2012

Empathy, connectivity, authenticity, and trust: A rhetorical framework for creating and evaluating interaction design

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Empathy, connectivity, authenticity, and trust: 
A rhetorical framework for creating and evaluating interaction design

by

Cyndi Wiley

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

MASTER OF FINE ARTS

Major: Graphic Design

Program of Study Committee: 
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Iowa State University
Ames, Iowa

2012
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ABSTRACT

Relationships are synergistic. Relational theories describe how we create and sustain relationships and take into consideration our own experiences, our own social location and include broad cultural signifiers (Hall, 2012). Part of our development as people is to learn about power; our own power, and others’ power (Hall, 2012). This thesis offers the combinational addition of Relational-Cultural Theory and the Connectivity Model to the spectrum of interaction design. Since interaction design is about designing mediating tools for people and their subsequent behaviors, particular attention is needed into establishing and maintaining relationship between designer and audience.

Relational-Cultural Theory pushes against typical patriarchal structures and values in the United States. These typical “power over” values/structures include men over women, whites over blacks, logic over emotion, provider over nurturer, and so on (Hall, 2012). Relational-Cultural Theory seeks a flatness of power. It creates a sense of shared power, or “power with” others. This idea of shared power can lead to collaborative creation in interaction design to produce useful and good designs.

Empathy, mutuality, and authenticity are essential in recognizing our own limits and strengths in connection with others. Building trust requires a mix of all three of these tenets, as well as evolution through conflict. Interaction designers can move toward creating an inclusive theory for this discipline by becoming vulnerable and sharing power with the people with whom they design interactions. Therefore, the rhetorical framework of empathy, connectivity, authenticity, and trust (e-CAT) is presented as a means of creating and evaluating interaction design.
CHAPTER 1. OVERVIEW

1.1 Introduction

“If I were to sum up interaction design in a sentence, I would say that it’s about shaping our everyday life through digital artifacts—for work, for play, and for entertainment.”

— Designing Interactions, Gillian Crampton Smith, (Moggridge, 2006)

Visualize sitting at your desk, whether at home or an external office, and count the digital artifacts lying around. I have no less than 10 at any one time on my desk, and more like 15 when I empty the pockets of my cargo pants. These artifacts, commonly referred to as devices or gadgets, are comprised of my laptop and touch devices (whose names rhyme with the word “grapple”) cell phone, monitor, printers, backup devices and the graphical user interfaces (GUIs) that each of these uses.

GUIs create an important distinction between the industrial design of the physical artifact and interaction design. Interaction design takes into consideration a designed artifact and the behavior of the person using the artifact (Fallman, 2008). “Interaction design begins with the needs and desires from the people that will use a product, and depends on both subjective and qualitative values” (Moggridge, 2006). Interaction design (IxD), defined by Rogers, Sharp and Preece (2011) as, “Designing products to support the way people communicate and interact in their everyday and working lives,” has developed out of the universal principles of design that apply to graphic design, environmental design, architecture, industrial design, user interface design, and other related design professions.
Others that are involved in IxD are software engineers, usability engineers, product managers, and executives (Buxton, 2007). The commonality between definitions of IxD is the human factor.

Going further, design research needs to be conducted with people within their real environments to measure the entire human experience. This experience includes the social, cultural, and emotional qualities of using the artifact. While no one definition of interaction design is commonly accepted, nor one theoretical framework (Rogers, Sharp, & Preece, 2011), “… its ultimate objective is to create new and change existing interactive systems for the better” (Fallman, 2008).

Though, how does one judge what is better. Further, how does one judge what is good or bad design? Who might be qualified to make those judgments? Heller and Vienne begin to approach these questions in their book 100 Ideas that Changed Graphic Design (2012). They briefly cover the history of the concept “good design,” and its development by the Union des Artistes Modernes (UAM), in Paris, France—active from 1929 until 1959 (S. Heller, and Vienne, V., 2012). Among its members were Robert Mallet-Stevens, Paul Colin, Jean Carlu, A.M. Cassandre, and Charles Peignot. This group of influential artists and architects was anti-ornamentation, believed in functionalism, and the less-is-more adage.

In an attempt to institute a minimal aesthetic, the Museum of Modern Art in New York (MoMA) followed the UAM’s lead and “…developed the concept of ‘good design’ with a series of exhibitions that promoted pure form and equated over-indulgent styling with morally inferior taste” (S. Heller, and Vienne, V., 2012). UAM’s, and subsequently MoMA’s, philosophy was adopted from the highly influential Bauhaus in Germany (1919-
The Bauhaus was founded when the German zeitgeist ("spirit of the times") had turned from emotional Expressionism to the matter-of-fact New Objectivity, or German Modernism. Bauhaus teachings are still championed today as the pathway and model of "good design." In fact, the five principles of interaction design are heavily influenced by the Bauhaus’ principles of design.

Modernist philosophy was also reflected in literature and theory during that same period of time. Clement Greenberg’s essay *Avant-Garde and kitsch* (1939) is about two polar opposites of avant-garde and mass-produced items. Avant-garde was in response to society’s growing consumerism and lowering of taste, referred to as kitsch. Avant-garde artists needed the wealthy capitalist’s money (the bourgeois) to support their art, yet the bourgeois was producing kitsch in mass quantity. In essence, moving back to what avant-garde culture principled, the artists finally created art for art’s sake and Greenberg describes their culture as the imitation of imitating.

Greenberg is ultimately saying that avant-garde was a response to the dumbing down of society by consumerism. He takes a Marxist stance of denouncing capitalism as the cause of this materialistic society. He wrote in the time of Nazi Germany, and witnessed the effects of the Industrial Revolution in Western Europe, as well as the mass production of propaganda for political purpose. Greenberg laments on capitalism and proposes socialism to preserve living culture.

Walter Benjamin’s *The work of art in the age of mechanical reproduction* (1936) discusses his view of exploitation of the proletariat (lower social class) through mechanical reproduction of art. He explains that art was historically based on ritual, but has now changed...
to being based on politics. He describes the aura of art as having authenticity by presence of the original. He goes on to describe film as destroying aura, yet upholds it as a valid form of artistic expression. Film has changed society’s perception of how masses can now control content and have a simultaneous collective experience while watching a film. The same control of content by the masses can be applied to explore authenticity and shared experience in interaction design.

In contrast to the values upheld by Modernism, David Harvey’s essay on Postmodernism (1990) explores the “structure of feeling” as it has dramatically shifted from the former to the latter. His thesis is an exploration of what differentiates Modern from Postmodern thought, as it pertains to diverse genres (architecture, literature, art, film, etc.) Using Hassan’s schema, he looks at many different theorists, including Foucault, Barthes, Lyotard and others, and finds the differences between Postmodernist and Modernist thought. He provides many examples to illustrate the move and provide validation for his thesis.

Essential to Postmodernism is embracing “otherness” and seeking to liberate individuals that have been repressed by Modernist thought and attitudes. Postmodernism provided the energy for the shift from first wave feminism (late 19th and early 20th century) to second wave feminism (1960s to 1990s). First wave feminists fought for the right to vote in the United States, United Kingdom, Canada and the Netherlands, while second wave feminists fought for expression of sexuality, family, the workplace, reproductive rights, and inequalities, both from a legal and purely ethical standpoint. Today, the word “feminist” still carries a negative connotation in the dominant patriarchal culture of the United States.
While I certainly uphold the tenets of both waves of the feminist movements, I believe that a broader focus, and terminology to reflect this, is needed to encompass all those in the margins of society currently. Henceforth, I present the addition of Relational-Cultural Theory and the Connectivity Model (Kang and Satterfield 2009) to the process of creating and evaluating interaction design as both grounds for terminology and scope of the current movement in interaction design toward inclusive “good design.”

1.1.1 Background of the study

Interactive systems are comprised of both the physicality of the object and its visual language spoken through the GUI. Language gives us knowledge (Winsor, 2004). Winsor (2004) states, “Knowledge is not found ready-made in nature. Instead, knowledge is constructed in the interplay between nature and the symbol systems we use to structure and interpret it.” In other words, symbol systems compose language, and knowledge is created from our interpretation of language. Uniquely, visual language contains both text and images that mediate knowledge to the audience from the designer. The designer then constructs the visual language used within an interactive system, subsequently referred to as interaction design in this thesis.

The visual language of interaction design has been used to sustain “…relations of domination” (Barton & Barton, 1993), or cultural hegemony in the United States, by catering to the dominant culture. Barton and Barton reference hegemony through the Italian Marxist Antonio Gramsci. Cultural hegemony can also be described through Relational-Cultural Theory as a culturally-diverse society in which the dominant center exerts “power over” subordinate, marginal groups (Walker & Rosen, 2004). These marginal groups, “…enjoy less
cultural privilege (whether by virtue of race, ethnicity, sexual orientation, or economic status)…” (Jordan, 2004), as well as age or gender identity (Butler, 1999). The “power over” dynamic is sustained through what Barton and Barton (1993) term the rules of inclusion and the rules of exclusion. These rules determine what is included and what is excluded from a design and visual language. “These rules amount to either explicit or implicit, overt or covert, claims to power” (Barton & Barton, 1993).

1.1.2 Purpose of the study

Designers often unknowingly use rules of exclusion in designing visual languages that effect many cultural groups. Unfortunately, these rules are often related to marginal groups and by excluding them, their wants and needs are ignored. Norman (2004) declares, “The distinction between the terms needs and wants is a traditional way of describing the difference between what is truly necessary for a person’s activities (needs) versus what a person asks for (wants). Needs are determined by task… Wants are determined by culture, by advertising, by the way one views oneself and one’s self-image.” Therefore, designers miss a rich (meaning, full of flavorful culture and diversity) potential audience (Norman, 2004) by focusing on the dominant majority.

One example of needs is defined by the task of going to the grocery store to buy food. “Grocery shopping constitutes an essential and routine type of consumer behavior. Unlike most consumer buying contexts, the grocery shopping experience is characterized by (1) multiple buying goals that must be achieved through the processing of a complex array of in-store stimuli such as products, brands, and point-of-purchase information, and (2) repetition at regular time intervals (e.g., once a week)” (Park, Iyer, & Smith, 1989). This seemingly
simple task may not be so simple for many. In fact, going to the grocery store can be a trigger for anxiety and stress (Aylott & Mitchell, 1998). Whether due to physical limitations of one’s body, cognitive impairments, dietary restrictions or limited funds, anxiety and stress may be brought on by many different factors either in combination with one another or alone. “When you are sad or anxious, feeling negative affect, you are more likely to see the trees before the forest, the details before the big picture” (Norman, 2004). Consequently, the need to buy food with a trip to the grocery store is not a pleasant experience for many of those in marginal groups.

In order to determine the needs and wants of those who travel in regular intervals to the grocery store, I have used a triangulation of data by distributing an online survey to Iowa State University faculty and staff, as well as referenced a study conducted by Consumer Reports that appears in its May 2012 issue (Consumer Reports, 2012), collected in-store observation as an ethnographic technique, and interviewed several individuals. The Consumer Reports study asked 24,203 of their readers to rate 52 grocery store chains and share their top gripes. It also asked respondents how much they spent on groceries each week, what items they purchased, and what they liked and disliked about particular stores and the experience of grocery shopping.

The case study that I present is an iPad app developed in 2010 (Wiley, Saka, Tauber, & Kang, 2010) for adults age 46 and over to use at the grocery store. However, I wish to present this case study (through the above stated research methodology), as what should have been done during the entire iterative process of design from sketching to user testing. This methodology will be used to develop a rhetorical framework to produce good (meaning
inclusive and easy to use) interaction design through the combination of Relational-Cultural Theory and the Connectivity Model. The resulting framework is comprised of the central tenets of each—empathy, connectivity, authenticity, and trust (e-CAT).

1.1.3 Theoretical context for the study

When addressing needs and wants of an audience, the designer has a particular responsibility as a citizen (S. Heller, Vienne, V., 2003) to develop relationships with the people for whom they are designing interactions. Research needs to be conducted before, during and after the launch of a design into the behavior of the people using it. For example, there are a multitude of applications (apps) available for mobile devices. One look at the iTunes Store yields thousands of choices that range from useful to utterly useless and even ethically abominable apps. Some are exemplary examples of design thinking and research, while others completely lack understanding of the intended audience. Activity theory, is one way that interaction designers have tried to meet the needs of their intended audience (Kaptelinin & Nardi, 2006). It incorporates mediating tools that account for environment, culture, role of the artifact, motivations, and complexity of real life activity. However, a wide gap exists in how to incorporate “… cognition, emotion, as well as affect” (Norman, 2004) by using activity theory alone.

The Connectivity Model proposed by Kang and Satterfield (2009), accounts for the emotional gap in using activity theory in isolation, by incorporating Kansei engineering to measure emotional responses to products. They have successfully developed the model for use in product design and brand experiences. The model can also be applied to interactive systems and ultimately interaction design.
The current paucity of an inclusive theory for interaction design (Rogers et al., 2011) results in designers not researching social, cultural and emotional effects of their designs with the people that use them. Inclusivity in this sense means designing with marginal groups in mind, rather than catering to the dominant majority. Whereas the dominant culture might squander more money than subordinate groups, it is imperative to honor the multitude of cultures that represent the US. This ideology keeps financial gain at the lowest possible level while designing interactions with people. At the same time, it holds people at the top level by creating relationship between audience and designer. This flipping of the money aspect on its tail is contradictory to the current approach of business, and particularly the software industry, in the US (Buxton, 2007). By examining priorities, the designer can then view through the lens of their audience’s social, cultural and emotional ties. Using multiple theories in combination, will provide a rhetorical framework for designers to work with their intended audiences and build “growth-fostering relationships” (J. Miller, 1976).

This thesis is an attempt to bridge the gap left by the absence of an inclusive theory for interaction design and is a call for radical change to current business models of the software industry. A case study of the development of an iPad app for use in the grocery store will be presented as an example of how a combination of Relational-Cultural Theory and the Connectivity Model (Kang & Satterfield, 2009) could have been applied to the design process to produce a useful and easy-to-navigate solution for persons using it. By first exploring interaction design’s history and current process, this thesis will provide the reader with a rhetorical framework for producing good and useful interaction design through the inclusive combination of these theories. This thesis is by no means suggesting this
framework is the ultimate solution for interaction design’s current lack of a widely accepted inclusive theory, rather it is one among many possibilities that are being brought into the discipline.

