Once the user has created a profile, he or she can select his or her profile (Figure 69), or a group of profiles of those he or she is shopping for and choose to "Track Progress", "Edit Profile", or "Shop." "Track Progress" allows the user to see how closely he or she is sticking to the diet they have entered into the device.

Scenario One: Interface Design for User with Diabetes

A user with diabetes has specific needs when he or she is grocery shopping. He or she is looking at grams of sugar and the amount of calories in a given product. For example, if the user were shopping for juice, he or she may pick up a bottle of White Cranberry Peach juice. The scanning device would read that the user picked up a White Cranberry Peach juice (Figure 71), and it would display information about the product. In addition to displaying information about the product, the device would also warn the user that White Cranberry Peach juice is high in sugar per serving. It would ask the user if he or she would like recommendations, or the user can press “OK” to ignore the warning. If the user chooses “Recommend,” the display would show better options for an individual with diabetes. The interface would also tell the user why he or she should avoid products like the first one they selected.

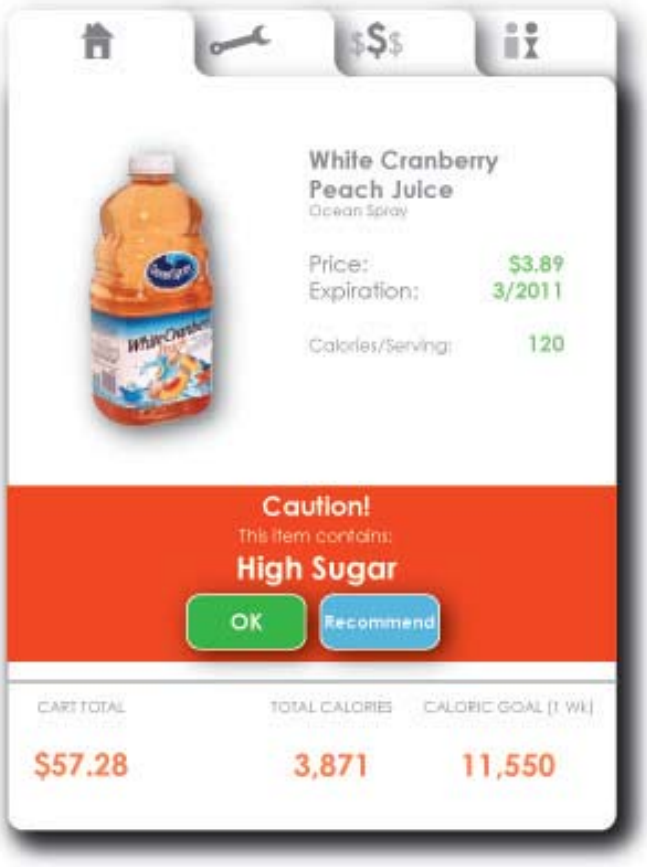


Figure 71. Interface Warning

Figure 72. Alternative Item Recommendation Interface

The alternative products are displayed so the best choice appears the largest (Figure 72) and the worst choice is the smallest. The user could then select an alternative. For example, if the user chooses the V8, the screen would then show information about the product and where it is located in the store (Figure 73). The screen would also display the location of the user to help navigate to the product.

Figure 73. Item Mapping Interface

Scenario Two: Interface Design for User with Food Allergies

People with food allergies have specific ingredients that they are trying to avoid. In the following the scenario, the individual has a wheat allergy. The user is looking for cereal and picks up a box of Cheerios. The device warns the user that the box of Cheerios contains wheat starch (Figure 74). The user would be able to choose to ignore the warning, or proceed with recommendations.