I am also attempting to humanize the language commonly used in interaction design by referring to users and target audiences as “people” or “human” as much as possible. After all, it’s people who are interacting with products and systems and it’s important to name them as such. Only by recognizing this relationship can we move toward implementing the e-CAT framework successfully.

1.1.4 Boundaries of the study

When speaking of interaction design, I am referring to the everyday use of technology by those within the United States. More specifically, the study takes place in the Midwest state of Iowa in two nearby cities. Des Moines is the capital of Iowa with a population of approximately 200,000 people. Located 35 miles north of Des Moines along the I-35 corridor, Ames, Iowa, has a population of approximately 58,000 people with a large university presence (Iowa State University).

According to the Census (2010), Des Moines’ racial makeup is as follows: 76.4% White, 10.2% African American, 0.5% Native American, 4.4% Asian, 0.1% Pacific Islander, 5.0% from other races, and 3.4% from two or more races. Hispanic or Latino of any race was 12.0% of the population. Non-Hispanic Whites were 70.5% of the population in 2010, down from 87.8% in 1990.
The racial makeup of Ames is similar with less diversity: 84.5% White, 3.4% African American, 0.2% Native American, 8.8% Asian, 1.1% from other races, and 2.0% from two or more races. Hispanic or Latino of any race were 3.4% of the population.

Socioeconomic levels of both cities differ. In Ames the median income for a family was $56,439, and in Des Moines the median income for a family was $46,590. This skew of data can be largely attributed to the prominence of Iowa State University as a main employer in Ames, employing over 6,000 faculty and staff.

1.2 Definition of key terms

- Affective: When referring to one’s feelings and emotions, the word affect is used and defined as, “relating to, arising from, or influencing feelings or emotions (MerriamWebster, 2012a)

- Experiential: Merriam-Webster defines this word as, “relating to, derived from, or providing experience.” The colloquial definition would mean learning by doing (MerriamWebster, 2012b)

- Interaction design: This two-word combination does not exist in Merriam-Webster’s dictionary at the time of this writing. Rogers, Sharp, and Preece (2011) define interaction design (IxD) as, “Designing interactive products to support the way people communicate and interact in their everyday and working lives.”

- Rhetoric: As defined rhetoric is, “The art of speaking or writing effectively,” (MerriamWebster, 2012c) however, I am using this term to provide a framework for evaluating good interaction design. In essence, by presenting a
rhetorical framework for “good” design that adheres to standards of interaction design being, “…usable, easy to learn, effective to use, and providing an enjoyable user experience,” (Rogers et al., 2011) as well as suitable for under served groups that are on the edges of the dominant center.

In this thesis, rhetoric means designing effective visual languages.

1.3 Research questions

This research will focus on two basic questions:

1. Can a rhetorical framework be created to evaluate good interaction design?
   a. What items must appear in such a framework?
   b. How can these items be defined as relative to the value of interaction design?

2. Can the framework be applied to interaction design as a tool to improve affective and experiential responses?

1.4 Thesis outline

Chapter 2 reviews relevant literature to the support the research questions. Chapter 3 covers the methods of procedures of the research study. Chapter 4 provides the results of the study, summarizes and discusses the findings. The appendices contain supporting information and data essential to the presentation of findings and summary of discussion.
CHAPTER 2. REVIEW OF LITERATURE

2.1 Defining the origins of technology through art

Benjamin pointed out that art was historically based on ritual, yet today has a political bias (Benjamin, 1936). Around 13,000 B.C, in the caves of Lascaux, France, a tribe of hunters painted and etched their art on the walls using the current technology of their time. Their motivation and ritual was multi-faceted. Anthropologists and art-historians have various theories of the significance and meaning of the cave art. Some theories indicate that the paintings could be an account of past hunting treks, or could represent a mystical ritual in order to improve future hunting expeditions. With any of the theories, it is clear that political motivation is absent. There was expansive focus by the hunter-artists on the ritual of creating their art, as well as using ritual as their inspiration for subject matter.

A work of art transcends time even though it was created during a certain period. It has the ability to speak to people now, just as it did when it was created. The meaning of the work has to be studied from cultural, historical and the viewer's own personal hermeneutical lens, with a chance that it may be misinterpreted or merely speculated. Is art then a form of communication? Yes, and art history teaches us the language (De La Croix, Tansey and Kirpatrick 1991, 3-4). *The Great Hall of the Bulls*, painted by hunter-artists, is one of the most remarkable examples of the language of art and how it transcends time (Fig. 1).
These hunter-artists used technology to engrave and paint the cavern surfaces. For light, they used small stone lamps filled with marrow or fat with a wick. Moss is a likely candidate for the wick, although it remains uncertain. They used chunks of red and yellow ocher for drawing and ground these same ochers into powder for painting. To apply the paint, they either blew the color onto the wall or mixed it with animal fat. They made brushes from reeds or bristles, and could also form a blowpipe for out-of-reach places (De La Croix, Tansey and Kirpatrick 1991, 29). Archaeologists and art historians tell us that engraving was as important to their craft as painting, and was practiced over generations.

Most people think that technology is a new phenomenon referring to our current digital age of computers and machines. In fact, technology has existed as long as humankind has existed on Earth. It is defined by Merriam-Webster (2012):

1. the practical application of knowledge especially in a particular area : engineering
2. a manner of accomplishing a task especially using technical processes, methods, or knowledge <new technologies for information storage>

By definition, the hunter-artists in France were using technology to communicate visually and store information. Similarly, interaction designers use technology in a very similar fashion. We know that the language of the cave painters was pictograms, but what is the language of designers? Graphic designer Ellen Lupton makes a comparison about icons and text (Lupton 2006), saying,

Another common assumption is that icons are a more universal mode of communication than text. (Fig. 2) Icons are central to the graphical user interface (GUIs) that routinely connects users with computers. Yet text can often provide a more specific and understandable cue than a picture.

Lupton believes that text is often stronger than iconic image because it is searchable, translatable and capable of being reformatted for different media types, even ones that don't yet exist.

Figure 2. Commonly found Internet icons.
By contrast, Jochen Gros believes in the idea to push pictograms and icons into ordinary text editors by developing visual grammar and designing icon-fonts (Fig. 3). He believes that this global, visual language without any words will become paramount to our society (Abdullah and Hubner 2006, 7). His view takes us all the way back to the caves at Lascaux, with a visual language in existence sans words. Pictograms and icons are central to interaction design’s GUIs, but oftentimes they are mixed with words, to display information more effectively, and remain searchable.

![Jochen Gros’s designed icons.](image)

I believe that a combination of icons and text will prove to be the best approach in developing visual languages for communication systems. I also believe that interaction design will leap to the forefront of systems design, because it is almost transparent as a means of communication. Education and professional practice is critical in training and preparing future designers. Curriculum focused specifically on digital communication and interaction design should be integrated closely with graphic design, art, communications, computer science, engineering, anthropology, and psychology, among other disciplines.
Since digital media is leaping ahead of traditional means of print, greater focus needs to be put on learning the techniques and principles of design to achieve multiple finished formats suitable for digital and print reproduction. Also combining design with computer-mediated communication (CMC) and human-computer interaction (HCI) is of utmost importance. It is necessary to learn printing techniques and history, balanced with the collaborative, interdisciplinary focus of the digital culture shift.

I found an example of this digital shift online while researching the caves at Lascaux. I had first consulted an art history book, but wanted more images of the caves. I performed a search on Google for “caves Lascaux” and found a French Web site that specifically provided information and a virtual experience of visiting the caves (Fig. 4).

![Figure 4. Web site pertaining to caves at Lascaux, France.](image)

Since the text was in French, I used Google once again to translate the site into English and easily navigated my online experience. This particular site combines art, graphic design, information design, and HCI, to communicate and create an interaction with the
viewer about the cave paintings at Lascaux. The hunter-artists certainly could not foresee that their visual communications would be seen thousands of years later or how people from distance lands might interpret them.

2.1.1 Graphic interaction

Graphic design and interaction design are closely related in that they both develop visual languages that communicate with an audience. Therefore, interaction designers should place great importance on graphic design’s history, theory, criticism, and practice, as well as its imperative relationship to art. Often, graphic design is not greatly emphasized as a contributing field of expertise in interaction design, or not mentioned at all. Bill Buxton’s Sketching User Experiences (2007), fails to mention graphic design specifically in his definition of interaction design and its fields of contribution. In 2012, Buxton published an accompanying workbook where he places much greater emphasis on graphic design. Rogers, Sharp, and Preece, in their book Interaction Design (2011), place little emphasis on graphic design’s contributions to the development of visual languages. Cooper, Reimann, and Cronin (2007) devote one chapter to visual design. In developing an inclusive theory of practice for interaction design, we need to study the history and criticize the theory and practice of graphic design, and its branches on the family tree of art.

Graphic design has the power to maintain and transform beliefs. Since its inception in 1922, graphic design has been taught and practiced through the objective guise of Modernism, mainly modeled after the Bauhaus teachings. The Modernist adage “form follows function” has aided and abetted the dominant culture’s “advertiser’s stance”—as described by Wayne Booth (1963)—in the work that graphic designers perform. Nowhere is
this emphasis on advertising more apparent than the food and personal care items carried at local grocery stores in the United States. This stance puts an over dependence on audience at the expense of value and content. Overemphasizing audience in advertising creates an unequal power distribution by inevitably catering to the majority. This privilege-power distribution (Jordan, 2004) works to disconnect the dominant culture in the United States (white, male, middle-class, heterosexual), and I would add Christian (Blumenfeld 2009), from those at the margins. The margins are comprised of people with less cultural privilege (by virtue of race, ethnicity, sexual orientation, or economic status) (Jordan, 2004).

According to the First Things First manifesto, first published in 1964 and again in 2000, a majority of advertisers in the US “manufacture demand” (Garland, 2000) for products that are “inessential at best”. This advertiser’s stance places profits before people, and has provided a bad example to the software industry and how it conducts business (Buxton, 2007).

Jan Van Toorn, a well-known and respected graphic design educator, published an essay in 1994 titled Design and Reflexivity. In it he observes, “…communicative design, which traditionally views its own action as serving the public interest, but which is engaged at the same time in the private interests of clients and media,” (Van Toorn, 1994) as conflicts of interest. He suggests that designers neutralize these conflicts, “…by developing a mediating concept aimed at consensus.” When designers attempt this neutralization they, “…conform to the neo-liberal concepts of the present socioeconomic circumstances” (Van Toorn, 1994). Thereby, they contribute to the “communicative monopoly” (Van Toorn,
2012) of the dominant majority. Van Toorn is saying designers too often do not consider their role in developing the public discourse that caters to the dominant center.

Neil Postman’s book *Amusing Ourselves to Death: Public Discourse in the Age of Show Business* (1985) is a critical look at culture in the US through television. In the Twentieth Anniversary Edition of his book, Postman’s son Andrew asks, “Is it really plausible that this book about how TV is turning all public life (education, religion, politics, journalism) into entertainment; how the image is undermining other forms of communication, particularly the written word; and how our bottomless appetite for TV will make content so abundantly available, context be damned, that we’ll be overwhelmed by ‘information glut’ until what is truly meaningful is lost and we no longer care what we’ve lost as long as we’re being amused… Can such a book possibly have relevance to you and The World of 2006 and beyond?” It’s a brilliant question, to which the answer is yes, as Andrew Postman continues to explain.

Verifying his father’s argument as reliable in the current culture of the US, Andrew Postman surveyed former students of his father (many of whom are teachers who teach *Amusing Ourselves to Death*) to share their students’ thoughts about the timeliness of the book (Postman 2005). After reading and discussing the book, one professor noted this his students came to realize that TV, “…is almost exclusively interested in presenting show business and sensationalism and in making money. Amazing as it seems, they had never realized that before,” (Postman 2005).

Television led the way and provided the model for the Web and interaction design. Just as we amuse ourselves to death with TV, leisure boredom has now become an issue in
regards to cell phone use and addiction (Leung 2008). Since there are an increasing number of cell phone users that have smart devices (phones and tablets that can access the Web and text messaging using SMS), a new addiction pattern has developed. In 2008, Louis Leung compiled and analyzed results in, *Leisure boredom, sensation seeking, self-esteem, and addiction: Symptoms and patterns of cell phone use*. His research offered a connection between gambling addiction and cell phone use. He states, “This impairment is manifested by seven symptoms from a list of conditions including withdrawal, tolerance, preoccupation with the substance, loss of control over the substance, more use of the substance than intended, continued consumption of the substance despite adverse consequences, and loss of interest in other social, occupational, and recreational activities.” His study can be applied to use of the Web through browsers, as well as apps. For instance, one might feel the effects of leisure boredom while playing Angry Birds (a game app developed by Rovio) for the one-thousandth time. While it is a game meant to entertain, we may use it to kill time and remark how bored we are while playing.

In relation to the advertiser’s stance of consumerism, an appropriate metaphor for “amusing ourselves to death” might be “consuming ourselves to death.” Those that have offered similar views and critiques of mass culture and popular entertainment during and since the Industrial Revolution include Walter Benjamin, Clement Greenberg, Theodor Adorno, Karl Marx, Aldous Huxley, Laura Mulvey, Steven Heller, Katharine McCoy, Naomi Klein and Kelle Lasn, among many others. One way that social critique has infiltrated mass culture is through the use of humor, and in particular parody. From Punch and Judy during
the Industrial Revolution to today’s *Saturday Night Live*, people have found ways of offering up wit to combat the ideology of the ruling class.

### 2.1.2 Parody as discourse

Idea number 64 in the book *100 Ideas that Changed Graphic Design* (Heller and Vienne 2012) is parody. Heller and Vienne (2012) define parody as:

*...arguably the most common form of visual satire. Although it dates back centuries, the act of altering a well-known image into a visual pun or other type of graphic witticism has largely been practiced during the second half of the twentieth century. The rise of consumerism sparked advertising campaigns that were at once embraced by the public yet became the butt of jokes.*

Using parody as discourse can provide validation for Relational-Cultural Theory to be applied to graphic and interaction design theory, education, and practice, to create more inclusive visual rhetoric. In effect, by calling attention to the absurdity of existing visual rhetoric of the current commodity-driven economy through subvertisements and the broader practice of culture jamming, the dominant audience might find ways of experiencing détournement, a “turning around” (Sandlin & Milam, 2008).