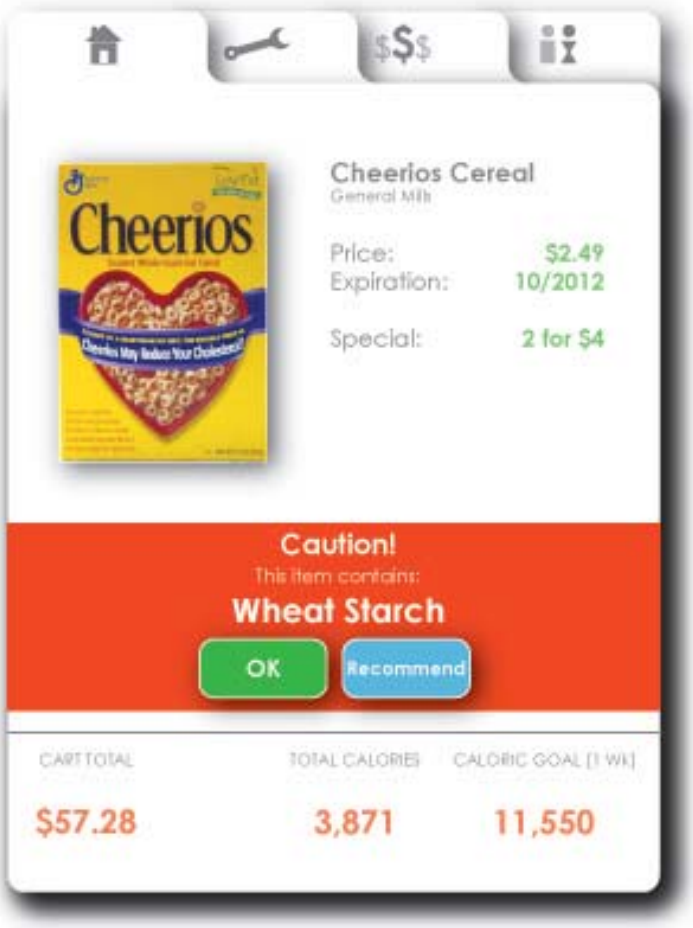


Figure 74. Interface Warning

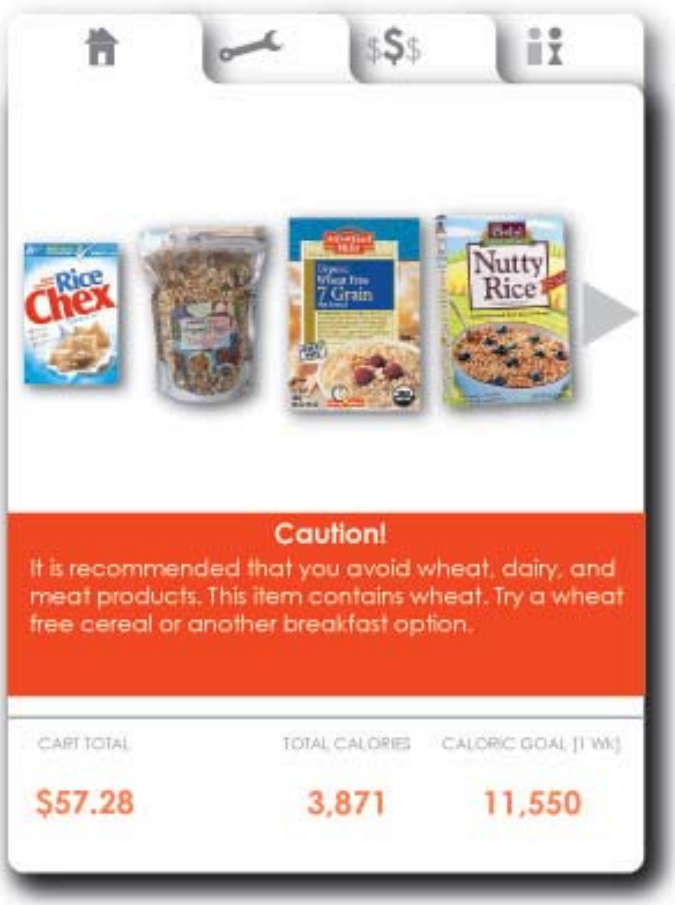


Figure 75. Alternative Item Recommendation Interface

The interface would display alternative options for the user to choose from (Figure 75). The interface would also give the user information about why he or she should be avoiding that particular product. The user would then select an alternative item and be able to locate that product in the grocery store (Figure 76).