### 2.1.1.1 Relationships and class

Using Relational-Cultural Theory, designers can create work that changes the privilege-power dimension in the United States. Western psychology (mainly psychoanalysis as presented by Freud) contains many theories stemming from a position of cultural dominance (Jordan, 2004), and the predisposition to appear scientifically objective or neutral.
It is important for the designer not only to consider the person viewing an advertisement (or interaction), but also consider that person’s cultural experience as a whole. The only way to accomplish this is by establishing relationships. Human relationships are imperative to fostering growth, both within the same social and economic classes, as well as different classes that are either perceived or actual.

Marx and Engels (1845) present their views of how the ruling class also rules ideas. They explore the division of labor and look at the way in which dominance is established by the ruling class. They present Hegel’s three points of how theorists, ideologists, and philosophers (the thinkers) have all at times been dominant in history (Marx and Engels 1845). They use Hegel’s work as justification for their argument that historians have overlooked what is used in ordinary life as the ability to distinguish between what somebody professes to be and what that person really is (Marx and Engels 1845).

Marx and Engels’ views of the dominant, ruling classes and ideas are very much applicable today. Even though they were writing during the middle of the Industrial Revolution, they saw human relationships from a different point of view than most of their contemporaries, and even still today. Our current digital revolution, which has been underway in mass since the 1980s, can compare directly and indirectly to the Industrial Revolution. Since Marx is exploring differentiations among class and how that came about, we can apply his ideology to how personal computers, the Web, cell phones, and smart devices are leading to class distinctions. It might seem the power is in the hands of the people, but it is actually leading to greater power divisions among the ruling class. Our ruling class today takes what Marx says about capitalist dominance and multiplies it into infinity.
E.P. Thompson (1963) argues in the preface of *The Making of the English Working Class*, that many have misread Marx’s writings about “class” as a thing. He argues that class is something that happens in human relationships, rather than being a structure or category. He sees his book as a contribution to the understanding of class and is a study of the active processes of “making” relationships that form class. Thompson’s analysis of class is similar to the definition of a noun, as opposed to a verb. While a noun is descriptive of a person, place or thing, a verb conveys an action or state of being. Thompson defines class as the latter. He uses the word “making” in the title of his book to invoke the action of creating class through human relationships.

### 2.1.1.2 Growth-fostering relationships

The first tenet of Relational-Cultural Theory, and the key to building growth-fostering relationships, is empathy. Respect is the foundation of empathy, a complex cognitive-affective skill that involves the ability to join with another in his or her experience (Walker & Rosen, 2004). Rather than a designer taking the stance of “power-over” the viewer, the designer can be in “power-with” the viewer by offering an empathic design solution (J. B. Miller, & Stiver, I.P., 1997). In “power-over” relationships the dominant culture works in ways that maintain the power differential. In “power-with” relationships, there is shared energy that facilitates productive movement (Jordan, 2004). Designers must speak to the persons of their target audiences rather than assuming what they want or need. Design solutions (ads, commercials, interfaces, etc.) should not be presented as a way to “fix” people. Designers cannot continue to take this “power-over” stance as they so often have in
designing for their own experiences alone. They must take into account the experiences of others to produce empathic designs.

2.1.1.3 Advertising images as power-over relationships

Many food and personal care ads are based on “power-over” relationships by manufacturing demand for these inessential products. Hundreds of inessential products are readily available in supermarket aisles. Barthes’ (Barthes, 1980) article *Rhetoric of the image* presents a thesis of how meaning is incorporated into images, particularly advertising. Barthes offers a deconstruction of a Panzani ad (Fig. 5) He says that advertising images are intentional. He states that the signifieds of the message must be communicated clearly and often they are expressed emphatically, not to be confused with empathy. In his analysis of a Panzani ad, he separates the linguistic message into denotational and connotational to further separate it from the image altogether (Barthes 1977). Hence, he presents three messages for the analyzed ad; the linguistic message, a coded iconic message and a non-coded iconic message (Barthes 1977). Barthes’ also points out that advertising images are ambiguous.
Figure 5. Panzani ad deconstructed by Barthes in Rhetoric of the image (1977).
Deconstruction of a recent ad appearing in the July 2012 issue of Better Homes & Gardens magazine (Fig. 6) contains all three of Barthes’ messages; linguistic, denotational, and connotational messages. Since part of the linguistic message in this ad molds with the image, it is difficult to separate the two. However, there is a completely separate linguistic message of “Bursting with 35% more flavor.” There are some elements of pure image, aside from the typography (“So creamy they belong in the fridge”) in the waterfall of cream. The refrigerator, floating bowl of sour cream pouring out with two different kinds of onions spill onto the floor, where the Pringles can is floating along with a couple of chips in the foreground.

The scene contains a can of chips that has burst out of the fridge and is now floating along a river of sour cream. A signified freshness and boldness of ingredients provides euphoric values, where the signifier is the can containing chips, and the two chips outside of the can. “The knowledge on which this sign depends is heavily cultural,” states Barthes in reference to the Panzani ad (Barthes, 1936). The same statement is true of the Pringles ad.
Figure 6. Pringles ad in the July 2012 issue of *Better Homes & Gardens* magazine.
Since most of us are not linguists, and most ads exist solely to capture quick attention to get us to purchase something, it is impossible for the typical person to decode advertising images seen on a daily basis, à la Barthes. Advertising images are named “publicity images” by John Berger in his 1972 book, *Ways of Seeing*. Berger (Berger, 1972) refers to the quick capture of attention by publicity images as belonging to the moment. Designers often do not pause to decode the images they design or view. Berger states, “We are now so accustomed to being addressed by these images that we scarcely notice their total impact.” As Berger explains, it is the advertising images that propose to us that we “transform ourselves, or our lives, by buying something more. This more, it proposes, will make us in some way richer—even though we will be poorer by having spent our money.” (Berger, 1972) As he states, this is the visible sign of “The Free World” (Berger 1972).

2.1.1.4 The myth

It is this sign of “The Free World” that perpetuates a great myth. The predominant myth that has been perpetuated in design education and practice in the US is that advertising is the primary practice for graphic designers, therefore the minimal attention from the current theories of interaction design. Since the Industrial Revolution, advertisers have created this fallacy by dumping exorbitant amounts of money into the industry to “sell, sell, sell” products. As Marx argued (Marx, 1990), commodities are the key distinguishing feature of the capitalist economy. Food and personal care items have been commoditized it the US. In a capitalist society, production has mastery over people, rather than the other way around.

Naomi Klein argues that the seemingly radical movements that occurred on college campuses in the 1990s were only related to representation. Women, gays, and minorities all
wanted to see mirror images of themselves in the Media. She states that this movement of identity politics only helped to propel marketers to seek “diversity” as their main selling tool to new niches as identity marketing. This movement of identity politics ignored issues of class, as this was an economical shift rather than a political one (Klein 2000).

Proctor & Gamble (P&G) and Johnson & Johnson (JnJ) are two companies that have contributed to this myth by manufacturing demand for their personal care products. In 2010 P&G spent $8.6 billion on advertising (P&G, 2010) while JnJ spent $7.8 billion (JnJ, 2010). Many of their personal care products were developed during the Industrial Revolution and have continued to grow alongside the advertising industry they helped to create. P&G and JnJ are leaders in producing and advertising feminine hygiene products such as maxi pads, tampons and deodorant. They set the precedent that many other advertisers are now following. One of the most memorable ads for a feminine hygiene product was produced in the 1980s for Massengill douche, and follows the P&G and JnJ model. A mother and daughter are walking on the beach when the daughter asks her mom, “Mom, do you douche?” The predominance of these ads, and their pejorative nature, led to the practice of culture jamming and subverting ads. Jamming is explained in an interview in 2002 with Kelle Lasn (founder of Adbusters) (Pickerel, Jorgensen, & Bennett, 2002):

*Jams are often aimed at exposing questionable political assumptions behind commercial culture, aiming to capture our attention so that, for a moment, we can consider the branded environment we live in. Culture jams refigure logos, fashion statements, and product images to challenge images of “what’s cool,” along with assumptions about the personal freedoms of consumption. Culture jams can help create a sense of transparency*
about a product’s production impact by presenting images that quickly communicate the realities hidden behind the slick corporate logos. The logic of culture jamming is to convert easily identifiable images into larger questions about corporate responsibility, the “true” environmental and human costs of consumption, or the private corporate uses of the “public” airwaves.

2.1.1.5 Subvertising

Subvertisements (or ad parodies) have become an accepted part of US subculture. For over 30 years, Saturday Night Live (SNL), an NBC TV show that parodies social aesthetics in US American society, has used the model of poking fun at taboo topics that began to appear in the form of print advertising during the Industrial Revolution (You might recall the SNL “commercial” from the 1990s, “Oops, I Crapped My Pants”). These topics are often comprised of sex, subjection of women and basic human bodily functions. Subvertisements increase awareness and activism surrounding the use of stereotypes in the advertising industry based on particularities of social class, ethnic groups, age and/or gender. These parodies point a beacon of light at the ridiculous nature of inessential products, the majority of which are geared toward so-called feminine care and the treatment of minorities.

In 2011, SNL performed a skit about a new feminine product called Camel Tame (SNL, 2011). The premise of this product is for women to be able to wear tight clothing without the embarrassment of having their genitals protruding outward from the crotch of their pants. Subvertisements are sometimes mistaken for real product ads. While this fake product was obviously a response to the vast increase in advertising for feminine hygiene products, it proves a valid point of how far an advertiser will go to create a market for their
goods. Stereotypes are often used to appeal to a specific target audience, often to the detriment of a particular social class, sexual orientation, ethnic group, age or gender.

A designer using empathy will include the audience during all stages of design, from concept to launch, and work to create relationship with the people in the group. Empathy should be used in all aspects of interaction design, as well, and is one of the missing links between designer and audience. Including the audience in the process allows for empowering, “power-with” relationships, rather than debilitating “power-over” relationships.

2.1.1.6 Mutuality

The second tenet of Relational-Cultural Theory is mutuality. Using this concept will enable designers of differing gender, race, ethnicity, socioeconomic status, sexual orientation, class concerns, or health status, to eliminate exclusionary bias in designing for under served groups and create mutually empowering connections. Mutuality is a creative process in which contributions of each person and openness to change allow something new to happen (Walker & Rosen, 2004).

Feminist author bell hooks writes, “By listening to the voices at the margins of patriarchal culture, the model can envision new alternatives for the center.” (Walker 2004) This statement can easily be applied to advertising. Advertising has tremendous effect on society’s perceptions of themselves and others and is often used to create perceived needs. Most of these ads are designed with the expectation of unilateral change. In a unilateral interaction, the less powerful person is changed. Without making contact with actual people within one’s audience before, during and after design, it is impossible to know what impact a particular advertisement or interaction might have.
Designers need to be aware with whom they are communicating and what impact their interactions have had or are having. Without this knowledge and experience graphic design and interaction design students will work naively as neutral, objective, mediating tools between industry and audience. This touches the age-old argument of education versus practice and even practice versus theory (S. Heller, 2005). Theory is no good without education and practice, and vice versa.

2.1.1.7 Authenticity

The final tenet of Relational-Cultural Theory is authenticity. Miller (1997) describes authenticity “…as an increasing capacity for representing oneself more fully in relationship.” Interaction design’s purpose should be to contribute to bettering the human existence, not to make exorbitant profits. Ken Garland’s First Things First 2000 (2000) makes salient points that the essence of design is not about commercialism. Authenticity in this sense is about contributing to the greater good, regardless of financial gain.

Each day we are bombarded with thousands of messages. Ads on TV, radio, the Web, magazines and newspapers, attempt to convince us of certain ailments and conditions that need fixing by using their products. Often these ads portray women as depressed, overweight, not having regular bowel movements and having smelly, itchy vaginas. Watching an ad for Vagisil instills an “itch” in you to purchase the product.

A 2011 episode of South Park (Parker & Stone, 2010) was created as a parody of the Vagisil product advertising. Cartman, who is one of the main characters, consumes Vagisil in hopes of being able to drive in the NASCAR circuit. In this episode Jeff Hamill, who is presented as Vagisil’s founder, along with his wife Patty, visits him. Jeff describes her as his
“muse, his flame.” Patty is the reason he created Vagisil, as he states, “Patty’s smile can light up a room, her vagina on the other hand clears it out and makes it uninhabitable for weeks.” This spoof about Vagisil is in response to the amount of feminine hygiene ads on TV. The real ad for Vagisil shows different animals as metaphor for a woman’s vagina. A skunk and a porcupine both have on screen time and demonstrate “stinky” and “itchy” respectively. These visuals persuade and deceive the viewer into thinking Vagisil is the cure for this “manufactured” smelly, itchy vagina syndrome. Women are made to feel unclean if they do not use this product.

The social taboos of sex, subjection of women and basic human bodily functions, appear in ads each day. Advertisers miss the target of what is really important to most US Americans, which is sweeping social changes rather than a woman’s vagina. It is more important to sell, sell, sell, products and rake in money rather than be seen as a company that cares for humanity by promoting healthy images and messages that instigate and become a model for social change.

Relational-Cultural Theory is one way to add empathy, mutuality and authenticity to advertising and ultimately to the whole of graphic and interaction design. Activity theory is currently being used in design research to develop products and services for people to use in their own environment. Performing studies of products and services with actual people is an extraordinarily valuable form of data collection. However, it leaves a sizable crater in the privilege-power dimension created by the subsequent advertising.

What can we as designers do to break out of this obedient, neutral, servant-to-industry, “advertiser’s stance” mentality and not be a pencil that someone else pushes?
Action through resistance can be liberating. Non-action leads to apathy between designer and audience and designer and boss. As Judy D’Ammasso Tarbox (2006) states, “…traditional theories and instinct may no longer be adequate as a base in the field of design.” She is making a case for using activity theory as a model for design research, which lacks the emotional component necessary to study authentic audience relationships. Relational-Cultural Theory, however, seeks to examine emotional relationships and power differentials, while the Connectivity Model offers a way to evaluate emotional responses to products and services. By applying Relational-Cultural Theory’s three central tenets of empathy, mutuality and authenticity, and the Connectivity Model’s use of activity theory and Kansei engineering, this framework can be applied to contemporary graphic design, and hence interaction design, to burst out of the neutral, objective mold.

2.1.1.8 Connecting with audience

Designers can use Relational-Cultural Theory and the Connectivity Model to form relationship with their audience. Often, advertisers treat their demographics as purely numbers and marketing data without really going further into the psyche of actual people. Building relationships with people that make up these demographics is the only way that designers will be able to create positive, growth-fostering change. The fight to mass produce products and appeal to the masses has led to even less innovation now than in the Industrial Revolution. Social changes are now tracked with highly engineered computer driven software that report to marketing agencies. Those agencies predict trends of what US American consumers “want and need.” There seems to be more human-computer interaction, than human-to-human interaction on the side of advertisers and graphic designers. Using the
computer to communicate to other people, instead of communicating face-to-face, has weakened communication as a direct result of the technology that is supposed to increase it. Information is not communication, nor is information knowledge.

Views about sex, women and the body’s most basic needs, while more talked about today than in the Industrial Revolution, are still seen as subjects not to be openly discussed at the dinner table. Rather, children are growing up in an age where their innocence is lost to the Web, movies, TV and magazines. Information, pictures, and all sorts of matters are readily available at the click of a button. Designers need to be aware of the impact of the interactions they design and take responsibility as citizens for their actions.

Designers using this rhetorical framework will indefinitely encounter conflict from all directions. Boss, co-workers and audience are all sources of conflict. Not all conflict is bad. In fact, it can make many relationships stronger if dealt with efficiently and effectively. But how do you do it? There are a few basic tips and techniques to use, but it does take practice, training, and experience. It will always depend on the situation and there is always a risk by becoming vulnerable when addressing any sized conflict. In the workplace, you risk your job if you say something, as well as your personal ethics if you don’t. In Western culture, conflict resolution is using a combination of techniques including diplomacy, mediation and negotiation to address the conflict that will hopefully lead to a mutually satisfying outcome. The lesson to be learned is creating interactions with people is what encompasses interaction design. If designers can learn to question the “advertiser’s stance” and produce interactions not based on the advertising industry’s model, but rather empathy, connectivity, authenticity and trust, we might be able to experience a more accurate portrayal of US American society
through products and services sharing power with us to enable informed personal decision-making.

### 2.2 Current theory and processes of interaction design

Human-computer interaction (HCI) and interaction design are closely related. In fact, Bagnara and Crampton Smith refer to this relationship in a familial sense. They say:

*The complexity of interaction design’s domain is evident in its parentage. On one side of its family is human-computer interaction (HCI), whose history is the coming together of hardware and software engineering, and physiological and cognitive ergonomics; on the other, a range of design practices and discourses including those of industrial design, graphic design, architecture, and film—each of which has a medium requiring a particular set of skills and mental attitudes (Bagnara & Smith, 2006).*

HCI predates interaction design by approximately twenty years. “Its mating with design to produce interaction design, which can probably be dated to the 1980s, was because digital products were increasingly aimed at a lay consumer (rather than professional) usership…” (Bagnara & Smith, 2006).

The discourse of interaction design has not yet been formalized, meaning that there is no one accepted theory, education or praxis for the process of designing interactions with digital artifacts (Rogers, Sharp, Preece 2011). This is partly due to the rapidly changing nature of technology. It’s been almost thirty years since personal computers started advancing their way into US workplaces and homes. Cognitive psychologist Donald Norman (2004) reflects on this phenomenon by saying, “Personal computers are successful throughout the world because their benefits overcome their (numerous) deficiencies, and
because there really is no choice.” Part of the deficiencies is the lack of intuitive interfaces, undoubtedly creating frustrations among computer users. Bill Moggridge (2007) states, “We’ve come to a stage when computer technology needs to be designed as part of everyday culture, so that it’s beautiful and intriguing, so that it has emotive as well as functional qualities.”

In his 2004 book, *Emotional Design: Why We Love (or Hate) Everyday Things*, Norman explores the emotional qualities associated with aesthetics of designed artifacts. He argues, “…that the emotional side of design may be more critical to a product’s success than its practical elements” (Norman, 2004). He illustrates this view by offering “three different aspects of design: visceral, behavioral, and reflective” (Norman, 2004). Visceral design is concerned with the appearance of a designed artifact. Behavioral design “has to do with the pleasure and effectiveness of use,” and lastly, “reflective design considers the rationalization and intellectualization of a product” (Norman, 2004). In other words, reflective design tells a story about the artifact. Considering Norman’s three aspects of design, where does interaction design fit in? He believes “It is not possible to have design without all three,” and that they are all “interwoven through any design” (Norman, 2004).

With these three different aspects of design, we can now see that designers are no longer “…suppressed by functionalism…we believe aesthetics to be a central concern for interaction design research” (Fallman, 2008). “Understanding the role of aesthetics means being able to deal with issues of what is beautiful, harmonic, and fitting in the digital world” (Fallman, 2008). Fallman (2008) continues by saying, “…issues of aesthetics concern not only how something looks and feels, but also the aesthetics of the whole interaction including
The whole of interaction design involves cognition and emotion, as well as affect (Norman, 2004). Norman (2004) believes that cognition and emotion are inseparable. He also believes that “Both affect and cognition are information-processing systems,” (Norman, 2004) and that “much of human behavior is subconscious, beneath conscious awareness” (Norman, 2004). He says that “Consciousness comes late…; many judgments have already been determined before they reach consciousness” (Norman, 2004). Considering this evolution of consciousness, interaction designers that do not interweave all three of these things (cognition, emotion, and affect) are missing most their user’s decision-making process. Therefore, they are creating artifacts that may be “usable but ugly” (Norman, 2004).

“Usable designs are not necessarily enjoyable to use,” continues Norman (2004). While using these three components together are essential to the design process, the most used theory of both HCI and interaction design is activity theory. Activity theory is used at the conscious level and does not provide a framework for emotion or affect. Hence, it only consists of covering one (cognition) of the necessary components. This leaves much room for exploration into other ways of including emotion and affect through theoretical frameworks.

### 2.2.1 Definition of key terms

- **Activity theory**: This theory has recently been applied to human-computer interaction (HCI) by a group of researchers led by Bonnie Nardi. Her book *Context and Consciousness: Activity Theory and Human-Computer Interaction* is a collection of articles written by preeminent figures in HCI research. Russian psychologist Lev
Vygotsky developed activity theory in the 1920s. It is being used in HCI research to understand the unity of consciousness and activity.

- **Relational-Cultural Theory**: Jean Baker Miller, M.D, worked in collaboration with several other psychologists (Judith V. Jordan, Janet Surrey, and Irene Stiver) to develop this theory in the 1970s. With its roots in therapeutic settings, it is aligned with feminist and multicultural movements in psychology. It is based in social justice, where the main locus is in building growth-fostering relationships using empathy, mutuality, and authenticity.

- **Kansei engineering**: Developed by Mitsuo Nagamachi at Hiroshima University as a way of accessing human emotions and sensitivity in product development (Kang and Satterfield 2009).

- **Connectivity Model**: Developed in 2007 by Kang and Satterfield as a bridge between activity theory and Kansei engineering, to consider emotion, cognition, behavior, motivation, and the context of an activity (Kang and Satterfield, 2009).

- **Human-centered design (more commonly referred to as user-centered design)**: A multi-stage design process that involves studying the end users of an interaction by determining their wants and needs. Typically used in developing interfaces. This process works to apply the current behavior of people, instead of attempting to change behavior.

- **Heuristic evaluation**: This is a type of expert evaluation and deconstruction process to find usability problems. However, it has been abused as a cheap way to skip testing with end users in some corporate settings.
• Rapid prototyping: This is an iterative design process that involves quick sketching techniques on paper and testing with people as end users to find usability issues prior to final design and coding.

• Evaluation: The purpose of evaluation is to judge something’s merit or worth, originally defined by Scriven in 1967 (Fitzpatrick, Sanders, and Worthen 2011).

• User personas: Part of the human-centered design process that provide designers with a way of envisioning how users might behave, through their needs and wants (Cooper, Reimann, and Cronin 2007). Personas are not real people, rather they are based on the behaviors and motivations of real people.

### 2.2.2 Interaction design fundamentals

“Interaction design is deep and complex,” states David Hogue (Hogue, 2012). David Hogue, PhD, is both an interaction designer and a psychologist. He created a course (one of many) for Lynda.com in February 2012 about the fundamentals of interaction design. He says that it is about how people perceive, process, understand, learn, remember, and how context and need influence behavior (Hogue, 2012). “Interaction design is really about the behavior of people,” (Hogue, 2012). This belief correlates with Norman’s trio of effective design—visceral, behavioral, and reflective.

Interaction design shapes our everyday lives and is defined by the IxDA (Interaction Design Association), as “The structure and behavior of interactive systems. Interaction designers strive to create meaningful relationships between people and the products and services that they use, from computers to mobile devices to appliances and beyond.” Since
interaction design is centered on people, the most utilized approaches are human-centered design and iterative, rapid prototyping.

From bulls that continue to speak to us at the caves at Lascaux to the iPad that speaks to us in the grocery store, interaction design has had a rich history. While these two examples are certainly not within the same context of use, they were both created with people and communication in mind. With the human-centered design process, research, ideation, and prototyping iterations lead to a finished product.

As a beginning to establishing the design process, Hogue quotes Albert Einstein; “We need to first define the problem. If I had an hour to save the world I would spend 59 minutes defining the problem and 1 minute finding solutions.” Hogue covers a few traditional processes, as well as a cyclical human-centered design approach for solving problems presented in figures 7 and 8. Design is a cycle and should be performed cyclically with users involved at each step. Another important aspect to consider is to monitor the performance after the launch of the design and continue to make improvements. Einstein’s emphasis on the process is well suited for designers. In theory, involving people as the users of interaction design at every step makes the most sense. Unfortunately, many companies delete this aspect of their design process due to budgetary concerns (Rogers, Sharp, Preece 2012).
Figure 7. Three differing approaches to design (Hogue, 2012).

Figure 8. Cyclical approach that incorporates human-centered design (Hogue, 2012).
2.2.2.1 Human-centered design process

The human-centered design approach is often used in developing interactions with people as end users, particularly implemented in GUI design. Human-centered design takes into account the needs and wants from the persons using a particular product or system. The process can include, but is not limited to:

- A heuristic analysis
- Interviews with stakeholders
- Creation of user personas
- Rapid prototyping & evaluation

A heuristic evaluation, as stated by Rogers, Sharp, and Preece (2011) is a usability inspection method that was developed by Nielsen and his colleagues, in which experts, guided by a set of usability principles known as heuristics, evaluate whether user-interface elements, such as dialog boxes, menus, navigation structure, online help, and so on, conform to tried and tested principles.”

The original set of heuristics identified by Nielsen and colleagues was derived empirically from an analysis of 249 usability problems (Rogers, Sharp, and Preece 2012). Nielsen’s website, useit.com, has a revised version of these heuristics (Nielsen 2010). They are:
1. **Visibility of the system status**

   The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

2. **Match between system and the real world**

   The system should speak the users’ language, with words, phrases, and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

3. **User control and freedom**

   Users often choose system functions by mistake and will need a clearly marked emergency exit to leave the unwanted state without having to go through an extended dialog. Support of undo and redo.

4. **Consistency standards**

   Users should not have to wonder whether different words, situation, or actions mean the same thing. Follow platform conventions.

5. **Error prevention**

   Even better than good error messages is a careful design that prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

6. **Recognition rather than recall**

   Minimize the user’s memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialog to another.
Instructions for use of the system should be visible or easily retrievable whenever appropriate.

7. **Flexibility and efficiency of use**

    Accelerators—unseen by the novice user—may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

8. **Aesthetic and minimalist design**

    Dialogues should not contain information that is irrelevant or rarely needed. Every extra unit of information in a dialog competes with the relevant units of information and diminishes their relative visibility.

9. **Help users recognize, diagnose, and recover from errors**

    Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

10. **Help and documentation**

    Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user’s task, list concrete steps to be carried out, and not be too large.

    By using these heuristics to judge against the interface design, good design can begin to be evaluated. However, heuristic evaluation is no replacement or substitute for testing the interface with people as end users at all phases of the design process. Although some
designers might use this part of the human-centered design process alone, it works best used in tandem with end users.

Another key component to the human-centered design process is to interview stakeholders. Cooper, Reimann, and Cronin (2007) define a stakeholder as, “…anyone with authority, and/or responsibility for the product being designed.” They recommend conducting interviews with stakeholders before any user research begins (Cooper, Reimann, and Cronin 2007). Mainly, because these interviews will help guide how the user research will be conducted (Cooper, Reimann, and Cronin 2007). Interviews with stakeholders should be completed one-on-one to promote empathy, mutuality, and authenticity (the three tenets of Relational-Cultural Theory) between the interviewer and interviewee. This method can lead to a growth-fostering relationship with stakeholders. Developing a common language (Cooper, Reimann, and Cronin 2007) is important to the design process, and individual interviews are one method to achieving that portion of the process.

The tools and techniques for interaction design are as varied as the differing disciplines that comprise the industry. Hogue recommends being pragmatic. Meaning, to “Choose the method, tools, and documents that are best for solving the problems at hand,” (Hogue 2012). Bill Buxton (2007, 2012) recommends beginning with hand-sketches as part of a low-fidelity process of producing paper prototypes to be tested with people. He also follows a pragmatic approach in part II of Sketching User Experiences (2007) where, “…it is about techniques for bringing design thinking to the design of interactive products and the experiences that they engender.”
2.2.2.3 Five principles of interaction design

Buxton (2007) states a need for an explicit and distinct design process. These five principles of interaction design are a good starting point for the process; consistency, perceivability, learnability, predictability, and feedback (Hogue 2012).

Consistency is needed to keep people on the appropriate path and not get lost along the way. People notice change (Hogue 2012), and differences can attract unwanted attention. If there is difference and change, it should convey meaning.