Figure 76. Item Mapping Interface

Scenario Three: Interface Design for User with a Budget

Individuals without health restrictions may have other constraints they are working with when they grocery shop, like a budget. An individual who is concerned about his or her budget would be able to program the device to help find the best value when shopping. If the user were planning his or her shopping trip at home, he or she could create the grocery list and have the opportunity to make cost-saving decisions before he or she even gets to the store. The user may add cereal (Figure 77) to the

grocery list. He or she could then select “cereal,” and the device would display different cereals and their cost (Figure 78). The user could then select the best cereal based on his or her budget. Their grocery list would automatically update “Cereal” to “Fruit Loops Cereal.”

Figure 77. Budgeting Interface Item Selection

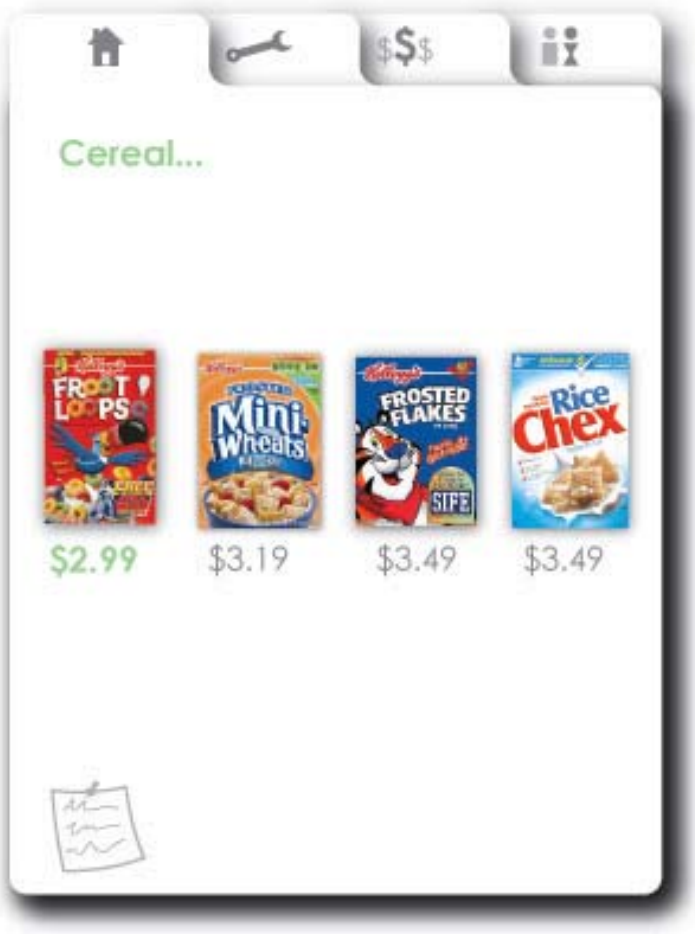


Figure 78. Budgeting Interface From List

The user would also have the opportunity to make cost-savings decisions while shopping in the store. For example, if the user were shopping for Tylenol, he or she would pick up a box of Tylenol. The interface (Figure 79) would tell the user that there is a generic brand that can save him or her money.

Figure 79. Budgeting Interface

Scenario Four: Interface Design for Store Marketing

The device could also be used as a means of transporting information, specifically marketing, from the store to the shopper. When a shopper comes into the store, the store could signal to the user's profile that he or she has new coupons. The coupons would display on the device (Figure 80) and would be applied to the purchase automatically without any paper transfers.

Figure 80. Coupon Interface

The store could also send signals to the device while the shopper is in the store based on the items they have picked up so far. For example, if the shopper picked up some chicken, the store might send a recipe for Chicken Alfredo along with a list of the other ingredients required to make that particular dish. If the shopper accepted the recipe, the ingredients would be automatically added to his or her list. The recipe would then be saved to the device. The user would be able to store all of the recipes he or she has collected on the scanning device (Figure 81). He or she could access them wirelessly later when he or she is ready to prepare them.