Perceivability invites interaction (Hogue 2012). “People will not interact if they do not know the opportunity exists.” (Hogue 2012). Signifiers are a way to invite interaction. Perceivable cues can be visual, auditory, and/or tactile (Hogue 2012). Norman recants his earlier introduction of the word “affordances” as synonymous to a “signifier” in his 2011 book, *Living with Complexity*. He says, “A ‘signifier’ is some sort of indicator, some signal in the physical or social world that can be interpreted meaningfully… In the vocabulary of design, signifiers are often called affordances or, more precisely, ‘perceived affordances’.”

Learnability makes interaction simpler. Norman (2011) states, “Fewer buttons may make something harder to operate.” He makes a point to say that “perceived simplicity” is not the same as “operational simplicity.” Hogue (2012) says that interactions should be easy to learn and easy to remember. He promotes recognition over recall in interaction design. Therefore, an “intuitive” interface is one that is easy for the user to learn quickly, because it anticipates what the person wants to do. A way to increase the speed of learning is through design patterns. “Design patterns are exemplary, generalizable solutions to specific classes of design problems,” (Cooper, Reimann, and Cronin 2007). While design patterns are not
recipes or plug-and-play solutions (Cooper, Reimann, and Cronin 2007), they can be useful as a means of capturing design solutions and generalizing them to address similar problems. They should be context specific.

Setting accurate expectations is the locus of predictability. When people cannot predict the expected interaction they are left to guess and through a process of trial and error, will navigate their experience. Contrary to popular belief people will spend an enormous amount of time trying to navigate a Web site successfully (Krug, 2006), rather than simply giving up and clicking on a competitor’s site. They often take responsibility for errors in navigation (Krug, 2006), while it is really the Web site that is at fault for failing to be predictable.

The last of the five principles of interaction design is feedback. Feedback can present itself in many different formats from an audible sound to a simple confirmation of adding an item to an online shopping cart. However, “… dialog boxes… used for error messages, alerts, and confirmations,” represent, “… three of the most abused components of modern GUI design,” (Cooper, Reimann, and Cronin 2007). The introduction of an error message box admits a shortcoming of the application itself and informs users of the inability of the program to work predictably. “Applications should use rich visual feedback so that users are constantly kept informed, the same way the instruments on dashboards keep us informed of the state of our cars,” (Cooper, Reimann, and Cronin 2007).

Using the five principles of interaction design forms a cohesive system. Designers using these principles are forming what Malcolm Gladwell names in his 2005 book, *Blink: The Power of Thinking without Thinking* as “thin-slicing”—filtering the very few factors that
matter from an overwhelming number of variables. Creating systems that are easy to use is the goal of interaction designers. However, also creating a pleasurable experience is desired.

2.2.2.4 Context and motivation

Activity theory comes into play when designing for context. Kansei engineering will allow for the study of motivation. Context scenarios help us understand people and needs (Hogue, 2012). “One of the most important claims of activity theory is that the nature of any artifact can be understood only within the context of human activity—by identifying the ways people use this artifact, the needs it serves, and the history of its development,” (Kaptelinin, 1996). Activity theory has been applied to human-computer interaction since the 1990s and was adapted from the work of Soviet psychologists in the 1920s. Bonnie Nardi (1996) describes activity theory as, “Understanding the interpenetration of the individual, other people, and artifacts in everyday activity.”

By contrast, “Kansei is an individual’s subjective impression from a certain artifact, environment, or situation using all the senses of sight, hearing, feeling, smell, taste,” as stated by Schütte (2005). Schütte adds, “Kansei is seen as sensual intuition providing the material for understanding, and through this the mental ability of experiencing affective values like feeling emotion and desire.”

In 2009, Kang and Satterfield presented a paper combining activity theory and Kansei engineering into a framework called the Connectivity Model. It is this combination of theories that, “From a design standpoint, the Connectivity Model is a powerful tool for identifying what characteristics of a design are preferred by a specific user group,” (Kang
and Satterfield 2009). The Connectivity Model can be used as a design and evaluation methodology to determine context and motivation related to interaction design.

### 2.2.2.5 Interface structure

At the beginning of any design process, hand-sketching and ideation should occur. Buxton (2012) states that sketching is not about drawing, but instead about design. He emphasizes that sketching is a “… critical part of a process that begins with idea generation,” (Buxton, 2012). This process will lead to elaboration, reduction, and finally to engineering (Buxton, 2012).

While Hogue (2012) doesn’t spend a lot of time on the process of sketching, as he is giving a brief overview of the fundamentals, Buxton spends much time presenting case studies as well as a workbook about sketching for user experiences (Buxton, 2012). In the workbook, Buxton teaches how to begin hand-sketching and focuses on not being an artist. Rather, the purpose of sketching is to get ideas out of your head and onto paper without the burden of using software to produce refined prototypes at the beginning. This hand-sketching process allows for quick prototyping of possible solutions to present to user groups. From hand-sketching rough ideas, to producing a visual narrative, Buxton walks us all the way through the human-centered design process. The last chapter in his workbook covers how to work with others during this process. He says, “Another use of sketches, storyboards, and animations involves the ‘end user’ as an actor in the visual narrative, where they have the illusion that their actions affect the underlying dialog. That is, they are living the user experience,” (Buxton 2012). In summary, a designer should be thinking more throughout the
entire process and one way to do this is to sketch out ideas first before designing any solutions.

Hogue (2012), as well as Cooper, Reimann, and Cronin (2007), offer many basic visual design principles in regards to building interfaces. They include:

- Gestalt Psychology
- Law of Figure-Ground
- Law of Proximity
- Law of Similarity
- Law of Closure
- Law of Common Fate
- Law of Continuity
- Law of Symmetry
- Grid systems
- Typography
- Design Patterns

In chapter 14 of *About Face 3: The Essentials of Interaction Design*, the authors state, “Regardless of how much effort you put into understanding your product’s users and crafting behaviors that help them achieve their goals, these efforts will fall short unless significant work is also dedicated to clearly communicating these behaviors to users in an appropriate manner,” (Cooper, Reimann, Cronin 2007). The authors argue that interface design is often misunderstood because of its similarities to visual art and graphic design.
When discussing the differences between art and interface design, the authors (Cooper, Reimann, and Cronin 2007) make a point that art is creating for one’s own self-expression, while “… design is creating artifacts for people other than themselves.” On the contrary, throughout history most artists produced commissioned works. Therefore, they were not creating for self-expression. Rather, they were creating communication based on the criteria set by their client or benefactor. A famous example of this is the Sistine Chapel ceiling painted by Michelangelo and commissioned by Pope Julius II (Leach, 1985). Therefore, visual interface design should be closely related to graphic design given its roots in art and commerce.

2.2.2.6 Navigation

Wayshowing, or wayfinding, is not a new technique for guiding people through a space. Whether it is used to direct tourists through an exhibit at a museum, visitors to a zoo or those visiting a hospital, basic needs of people are similar. Signs or symbols that guide visitors to attractions, food, entrances, exits and restroom facilities are among common wayshowing systems. Accounting for different cultures is a large concern for those that design these systems. In the pre-modern world, pictorial signs to identify the goods and services of the city were used to speak to a largely illiterate audience (Herdeg, 1978, p.6). Today, wayshowing encompasses not only traditional printed signage but also digital signage referred to as navigation. Since technological advances are swift, new ways of communication may be in use in the near future that will aid in advancing wayshowing in the digital space.
“We need an effective organizational system and structure for the content and functionality, and effective ways to move around within it,” says David Hogue (2012). He provides examples of site maps as a way of categorizing and classifying information. He also states, “Navigation is always present and available,” (Hogue 2012). What he means is that a good navigational system will be consistent across the entire interface.

How many clicks (or taps for a touch interface) should a user have to go through to find what they are seeking? Hogue (2012) says, “As long as every click or tap makes sense and people feel like they are moving toward their goal appropriately, then the experience is not too deep.”

When it comes to the search function, many people use it because there is often too much information being presented (Hogue, 2012). Steve Krug (2006) makes a point to say that the search box should appear on every page of a website regardless of how much information is on any one page. This would be considered a global feature.

The sketching process can also help with navigation. By sketching out a flow chart of navigation for each page of the interface, the designer can then test it quickly in paper format with users, as a low-fidelity rapid prototype. This step will alleviate much end-user frustration when the interface is launched.

**2.2.2.7 Images and media**

Adding images and media to an interface will add “visual noise” (Cooper, Reimann, Cronin 2007). This visual noise is similar to Edward Tufte’s concept of “chartjunk” in information design. That is, adding, “… superfluous visual elements that distract from the primary objective of directly communicating software function and behavior,” (Cooper,
In the same respect as adding images and media, adding other types of design embellishments can create a cluttered interface.

Think more, design less; these four words speak volumes. In her book *Thinking with Type, A Critical Guide for Designers, Writers, Editors, & Students*, Ellen Lupton (2004) includes a free advice section in the appendix that includes this statement. She refers to gradients, drop shadows, and the gratuitous use of transparency as desperate acts of design which are perpetrated in the absence of a strong concept (Lupton, 2004, p. 172). Her philosophy can be directly applied to interface structure. These elements only work to confuse and do not help the interface design stake its own territory, as Lupton would say (Lupton, 2004, p. 157).

Designers must consider sensation and perception of their users when adding images and media. Hogue (2012) offers definitions of both as such:

*Sensation is when an external event (a stimulus) causes a biochemical reaction in a sensory organ. Perception is the process through which we become aware of and assign meaning to sensory stimuli.*

Hogue (2012) presents the convention that interaction design tends to focus on just three of our senses: vision, hearing, and touch. He also explains proprioception as, “Our internal sense of relative position and movement used to keep track of our own body parts.” Examples of using this sense in interaction design are accelerometers (found in iPhones, iPads, and other mobile devices) and spatial sensors (found in the game device Kinect) that detect gestures and motion.
2.2.2.8 Decision-making

There are multiple parts that exist in decision-making, and it is important to note that researchers are not aware of all the brain functions that are interrelated that cause us to arrive at a decision. Three aspects of brain function that have been researched are cognition, social interaction, and emotion.

Cognition has two general modes (Norman, 1993): experiential and reflective. Experiential cognition occurs effortlessly, while reflective cognition requires thinking (Rogers, Sharp, Preece 2011). Differing descriptions of cognition include:

- Attention
- Perception
- Memory
- Learning
- Mental imagery
- Reading, speaking, listening
- Problem solving, planning, reasoning, and decision-making.

Cognitive biases can occur in relation to cognition in interaction design, due to using good processes at the wrong time, perceptual distortions, acting quickly at the risk of error, and insufficient capacity or capabilities (Hogue, 2012).
2.2.2.9 Designing for behavior

Affordances, or more specifically, “perceived affordances” was a term introduced by Donald Norman in *The Design of Everyday Things* (1988). He has since recanted using these terms and has replaced them with “social signifiers” in an attempt to make the design vocabulary more precise (Norman, 2011). He believes that the term affordance has deeper meaning. He explains a social signifier as, “…subtle clues provided by the activities of others. People’s actions have side effects, leaving behind traces and trails of their activities that enable us to retrace their steps. Most of this is done without conscious awareness, but the side effects are important social signals.”

Designers can use signifiers deliberately to be informative to users. As Norman says, “We must design for the way people behave, not for how we would wish them to behave.” This is a very important distinction to consider and can only come from studying actual people and how they behave in their natural environments while performing a certain activity, as activity theory states.

Recommender systems, like the one Amazon.com uses, can inform people of what others have liked, purchased, or recommended. This becomes a value-added resource for e-commerce sites. Using this word-of-mouth method of advertising leaves a trail that a user can choose to follow or not.

Designing for behavior “… requires a special talent: empathy” (Norman 2011). Norman goes further to say, “Designers must place themselves in the position of those who use their designs, and then provide the information required for proper usage, but without destroying the aesthetic beauty or the functions, or increasing the cost.” Using empathy to
design solutions for people is a difficult and daunting task. However, by talking with people as end users, designers can begin to understand behavior. Observation plays a very important role in designing, and can offer guidance to questions in which designers have assumed answers.

2.2.2.10 Providing feedback

Providing feedback to the user is integral to the success, or failure, of an interaction. Since machines currently cannot understand the context of an actual situation (Norman 2011), the designers must provide ways to confirm an action to the user. This is especially important when something goes wrong. Often times there is just a machine and no human in the vicinity. Norman observes, “Machines can often simplify our lives by taking over some of the routine, mundane parts of everyday life… The problems arise when the machine doesn’t work: then the machine adds complication.”

When using a self-checkout lane in the grocery store, the machine does not account for every situation and cannot perform all the needed tasks on its own. There is always an attendant standing by to assist people. This is not necessarily expecting the machine to fail, however, when purchasing liquor the attendant has to personally check the identification of the shopper to ensure legal drinking age. When the machine does fail, the attendant is there to rectify the situation. Sometimes using the self-checkout lane is faster than using a regular lane with a checker if the machine does not fail, and sometimes it is slower if the person has problems operating the machine or if the machine fails.

Feedback has several important features. The timing of it is the first area of importance for designers to consider. For feedback to be effective, it should be: prompt,
meaningful, and perceivable (Hogue, 2012). Feedback should not interrupt the experience of the user unless it is to prevent errors (Hogue 2012), and it should complement the experience, not complicate it.

Formats for feedback can be visual, audible, and/or tactile. In the example of the self-checkout machine, the feedback is visible on the screen as well as audible. Most often a computerized female voice talks the shopper through the steps of checkout as the screen provides the same visual steps. When a user clicks on a button on the touch screen, there is an audible click sound. One thing that is missing is a step-by-step status of the process. However, when the transaction is complete the audible voice reminds the shopper to take their groceries, receipt, and thanks them for their purchase.