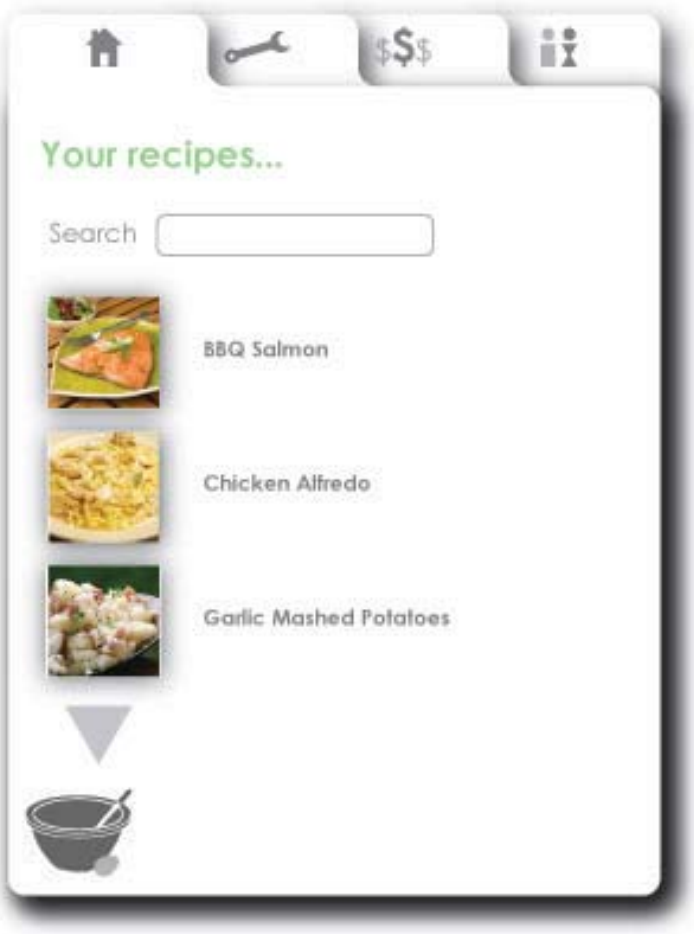


Figure 81. Recipe Interface

Sketch Development of Portable Device

The goal of the handheld portable device was to create a device with which a user could easily understand and interact. RFID scanners were examined. Initial sketches required a user to hold the device with two hands, similar to the way someone holds a portable video game (Figure 82).

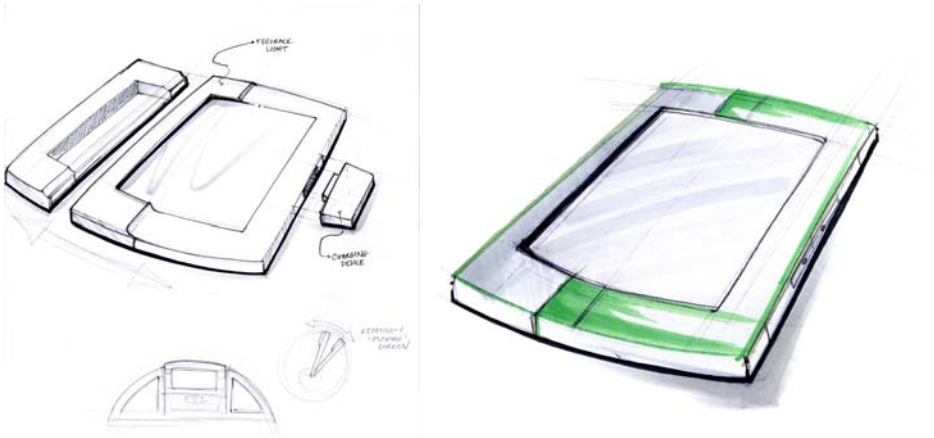


Figure 82. Initial Form Exploration

After conducting user research, it was realized that a device that could be held with one hand, leaving the other hand free to pick up products or hold the grocery basket, was more functional and easier to use for shoppers (Figure 83).