2.2.2.11 The big picture

“Graphic design has often been associated with glossy magazines, elaborate advertising campaigns, or fancy book covers, but many designers today use their skills for a very different kind of design work,” (Shea, 2012). This is the segway into interaction design for graphic designers. Interaction design is about designing for people. Designing for people should consider social justice issues and include those in marginal groups. Interaction design can be used to support the dominant culture’s views and preferences, or it can be used as an agent for social change. Collaboration among designers, schools, and communities, can lead to social innovation (Shea, 2012). Increasing the quality of life for citizens is the goal of designing for social change, and should be the goal of interaction designers to instigate this change.
2.3 Theoretical Models

2.3.1 Relational-Cultural Theory

Empathy, authenticity and mutuality are the three central tenets of Relational-Cultural Theory (J. Miller, 1976). Although developed as a therapeutic process, when combined with the Connectivity Model, interaction designers can create relationship with people using and viewing their designed visual languages. Technology often interferes with the growth of a relationship and is not always an appropriate solution.

Western psychology contains many theories stemming from a position of cultural dominance (Walker & Rosen, 2004) and the predisposition to appear scientifically objective or neutral. It is important not only to consider the person as end user, but also consider the person’s cultural experience as a whole.

The first tenet of Relational-Cultural Theory is empathy. Norman (2011) laments, “Less empathetic designers (and sometimes I think these are the majority) focus on only one or two aspects of a design, perhaps appearance, perhaps engineering practicality, perhaps cost.” His point is that designers must use “social synchronization” (Norman, 2011) as a discipline. Social synchronization is to consider the context of use of an artifact, but also the social setting in which that artifact is to be used and who will use it. Designers must fully define the scope of the problem by talking with people in their target audience using empathy.

A predominant number of information technology (IT) professionals in the United States are male. “The Information Technology Association of America (ITAA) finds that women and most racial minorities remain significantly underrepresented in today’s US information technology (IT) workforce” (ITAA, 2005). This brings questions of privilege and power to
the fold since men outnumber women three to one in the IT industry, which includes interaction design. Using the concept of mutuality to create mutually empowering connections, designers of differing gender, race, ethnicity, socioeconomic status, sexual orientation, class concerns, or health status, can eliminate exclusionary bias in designing for under served groups. The question designers should ask before beginning any interaction design is, “How can relationship [with my audience] increase capacity for resilience and empower movement toward connection to others?” (Walker, 2004).

The final tenet of Relational-Cultural Theory is authenticity. Authenticity can be applied to interaction design by using direct communication with people using products and services to create empathic solutions that do not seek to fix people or invade their privacy. Interactions should be created to support people and enrich their lives, rather than complicate or act in a way that compromises civil liberties.

2.3.2 Activity Theory

Kaptelinin and Nardi (2006) believe that activity theory “… fits the general trend in interaction design toward moving out from the computer as the focus of interest to understanding technology as part of the larger scope of human activities.” Looking into the theory from a broader perspective, Kuuti (1996) defines it as, “… a philosophical and cross-disciplinary framework for studying different forms of human practices as development processes, with both individual and social levels interlinked at the same time.” The tenets of activity theory are (Kaptelinin & Nardi, 2006):

• an emphasis on human intentionality;

• the asymmetry of people and things;
• the importance of human development; and
• the idea of culture and society as shaping human activity.

This Soviet-based theory has its, “… roots in Vygotsky's cultural-historical psychology to the conceptual framework formulated by Leontiev, to current theoretical developments” (Kaptelinin & Nardi, 2006). The basic principles of activity theory emphasize the social, cultural, and creative components of people in their environments (Kaptelinin & Nardi, 2006). In other words, it is a way to look at an individual’s interactions with people and artifacts in everyday life.

Kuuti (1996) states, “An activity always contains various artifacts.” These artifacts are tools that mediate between people and the world. In the case study being presented of the iPad app for the grocery store, it becomes the mediating tool between the person shopping and the grocery store. The activity theory model contains three mutual relationships between subject, object and community (Kuuti, 1996). In this paper the subject is the person shopping, the object is the grocery store and the community is those within a family unit that shop for food either alone or together, as well as the community of people within the grocery store. This includes the employees and other shoppers.

The introduction of the grocery store app is another mutual relationship between subject and object, in the already existing object of the grocery store. By introducing the app into an already existing environment, a change in relationship occurs. The app becomes a mediating tool between the object of the grocery store, the community and the subject (Kuuti 1996). Whereas, activity theory explores the mediating tool, the store and the socio-cultural
interaction of the person, it does not provide enough guidance of how the designer should interact with the audience to design appropriate solutions.

2.3.3 Kansei Engineering

Kansei engineering was developed in Japan as a context of “affective engineering” (Schütte, 2005), to design feelings into products. There is no direct corresponding word in English, however the closest meaning is the definition of “sensitivity” (Schütte 2005). Figure 9 contains several words in English to explain the meaning as part of its etymology. As Schütte states in his thesis, the field of Kansei was originally addressed by German philosophers and called “Sinnlichkeit (cognition sensitive)” during the late eighteenth century (Schütte, 2005). He states, “The Kansei therefore is a basic part of a complex combination and reciprocal effect of cognition and emotion,” as explained in psychological terminology.

Many engineers view Kansei as confusing, preferring logic and reason instead. “The Kansei is an individual mind structure. Understanding others’ Kansei is not always easy and involves a large amount of empathy and experience,” (Schütte, 2005). While Donald Norman does not mention Kansei, he does place emphasis on empathy and the need for designers to provide empathic solutions. However, as Schütte points out, this takes a great deal of experience to master. Designers are only beginning to learn how empathy can be used to build relationships with people that will use their designed interactions.
2.3.4 Connectivity Model

The Connectivity Model (Fig. 10) was developed by Sunghyun Kang and Debra Satterfield (2009), and combines Kansei engineering and activity theory. This model provides for, “… social, emotional, and behavioral data to make research-based design solutions in areas such as color, typography, shape, layout, and information design” (Kang and Satterfield, 2009). The combination of methodologies considers, “… audience analysis to understand the characteristics of a target audience, with regard to their activities, emotions, motivations, and cognition” (Kang and Satterfield, 2009).
Understanding decision-making and how the mind works in correlation is the impetus of interaction design. Designing for the behavior of people involves many cognitive, social, emotional, and motivational skills. Using activity theory alone works to sustain ideals of the dominant culture by governing the explicit and implicit norms and conventions within a system. Advertising is the dominant stimulus in our daily lives, and food is a daily ritual. Assessing the needs and wants of people at the grocery store accounts for the advertising that has lead them to purchase certain products or brands, and their emotional ties to them. Using the Connectivity Model brings together Kansei engineering and activity theory (Fig. 11) to provide for a more inclusive assessment of experience.
CHAPTER 3. METHODS AND PROCEDURES

The first portion of research methodology involves a case study of an existing prototype and its interaction design process. The product has not been produced in a final format. The case study is offered as what was done and what should have been done in the process of designing for interaction with people.

3.1 Case Study

The SCIP project was created in fall 2010 for a graduate-level graphic design course at Iowa State University (ISU) (Wiley, Saka, Tauber, Kang 2010). The capabilities of the
application were to provide an interface to display readable nutrition information on a wireless device (i.e. Apple’s iPad) and tailor to specific dietary restrictions of its users, thus enabling shoppers to have a less frustrating and less time-consuming experience while shopping for food. However, the research conducted to produce the design iterations was not as complete as it should have been and did not consider empathy, connectivity, authenticity, and trust. Two assumptions were created as research questions prior to the beginning of the SCIP project. The first assumption was that the nutrition facts and ingredients were difficult to read for adults ages 46 and over. The second assumption was that shopping was difficult for people with health conditions that create dietary restrictions, such as diabetes, high-blood pressure, and food allergies.

### 3.1.1 Rationale for SCIP

It’s no secret that our population is significantly aging. It’s also no secret that those age 65 and over are an under served group in HCI and interaction design (Czaja & Lee, 2001), making them also a marginal group according to Relational-Cultural Theory. The first of the Baby Boomer generation (those born between 1946 and 1964) turned 65 in 2011 and the last turned 46 in 2011 (AARP, 2010). While this group of adults has enormity in numbers, it is not homogenous. The older adult age group consists of varying socioeconomic levels and varying degrees of technological savvy. The participants in the usability test represented a variety of age, gender, and cultural groups within the target group of those aged 46 and over.

It is estimated that 20% of the population will be 65 or older by 2030 (Czaja & Lee, 2001). According to the American Heart Association (AHA) (2011), an estimated 82.6
million American adults (greater than 1 in 3) have 1 or more types of cardiovascular disease (CVD) with 40.4 million estimated to be 60 years of age or older. The percentages of those diagnosed with high blood pressure (HBP) are a bit lower than those with CVD, but not significantly so. The 45-54 year-old age group denotes that 37.1% of men and 35.2% of women have HBP (AHA, 2011b). Conversely, the 55-64 year-old age group shows that 54.0% of men and 53.3% of women have HBP (AHA, 2011b). The most alarming statistics are in the overweight and obesity category. At ages 45-54, 78.5% of men and 67.3% of women have a body mass index (BMI) of 25.0 kg/m² and higher (AHA, 2011b). At ages 55-64, 79.7% of men and 69.6% of women have a body mass index (BMI) of 25.0 kg/m² and higher (AHA, 2011b). Diabetes is sometimes the result of obesity and poor diet with little or no exercise (AHA, 2011c). In 2008, 18.3 million Americans had physician-diagnosed diabetes, while an estimated 7.1 million Americans have undiagnosed diabetes (AHA, 2011c).

What do all these statistics mean? You guessed it, there is a systematic problem with the way Americans eat and shop for food. In summary, dietary restrictions are important to track and to buy foods that are low in sodium, saturated and trans fat, and added sugars that can help reduce the effects of these diseases (AHA, 2011a).

Considering those with dietary restrictions within the target age group, the team designed an iPad app to guide a shopper through the grocery store. The main usability question of how to obtain positive user affect while using this technology was based on a literature review, and was conducted before the usability test. According to Lee Rainie at Pew Internet & American Life Project (2010), between the years 2000 and 2010, the number
of older adults (aged 46 and over) using the Internet increased from 40% to 74%. Using the same comparisons, 63% have broadband at home, 81% own a cell phone, 46% connect to the Internet wirelessly and greater than 50% use cloud computing (Rainie, 2010). It seemed that the audience of those age 46 and over would be receptive to using an iPad app in the grocery store.

Physiological changes associated with aging—such as decrements of sight, hearing, dexterity, motor functioning, hand-eye coordination and cognitive processing—make new screen technologies more difficult to use (Selwyn, Gorard, Furlong, & Madden, 2003). These changes occur regardless of gender, race or culture, and can have significant impact on quality of life, including what used to be a simple trip to the grocery store.

The ability to read food and product information at the grocery store in a clear, concise, and consistent format is important to sustaining independence. Adults with dietary restrictions—such as the need for lower sodium intake, diabetes, and/or allergies—make it imperative to be able to read all nutritional information on packaging, including the nutrition facts, drug facts, supplement facts, as well as the complete list of ingredients. However, the lack of consistency in product packaging and information not visually presented in the same manner can create frustration in shoppers. The Food and Drug Administration’s (FDA) regulations are little help. They state that nutrition, drug and supplement facts must be at least eight-point type (Fig. 12) (FDA, 2011), but that is hardly readable according to the National Institute on Aging (NIA) and the National Library of Medicine (NLM). They stipulate a minimum of 12-point type for those aged 65 and over to be able to read (NIA &
In addition to the text sizes being too small for aging eyes to read, it can cause illness for someone with a dietary restriction that cannot properly read a product’s contents.

![Nutrition Facts](image)

**Figure 12. Nutrition facts guidelines as recommended by the FDA.**

### 3.1.1.1 Purpose of the SCIP project

The purpose of this project was to discover the effective design strategies for an application to be developed for a wireless device (i.e. Apple’s iPad) to be used in a grocery retail environment by those aged 46 and over. The device would function with Radio-Frequency Identification (RFID) tags placed on each product in the grocery store. Although the technology exists and is in use in a handful of test markets in the US and Europe, RFID labeled food products are not widely available. Therefore, implementation of the SCIP app would be in the future, after supermarkets implemented RFID labeling in their stores. The
device would receive the product information and present it in a clear, concise, and consistent format so shoppers will be able to read all of the nutrition facts and ingredients listed on a package.

During the evaluation phase of this project, the following questions were answered with Institutional Review Board (IRB) approved usability testing:

1. Are adults born between 1946 and 1964 receptive to using the Web-based application?
2. Will the application prove easy to navigate?

### 3.1.1.2 Feasibility: The sky’s the limit for SCIP

When choosing the parameters for this project, the design team did not consider immediate feasibility for implementation. Initially, the envisioned solution would be similar to a grocery store that the Jetsons—a primetime animated sitcom, originally airing in 1962-63 (Wikipedia, 2011)—might visit. The store of our not-so-distant future would label its products with RFID tags, and all shopping carts would be mounted with an Apple iPad or a similar device. The question might be asked, why propose this solution when it cannot be easily implemented into an existing grocery store in the state of Iowa? The simplistic answer was the sky was the limit for this project, and the team did not have to adhere to real world concerns of bringing a solution to market. They also did not have the resources available to produce a high-fidelity prototype to test within the user’s environment of the grocery store. Hence, a central tenet of activity theory was not used and is reflected in the poor usability results. Additionally, since the target audience was not brought into the design process until the usability-testing phase the central tenets of Relational-Cultural Theory were not
considered. Therefore, a relationship with the persons using the app was never established. Thus creating a “power-over” dynamic between the designers and users. This “power-over” dynamic is a case of the designers wanting to rescue those in the target group by developing this app.

### 3.1.1.3 Design Concept for SCIP

The concept was to develop an application for the grocery retail environment to address the issues of physiological changes that occur with aging, as well as dietary restrictions that accompany food allergies, diabetes, cardiovascular disease (CVD) and high blood pressure (HBP) for people age 46 and over. Accessing product information about food, supplements and drugs in a clear, concise, and consistent format was the main focus for developing the iPad application.

Part of the concept is for the grocery store to provide a wireless device (i.e. Apple’s iPad) that can be mounted on a shopping cart with a closed, secure WiFi network. Differing socioeconomic groups of older adults would have access to the benefits of this device by the store providing it. A user could also use his/her own wireless device to login securely to the store’s network. All shoppers of the grocery store of any age would be able to use the device, in addition to the older adults who were researched for this project.

Thomas Friedman, in his book (2007) *The World is Flat*, refers to RFID technology by stating, “This is clearly the wave of the future. RFID technology and sophisticated order analysis tools that monitor even the most minute market activity are rapidly leading us toward industry’s holy grail—absolute balance in supply and demand” (Friedman, 2007).
Each product in the store would be labeled with a RFID tag that the wireless device would read via a wireless antenna contained in the tag over the store’s secure, closed WiFi network. RFID tags would complement barcodes and barcode readers, since they are more efficient, easier for devices to read and are capable of storing large amounts of information in their microchip. Nutritional information, pricing, expiration date, country of origin, size, weight, and further product information can be stored in the RFID tag related to a specific user’s shopping needs.

The mounting bracket on the cart would be adjustable to accommodate differing user heights and reduce glare, as well as allowing users with their own mobile devices to be able to mount them on the cart.

Two different low-fidelity prototypes (Figures 13 & 14) of user interfaces were designed to perform A/B testing. A/B testing is when two different alternatives are presented to the same user to determine which one is preferred. The interfaces of the iPad application were named User Interface 1 (UI1) and User Interface 2 (UI2) (Wiley et al., 2010). Both interfaces followed the same navigational flow and displayed the same types of information. However, the visual presentation of elements varied drastically. Prototype UI1 was based on using icons with text, and prototype UI2 was a predominantly text-based navigation set within a modular grid format.
Figure 13. UI1 prototype screens on an iPad.
The design team considered the following graphic design guidelines when they designed the interfaces (NIA & NLM, 2004):

- **Typeface:** Use a sans serif typeface that is not condensed. Avoid the use of serif, novelty, and display typefaces.
- **Type size:** Use 12 point or 14 point type size for body text.
- **Type weight:** Use medium or bold face type.
- **Capital and lowercase letters:** Present body text in upper and lowercase letters. Use all capital letters and italics in headlines only. Reserve underlining for links.
- **Physical spacing:** Double space all body text
- **Justification:** There are three ways to justify type; left, full, or centered justified. Left justified text is optimal for older adults.
• **Color:** Avoid yellow and blue and green in close proximity. These colors and juxtapositions are difficult for some older adults to discriminate. Ensure that text and graphics are understandable when viewed on a black and white monitor.

• **Backgrounds:** Use dark type or graphics against a light background, or white lettering on a black or dark-colored background. Avoid patterned backgrounds.

In regards to navigation through different screens, the team lessened the amount of vertical scrolling, kept the layout consistent, eliminated the need for a mouse by using a touch screen interface with a virtual keyboard, incorporated text with icons, used pull-down menus sparingly, and incorporated backward and forward navigation arrows on each page.

### 3.1.1.4 Ethnographic scenario of SCIP

Both of the UI designs depend on the user already being registered in the SCIP program. The registration process could be completed at a store with the assistance of customer service or online via secure Web site. The person would fill out a submit form with their dietary restrictions so the SCIP application would be able to warn (using feedback of a sound and/or a warning symbol) the person if any product in their shopping cart contains the ingredient(s) that is among their restrictions. For instance, if a user was allergic to peanuts, then the SCIP application would display a warning—and a sound if the user chooses—if that ingredient was present in the product when it was placed in the cart.

The user would also be able to compare the nutrition facts with another product. For example, the sodium content per serving in two different kinds of canned soup could be
compared to see which contains the lowest amount. This feature would be useful for someone keeping track of sodium intake.

In order to remove an item from the cart, the user simply places it back on the shelf as the device automatically removes it from the cart’s contents. Once the user is ready to checkout, the checkout button is touched and the registered user’s banking information or credit/debit card on file is charged for their purchases. This eliminates waiting in a checkout line to have the cashier scan each item and receive payment. Upon checkout, the user can choose to bag their own groceries while shopping, or have a store employee bag their groceries.

3.1.1.5 Research methodology for SCIP

Data were collected using a triangulation of methods. Software was used to record mouse clicks on screen, audio was recorded as the user thought aloud through the task list, and the test administrator took notes. The data were then placed into Excel spreadsheets and charts and graphs were created.

3.1.1.6 Usability testing process for SCIP

The two prototypes were tested during the same usability testing sessions with five users that were selected from a pool of respondents within the target demographic of adults age 46 and over. User demographics are displayed in Table 1.
Table 1. User demographic facts summary for SCIP usability test.

<table>
<thead>
<tr>
<th>Question</th>
<th>%Breakdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age range</td>
<td>80% 45-55</td>
</tr>
<tr>
<td>Gender</td>
<td>50% female/50% male</td>
</tr>
<tr>
<td>(5 users total)</td>
<td></td>
</tr>
<tr>
<td>Native language</td>
<td>65% English</td>
</tr>
<tr>
<td>Occupation</td>
<td>60% Professional</td>
</tr>
<tr>
<td>Computer use</td>
<td>100% Daily</td>
</tr>
<tr>
<td>Web use</td>
<td>100% Daily</td>
</tr>
<tr>
<td>Cell phone use</td>
<td>80% Daily</td>
</tr>
<tr>
<td>Use a smart phone</td>
<td>60%</td>
</tr>
<tr>
<td>Used iPAD before</td>
<td>60%</td>
</tr>
<tr>
<td>Shop online</td>
<td>60%</td>
</tr>
<tr>
<td>Grocery shop routine</td>
<td>80% Weekly</td>
</tr>
</tbody>
</table>

Neither of the males in the study had dietary restrictions, but all three women had at least one. Two out of three women needed reduced sodium and reduced sugar intake. 60% of the users have problems reading the nutritional facts on food product packaging and 40% have problems reading the ingredients.

3.1.1.7 Findings and discussion for SCIP usability test

UI2 was initially redesigned as part of the iterative design process (Figures 15-19) since 80% of the users preferred it. However, taking into consideration the user data it would be beneficial to use both Relational-Cultural Theory and the Connectivity Model to determine the audience’s specific needs and wants with this app prior to another design iteration. All of the users questioned why they would want to use this app in the grocery store in its current state due to numerous problems during usability testing. The navigation was not
clear and the fact that the testing was performed on a laptop, rather than a touch screen was problematic. The users did not like using the mouse to click through the tasks, since it was counter-intuitive to a touch screen interface. The users also remarked about the visual representation of the nutrition facts not making sense. None of them recognized the nutrition facts in UI2 upon first glance.

Figure 15. Opening screen of UI2 redesign of the SCIP app.
Figure 16. Nutrition facts visual representation in UI2 redesign.

Figure 17. Summary of product placed in shopping cart in UI2 redesign.
Figure 18. Compare products screen in UI2 redesign.

Figure 19. Product placed in shopping cart in UI2 redesign.
An interesting correlation became apparent in terms of color preference and gender. All female users (60% of total users) found the color palette of orange and grey pleasing. Male users (40% of total users) strongly disagreed with the color choices. The color palette of blue and grey used in UI1, created a mixture of pleasing versus not pleasing. Only one female user and one male user found the colors attractive. The warm colors of orange and grey were used in the redesign of UI2, but the visual representation of data was restructured greatly in accordance with user feedback.

Further design and subsequent usability testing should be conducted with focus on building an emotional connection with the user. Norman (2004) says, “When people are anxious, they are more focused… the designer must pay special attention to ensure that all the information required to do the task is continually at hand, readily visible, with clear and unambiguous feedback about the operations that the device is performing. Designers can get away with more if the product is fun and enjoyable.” The emotional connection will encourage user participation with the application and create a more pleasurable shopping experience overall. A more bold color palette will be used to create contrast and evoke positive affect from the user. A suggested rename from SCIP to a more person-centered name of Ginger (which is also a food) will be given to the application. Another possible consideration will be a customizable avatar of the same name that will guide the user through the grocery retail environment.

In addition to adding a more emotional connection, haptic feedback in the form of vibration, sound, and visual cues could have been added to the interface. Using sounds and
vibration along with visual cues will help the user feel that the interface is responding to their actions by providing feedback.

3.1.1.8 Recommendations for the SCIP design process

The designers encountered problems during usability testing that could have been addressed in the beginning during the needs analysis phase by speaking with the target audience and beginning to form relationships with them. The needs analysis phase is typically the first phase of an interaction design project, where the needs and wants of the audience are determined and research questions formed. This should be done with a combination of interactions with the audience through varying techniques that can include interviews, survey instruments, focus groups, etc. Body language is an important aspect to building relationships, and designers need to pay attention to the subtleties of human behavior; especially in response to technology use. Unfortunately, the target audience was not brought into the process until after two mid-fidelity prototypes were produced for usability testing. This was due to the need to obtain Institutional Review Board (IRB) approval prior to involving people using the technology. In an ideal scenario, the design team would conduct the needs analysis face-to-face with the people that would use the product, after receiving IRB approval, and begin the process of design based on the analysis. However, in the context of a semester-long class the timing was not possible to halt the design until after receiving IRB approval that took approximately six weeks. In essence, the team created a product that was difficult to use and understand because of the lack of inclusion of its target audience from the beginning and incorrect assumptions as the research questions.
3.1.1.9 Proposal

Using the framework of empathy, connectivity, authenticity, and trust can inform the entire design process, as well as lend itself as a framework for evaluation of interaction design. Identifying and defining the problem is imperative for interaction designers. Effective problem definition requires designers to ask appropriate questions and build growth-fostering relationships through empathy, mutuality, and authenticity with their audience. Designers must also bear in mind the needs and wants of marginal groups and cannot guess what these are for any person. Assuming and offering solutions based on those guesses cannot replace direct interactions between audience and designer. Designers should initiate the conversation. After all, we don’t want yet another gadget laying around on our desks—or mounted on our shopping cart— that is of no use.

3.2 Overarching approach

I continually narrowed the research by constantly analyzing data until I reached ways to create empathy, connectivity, authenticity and trust in the process of designing an interaction. This rhetorical framework can also be applied to other environments, situations, and products to evaluate experiences and apply design empathy. In this case, I used it to evaluate a possibility for development of an interaction design for the grocery store environment that would involve the use of a mobile device. The first step was to deconstruct the design process used to create an existing prototype for the SCIP project, as outlined in the previous section. I looked for gaps in which empathy was not applied by the designers and where it could have been applied in the entire process.
Each design decision should be empathic to the end user. The second step was to create evaluation instruments to survey a large number of people about their grocery shopping experiences and behavior. This led to the next step of implementing connectivity with observation of shoppers in the grocery store. Coding this data (Table 2) helped guide the next phase of gathering data, that involved a literature review and analysis of an existing survey of grocery shoppers conducted by Consumer Reports.

<table>
<thead>
<tr>
<th>Observation Codes</th>
<th>Generation</th>
<th>Gender Expression</th>
<th>Cart</th>
<th>List</th>
<th>How many shopping together?</th>
<th>How full was cart at checkout?</th>
<th>Method of Payment</th>
<th>Physical Limitations</th>
<th>Reading Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-F-C-NL-1</td>
<td>Boomer</td>
<td>Male</td>
<td>No</td>
<td>List</td>
<td>1 Quarter</td>
<td>Card</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>B-F-NC-NL-1</td>
<td>Boomer</td>
<td>Female</td>
<td>No</td>
<td>List</td>
<td>1 Quarter</td>
<td>Card</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>B-F-C-L-1</td>
<td>Boomer</td>
<td>Female</td>
<td>Cart</td>
<td>List</td>
<td>1 Quarter</td>
<td>Card</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>B-F-C-L-1</td>
<td>Boomer</td>
<td>Female</td>
<td>Cart</td>
<td>List</td>
<td>1 Quarter</td>
<td>Card</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>M-F-C-NL-1</td>
<td>Mature</td>
<td>Male</td>
<td>No</td>
<td>List</td>
<td>1 Quarter</td>
<td>Card</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>B-F-C-L-Y-1</td>
<td>Boomer</td>
<td>Female</td>
<td>Cart</td>
<td>List</td>
<td>1 Quarter</td>
<td>Card</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>B-F-C-L-1</td>
<td>Boomer</td>
<td>Female</td>
<td>Cart</td>
<td>List</td>
<td>1 Quarter</td>
<td>Card</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>M-F-C-L-1</td>
<td>Mature</td>
<td>Female</td>
<td>Cart</td>
<td>List</td>
<td>1 Full</td>
<td>Check</td>
<td>No Noticeable</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>B-F-C-L-1</td>
<td>Boomer</td>
<td>Female</td>
<td>Cart</td>
<td>List</td>
<td>1 Quarter</td>
<td>Card</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>M-F-C-L-1</td>
<td>Boomer</td>
<td>Female</td>
<td>Cart</td>
<td>List</td>
<td>1 Holiday</td>
<td>Cash</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>M-F-C-L-1</td>
<td>Boomer</td>
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<td>Hand Basket</td>
<td>No List</td>
<td>1 Half</td>
<td>Cash</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>B-F-M-C-NL-1</td>
<td>Boomer</td>
<td>Female</td>
<td>Cart</td>
<td>List</td>
<td>1 Half</td>
<td>Cash</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>B-F-M-C-NL-2</td>
<td>Boomer</td>
<td>Male and Female</td>
<td>Hand Basket</td>
<td>No List</td>
<td>2 Quarter</td>
<td>Card</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>M-F-C-L-1</td>
<td>Boomer</td>
<td>Female</td>
<td>Cart</td>
<td>List</td>
<td>1 Half</td>
<td>Card</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>B-F-C-NL-1</td>
<td>Boomer</td>
<td>Female</td>
<td>Cart</td>
<td>List</td>
<td>1 Quarter</td>
<td>Check</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>B-F-M-C-NL-1</td>
<td>Boomer</td>
<td>Female</td>
<td>Cart</td>
<td>List</td>
<td>1 Quarter</td>
<td>Cash</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>B-F-C-L-1</td>
<td>Boomer</td>
<td>Male</td>
<td>Cart</td>
<td>List</td>
<td>1 Quarter</td>
<td>Check</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>M-F-M-C-L-2</td>
<td>Mature</td>
<td>Male and Female</td>
<td>Cart</td>
<td>List</td>
<td>1 Quarter</td>
<td>Card</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>M-F-C-L-1</td>
<td>Mature</td>
<td>Female</td>
<td>Cart</td>
<td>List</td>
<td>1 Quarter</td>
<td>Card</td>
<td>No Noticeable</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 2. Coded data

The last step in the process was to establish authenticity with potential users of the interaction by conducting individual interviews. The interviews were conducted face-to-face to further explore relationship building as a technique of data gathering. Using the rhetorical framework of empathy, connectivity, authenticity, will lead to trust from the end user. Hence,
I present the e-CAT framework (Fig. 20) for evaluation and creation of interaction design.