Figure 83. Sketch Development for One-Handed Device

Prototyping and Form Development of Portable Device

A three-dimensional yellow foam model (Figure 84) was created in the second phase of form development. The front of the model features a touch screen and two buttons. The two buttons allow the user to interact with the device without having to look down at the device. The “Information Button” allows the shopper to get more information about an item. The “Shopping Cart Button” allows the shopper to accept a scanned item with the understanding that he or she is agreeing to pay for that item. The back of the device (Figure 85) features a plastic screen where the RFID signal is transmitted and received. The form of the device is designed to mimic the conveyor belt in the grocery store that moves the groceries from the cart to the cashier and on to be bagged.

Figure 84. Portable Device Foam Model

Figure 85. Portable Device Foam Model Back View

Computer Modeling of Portable Device

A Rhino Model (Figure 86) was created in the third phase of design development. The model was designed to be held in one hand. The two buttons were strategically placed in the middle of the device so the user can access them if he or she is left-handed or right-handed. The top button is the “i” button. The “i” stands for “information.” When the “i” button is pressed, the device scans the product, and information about the product is displayed. The button under the “i” button is the “Shopping Cart” Button. When the “Shopping Cart” button is pressed, the user accepts the scanned item as an item they want to purchase. The item is now added to his or her total shopping cart inventory. The device features a textured rubber area surrounding the two buttons (Figure 87), so the user can tell which side of the device they are holding. The top of the device features a light to indicate to the user what action the device is taking. The light turns green if input is

understood by the device and accepted. It turns red if there is an error in scanning an item.

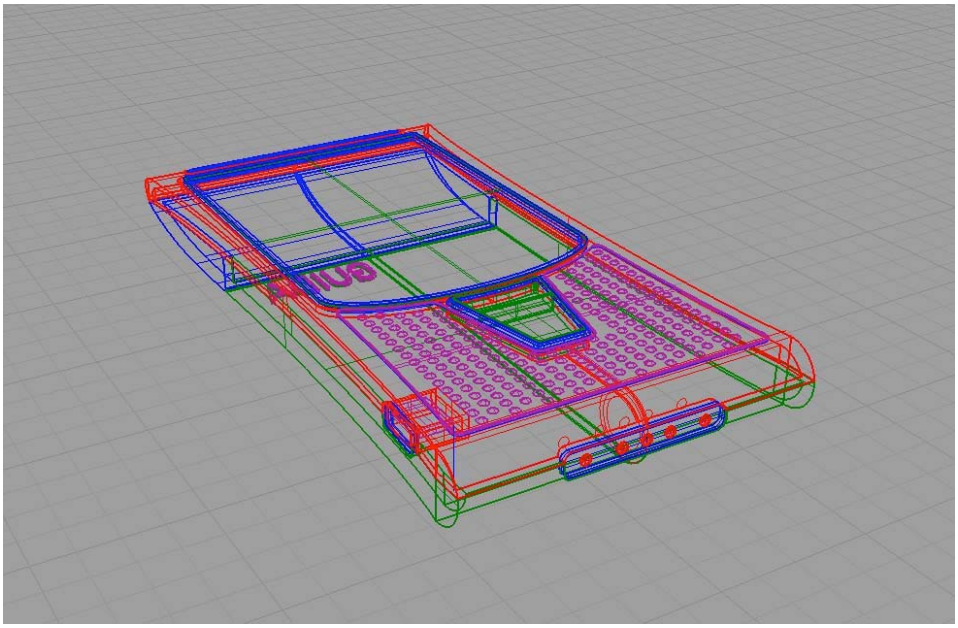


Figure 86. Computer Model of Portable Device.

Figure 87. Rendered Portable Device

Sketch Development of In-Store Device

The development of an in-store device was designed to save users money and give the store control of the product. The store may also be more likely to update the device's software. And making the device a part of the grocery cart allows one product to be shared among many people, saving resources and providing an additional service to shoppers. Incorporating a smart technology-scanning device into the grocery cart allows for an opportunity to redesign the shopping cart.

Initial sketch concepts (Figure 88) explored the incorporation of a screen that could give the user information during the shopping experience. The interactive product system would not require an individual to "check out" their items at a register; rather, the shopper would be able to use his or her screen to tally up the items in the cart and deduct the total amount using an electronic payment option. This requires the shopper to bag items as they move through the store. Initial sketch concepts of the in-store device included areas for bags.

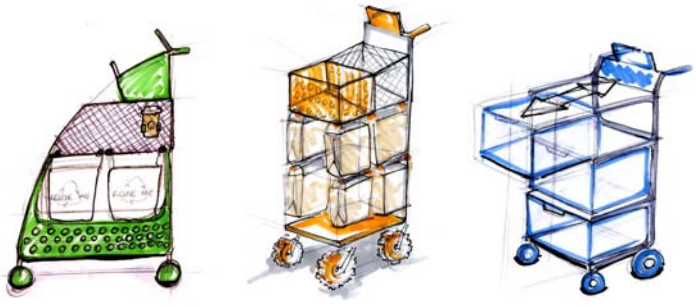


Figure 88. Initial Sketch Development of In-Store Device

Thumbnail ideation sketches (Figure 89) explored a form that was considerate of the user's ergonomic necessities. The cart featured a form that angled the back wheel away from the user's feet.

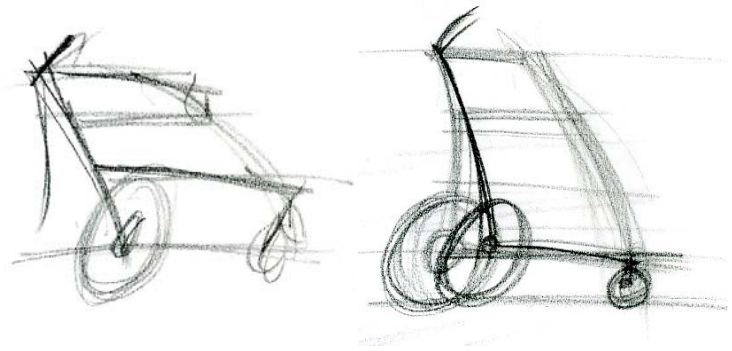


Figure 89. Thumbnail Ideation Sketches

The second phase of sketching (Figure 90) included a more refined form with a definitive aesthetic design. The concepts featured two baskets where groceries could be placed. They also featured a curved handle and an integrated computer screen.

Figure 90. Refined In-Store Device Sketches

Prototyping and Form Development of In-Store Device

The second phase of design development for the in-store device was a full-scale sketch prototype (Figure 91). The prototype was constructed out of polyvinyl chloride plastic tubing, plywood, and foam core. The full-scale prototype revealed the need for negative space between the user and the back wheels. It also demonstrated the need for a tapered form so multiple carts could be nested together.

Figure 91. Full-Scale Sketch Prototype of In-Store Device

Computer Modeling of In-Store Device

The third phase of the design development process was creating a computer model. Two computer models were built. The first model (Figure 92) was proportionally unbalanced. It did not give the user enough room for a large amount of groceries. The

wheels were all caster wheels, making the cart hard to maneuver. The cart did not feature an area for a small child to sit. The two baskets were equal in height. The identical height made the cart appear “top heavy.” The cart featured two parallel frames that did not allow multiple carts to be stacked together.

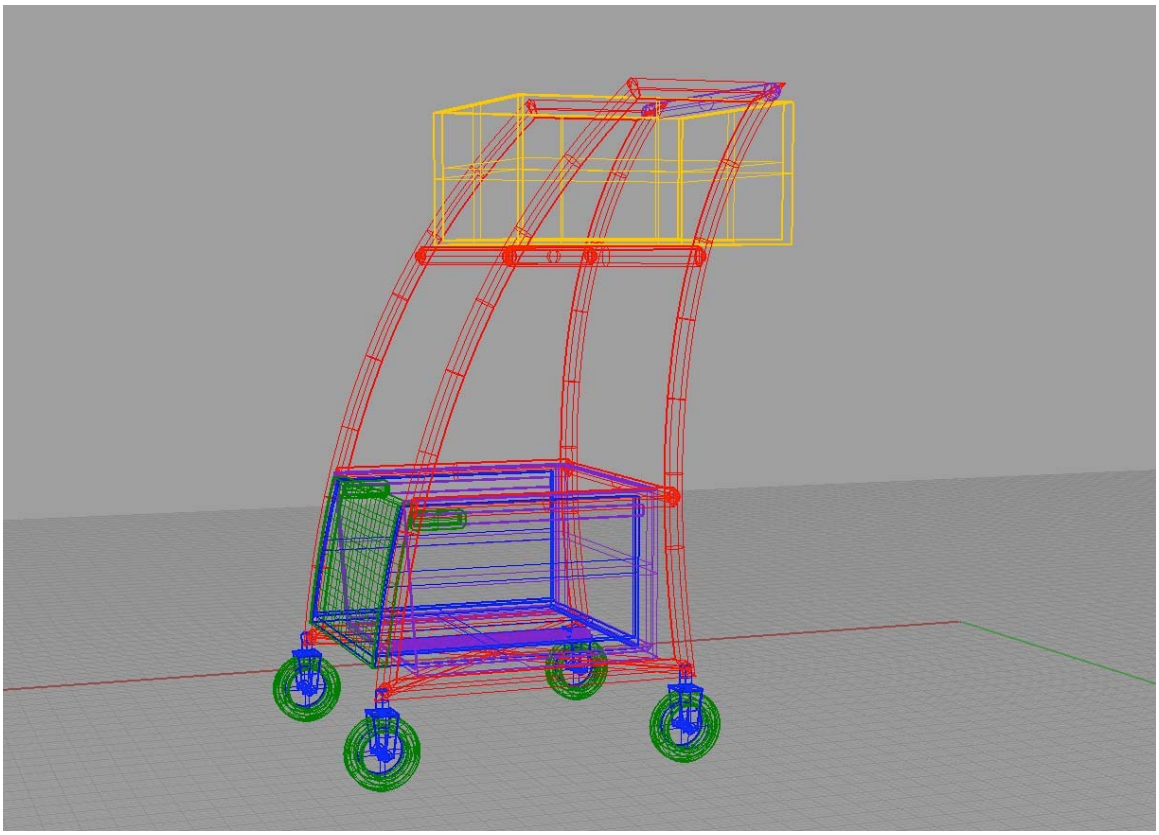


Figure 92. First Version Computer Model

The second computer model (Figure 93) features a more proportionate aesthetic with a tapered form, allowing multiple carts to fit together. The cart features rectangular shopping bags specifically designed for the cart (Figure 94 & 95). Six bags can fit on the top basket; eight can fit on the bottom. The bags come in a variety of colors so the user can organize their groceries according to type. For example, the user can put all of the dry goods in the light gray bags and the produce in the green bags. The cart features two

hooks below the child's seat where additional folded shopping bags can be stored. The cart features an integrated computer screen where the interface is displayed to the user. On the backside of the screen, there is an RFID scanner. The bottom basket was designed to be taller than the top basket, giving the user space to put large items like paper products. The back wheels are larger than the front caster wheels. They are positioned on the outside of the cart's frame, giving the cart more stability. The large wheels also allow the cart to be tilted back, similar to the way a dolly is tilted, for supplementary maneuverability. The handle is curved towards the user, allowing hand placement at a comfortable shoulder width position.

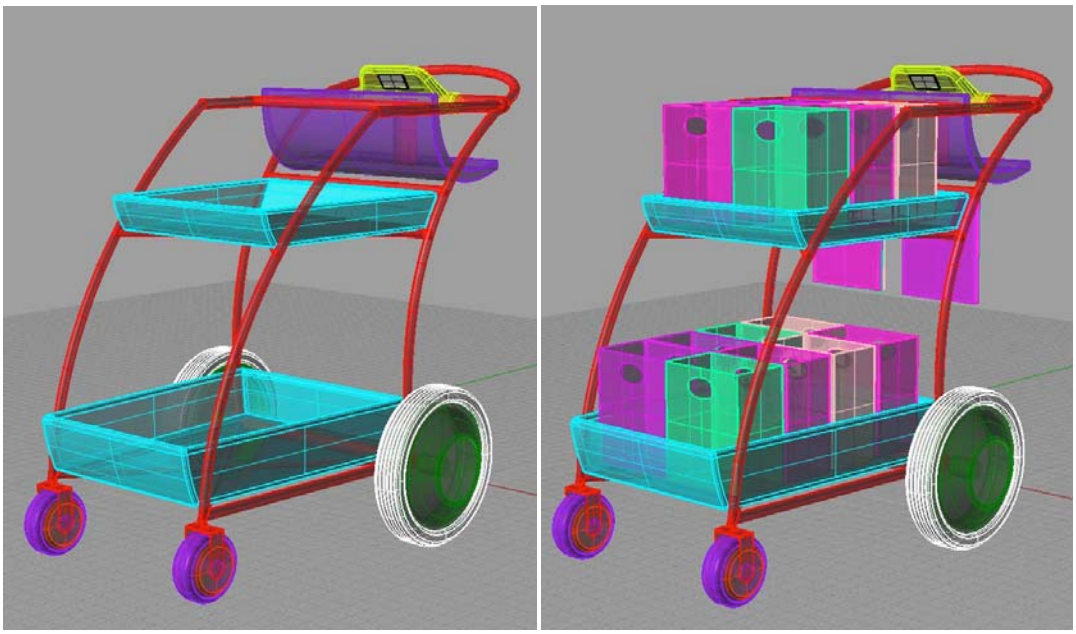


Figure 93. Cart Computer Model Version 2

Figure 94. Rendered Computer Model of Cart

Figure 95. Rendered Computer Model of Cart in Grocery Store

CHAPTER 8: CONCLUSIONS

Summary of Study

This study began with the identification of a need; health conditions are increasing, and nutritional information remains stagnant and incomprehensible. It showed the link between health conditions and food. It then examined the information product packaging displays. The study then addressed the growth of the incorporation of smart technologies into product packaging. It then summarized the trends in grocery shopping, and user research was conducted to see how people grocery shop. The research was followed by a user-centered interactive design approach and two variations of a scanning device that could communicate information to a user, providing them with a more meaningful grocery shopping experience.

Study Accomplishments

This approach was created to demonstrate how an interactive product system could benefit people, not just companies. The thesis outlines the kind of information people need to know when they shop, especially those with health conditions. This study explains that individual people need individualistic information that is specific to their needs instead of a collective average that is not relative to any one person. The study demonstrates how the information can be carried in two different product forms, a portable device and an in-store, shared device.

Future Applications

A user-centered interactive product system may be able to be implemented differently in the future. As the cell phone continues to encompass more technologies, like the camera, video camera, voice recorder, and more, it may be possible to incorporate a smart technology scanner. An application could contain the interface, and the cell phone would become the reader for the system.

User-centered interactive product systems have further avenues of exploration in the process of designing more meaningful experiences for people. As technology develops, interactive product systems will become more available for use. These systems could greatly benefit people, giving them more information to make more knowledgeable decisions not only in the grocery store, but also in other instances. More user research should be conducted to determine what information people need and are not getting.

Additionally, protecting peoples' information is of great importance in future applications of an interactive product system. As systems move from paper to digital, peoples' security of information can become more vulnerable. Many people are concerned with the protection of the information now; they will likely become more concerned as more of their information is digitally accessed. More research needs to be conducted to prevent the loss of peoples' property and privacy.

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