Figure 20. e-CAT rhetorical framework typographic diagram for evaluating interaction design using empathy, connectivity, authenticity, and trust. Each component overlaps with one another, surrounded by empathy.

I chose to use an experimental typographic treatment, rather than a Venn diagram or some other form of information graphic to represent the e-CAT framework. By not showing “… preference for the status quo and an implicit adoption of the viewpoint of powerful stakeholders,” (Shea, 2012) that may read this thesis, I am attempting to disrupt the cultural norms of information design and possibly create controversy.
In the diagram, empathy is represented by the large, bold, black “e” letterform, and surrounds all other elements and holds them together as an anchor. The “c” letterform signifies connectivity and overlaps other elements to represent informing them in a transparent process of interaction design. The “a” letterform signifies authenticity and is holding onto the “c” and the “t.” The “t” letterform signifies trust and also overlaps other elements and remains transparent. I also chose to use all lowercase letters to represent the under served populations and assigned equal size to the letters C-A-T. The “e” has a larger size and bolder weight to place emphasis on empathy leading the entire framework. One way the framework can be read is in a linear fashion, e-C-A-T. Since empathy has the greatest size and mass to lead the process of the framework, the viewer might read this in a non-linear way and use another order of C-A-T. Thereby, the viewer is empowered to apply the framework in another way. However, for the purpose of this thesis, I am using the framework linearly.

The e-CAT framework works to answer the following questions:

- Has the designer(s) used empathy at each phase of the design process?
- Has the designer(s) conducted research with actual users in their natural environment and used this in consideration of affective outcomes (connectivity)?
- Has the designer(s) used provided valid and reliable data (authenticity)?
- Has the designer(s) instilled a sense of trust in the end user?
3.3 Definition of key terms

- Empathy: “Profound respect is the foundation of empathy” (Walker and Rosen, 2004). Using empathy in interaction design is a way to connect with one’s audience and conduct research to inform the entire design process.

- Connectivity: Connecting with one’s audience is imperative to the human-centered design process. However, using the word connectivity invites interaction between the designer and the people that will use a product or service. In this thesis, connectivity is directly correlated to the Connectivity Model proposed by Kang and Satterfield (2009) that combines activity theory and Kansei engineering to measure both cognitive and affective outcomes of one’s experience with a product and/or service.

- Authenticity: “It signals respect for the complexity of each person, acknowledges the importance of embodied difference, and invites expression of that difference in relationship” (Walker and Rosen, 2004). Authenticity is a way for designers to apply their own self-experience to understand their audience with hopes of building relationship and gaining trust.

- Trust: Gaining trust is a process. It does not happen in seclusion or isolation from a designer’s audience. Using empathy, connectivity, and authenticity can lead to trust between designers and end users of their products/services. From the viewpoint of Relational-Cultural Theory, trust is partially achieved through mutuality in relationship and the sharing of power in that relationship. If users feel they are part of the process and their needs and wants are
addressed, they can more easily trust designers to provide appropriate solutions that are not seeking to change their behavior. Rather, they accommodate current behaviors.

3.4 Delimitations

I investigated the case study of the SCIP project from an insider’s perspective. I was one of the three designers involved in the project. Gathering other experts to perform a heuristic analysis of this project would be of great benefit to the future development. The e-CAT framework was applied to the evaluation of the iPad app SCIP, created in the case study.

3.5 Participants in the study

Participants in the study were adults age 46 and over, composed mainly of Iowa State University faculty and staff, as well as adults outside of ISU. The socioeconomic backgrounds, race, culture of the participants were similar and indicate mostly middle-class representation of dominant culture.

I first created an online survey and sent a link via mass email to 6,100 faculty and staff at Iowa State University. I received 403 completed responses. Once informed by their shopping preferences, experiences, and behavior, I conducted observation of 30 people at two grocery stores in Des Moines, Iowa. Using a Consumer Reports study to cross-tabulate with my gathered data, I conducted individual interviews with four people.
3.6 Consent procedures

The online survey had a beginning page that included the consent form (Appendix F). The participant chose to agree or not before beginning the survey. Observation was conducted without consent from the participants, as outlined in the approved research plan of the IRB form. Informed consent was obtained from those that participated in individual interviews (Appendix A).

3.7 Data collection

In order to gather data for this thesis and apply the e-CAT framework, I used various methods of data collection. I continually analyzed the data and coded it into categories while continuing to collect. I used an online survey, direct observation of behaviors in the grocery store, a content analysis of existing sources, and in-depth individual interviews.

Using existing documents is a common source and method for collecting information, and should be performed first (Fitzpatrick, Sanders, Worthen, 2011). A large-scale study published by Consumer Reports in May 2012, provided much quantitative data that did not need to be repeated in my other data collection methods. More than 24,000 shoppers rated 52 chains of grocery stores and shared their experiences. Coding this data led to the creation of the online survey as an evaluation instrument.

The online survey was used to collect many responses from the intended audience with a mixture of Likert 5-point scales, multiple choice, and open-ended questions. It proved to be invaluable in obtaining quantitative information such as age, gender, and other demographic information in relation to perceived needs and behaviors, knowledge, skills, and
attitudes (Fitzpatrick, Sanders, Worthen, 2011) toward the grocery store and use of mobile devices. The information gathered was again coded and provided basis for observing shoppers in their natural environment of the grocery store.

During the observation, which is essential for almost all evaluations (Fitzpatrick, Sanders, Worthen, 2011), I was able to note contextual issues and “see the real thing” as Fitzpatrick, et al. points to as a major strength of this method. I performed an informal observation of shopping behaviors, and further narrowed down the categories from coding.

The last form of data collection was to conduct semi-structured individual interviews. I chose face-to-face for this method, since I wanted to “establish rapport with respondents in person” (Fitzpatrick, Sanders, Worthen, 2011). I made eye contact with the respondent, explained the purpose of the study, answered questions, smiled, made the respondent feel comfortable, and encouraged responses. However, I did not reveal my own preferences or show approval or disapproval for their responses.

### 3.8 Researcher’s role

My role as a researcher involved creating evaluation instruments, contacting participants, observing shoppers in the grocery store, interviewing participants, and organizing, interpreting, and analyzing data.

In the individual interviews that I conducted, I explained to the participant why they were being interviewed. By explaining who, what, where, when, why, and how to participants, there is greater chance of a successful interview (Rubin and Chisnell, 2008). There is much importance and responsibility placed in the hands of the researcher. The researcher becomes the leader of the interview and has direct participation along with the
participants. It is important to be aware of body language, as well as verbal cues, as to the comfort level in the room. The researcher should also be aware of the power dynamics at play. Rubin and Chisnell (2008) recommend sitting in a chair lower than a participant in a usability test. An interview setting should not be any different, and there is a need for shared power between the researcher and participants.

3.9 Data management, reporting, and analysis

“The aim of data analysis is to reduce and synthesize information—to make sense of it—and to allow inferences about populations,” (Fitzpatrick et al. 2011). Data analysis was conducted using Microsoft Excel, SPSS, and Qualtrics online survey software. I looked for patterns in verbal and non-verbal cues during observation at the grocery store, as well as individual interviews.

Data analysis began with the online survey, which later informed observing behavior of the participants and adding codes to the field notes. I looked for patterns and themes, developed working hypotheses from these, and then conducted confirmation checks and analyzed negative cases or cases that did not support or strengthen the working hypotheses (Fitzpatrick et al. 2011).

Since data analysis focuses on organizing and reducing the information collected into themes or statistical descriptions and inferences, the interpretation attached meaning to the organized information and used it to answer the evaluation questions,” (Fitzpatrick et al. 2011).
3.9.1 General ideological and theoretical assumptions

I believe in evolution. The evolution of the data informs more questions to be asked. There are an infinite number of questions that may be asked, and this evolution is an important and fundamental step in conducting research. My research methods are rooted in social justice. Meaning, that I attempted to look for patterns in the data that indicated a departure from dominant culture, regardless of whether or not the percentage of a response was the majority. Rather, I analyzed the data to find what the minority of respondents preferred to compare with the majority. I did not just automatically report the largest percentage of preference, without concern for other responses.

3.10 Trustworthiness

There are many differences between evaluation and research. The purpose of this thesis was to first research the intersections between graphic and interaction design’s history and current practices, and then to evaluate an iPad app through a case study. “Research and evaluation seek different ends. The primary purpose of research is to add to knowledge in a field, to contribute to the growth of theory” (Fitzpatrick, Sanders, Worthen, 2011). This is not the primary concern of evaluation. Rather, evaluation’s primary purpose is to judge the merit or worth of something (Fitzpatrick, Sanders, Worthen, 2011). “Research seeks conclusions; evaluation leads to judgments” (Fitzpatrick, Sanders, Worthen, 2011).

Professional evaluators must establish relationships with their clients (Fitzpatrick, Sanders, Worthen, 2011). This often differs from research where no stakeholders are involved. However, an effective use of human-centered design as a process to interaction design always involves stakeholders at multiple levels.
Strategies for validity and reliability are essential to all evaluations. The case study was one way that the research questions proved reliable. Reliability does not imply validity. Using a mixed methods approach (Fitzpatrick, et al. 2011) can be used to improve validity. An online survey, observation, literature review (research), and individual interviews combined to triangulate data. These mixed methods were also used to improve understanding and diversity in addition to validity (Fitzpatrick, et al. 2011). Using this triangulation of methods with different biases, greatly improved validity.

Also, my prior experience with interview sessions, in addition to knowledge gained in classes, and research and evaluation work as a graduate research assistant with the collaborative Design Information Research Group at ISU, increased validity. An experienced facilitator can be invaluable to the group process. Simply asking yes or no questions are of little use in this setting (Fitzpatrick, et al. 2011). The facilitator is charged with the responsibility of careful observation along with prompting to keep the conversation going and in the right direction.

3.11 Ethical considerations

When gathering data I adhered to the IRB guidelines for human subject involvement. All subjects signed the informed consent form prior to data collection. The online participants indicated their electronic signature by checking a box to agree and then were able to begin the survey. The individual interviewees all signed an informed consent form prior to beginning the interview.
CHAPTER 4. SUMMARY AND DISCUSSION

The findings from the online survey, in which I received 403 responses, overlapped in several places with the findings from the Consumer Reports study (24,203 responses). Whereas, the Consumer Reports study focused mainly on price and service in the grocery store, the data that I collected was related to shopping behavior and influences on decision-making. I asked respondents when they typically shop, how much time they spend in the store, who accompanies them, how they feel about grocery shopping, if they read ingredient labels and what they thought of the readability of the labels, if they had dietary restrictions, if they used a mobile device to aid in shopping decisions, and if they would consider using a mobile device to help track dietary restrictions.

The data from observation of shopping behavior in the grocery retail environment was coded according to gender, age range by generation, whether the shopper pushed a cart or carried a hand basket, how full the shopper’s cart was at checkout, how they selected products from the shelves (at eye level or above/below eye level), if they read the nutrition facts/ingredients labels, whether they shopped alone or with someone, method of payment at checkout, and any visible physical limitations the shoppers had. Cognitive impairments were not observed.

During the four individual interviews, I asked for the participant’s perception of using a grocery store app on an iPad. The participants chose from four existing apps and explored one or two. They then rated their experience using a Likert scale.
4.1 Summary of findings

Several responses to the online survey were very similar to the Consumer Reports survey. Most respondents shopped weekly with an average bill between $100-$120. The Consumer Reports survey broke down the amount spent by generation. Boomers (born 1946-1964) spend on average $106.40 per week, while Matures (born before 1946) spend $89.60 per week. My online survey showed 188 of the 403 respondents (47%) were between 55-64 years old, while the second largest group was age 46-54 with 175 respondents (43%), and the third largest group was age 65 and over with 28 respondents (7%). There were 12 responses that were not in the age range of 46 and over, so the margin of error was +/- 2%.

Most respondents to the online survey were female with 279 responses or 69%. This trend proved true in the in-store observation with 16 female shoppers, 8 male shoppers, 1 pair of female shoppers (relationship unclear), and 2 heterosexual couples. Based on the data collected as to the larger percentage of female shoppers, I conducted the four individual interviews with females.

A lesser number of respondents to the online survey had dietary restrictions. There were 105 people (25%) that indicated they had at least one dietary restriction. This counters the majority of 308 respondents (75%) that do not have dietary restrictions. When asked if they used grocery related apps, 388 respondents (94%) indicated they did not. When asked if they might benefit from a mobile system that would alert them to items that contained something that was a dietary restriction (such as sodium, sugar, food allergy), 137 people (33%) said maybe, 83 (20%) said yes, and 191 (46%) said no.
Three out of four individuals interviewed thought that the iPad app was easy to use once they were accustomed to its navigation. However, they did not find much use for it and would probably not use it to help them create a list for shopping. One of the interviewees had dietary restrictions, but already knew what brands to buy and what brands not to purchase. All of the interviewees could read packaging at the store without much difficulty, whether they wore corrective lenses or not. None of the interviewees had previously used an iPad on a regular basis.

4.2 Discussion on selected findings

The hypothesis of the SCIP project to create a mobile app or in-store device mounted on the shopping cart to help shoppers track dietary restrictions and present nutritional facts and ingredients in a clear, concise manner seemed to be disproved by the majority of respondents in the e-CAT study. However, with more attention to the entire design research process, including data collection and analysis using the e-CAT framework, other conclusions may be drawn with focus on under served groups from a perspective of social justice.

The first step in the analysis process, based on design research, was to map out the necessary steps in the task of grocery shopping. Using IDEO’s Human-Centered Design Toolkit, and immersing myself in this process (Shea, 2012), I created the following ten steps associated with grocery shopping.

1. Learning: Weekly sales flyers, coupons, ads on TV/radio, Internet
2. Planning: Creating shopping list, looking for recipes to help in list creation, asking family members for their contributions to the list
3. Starting: Getting transportation to store, either car, bus, bike, or pedestrian
4. Entering: Getting cart, or hand basket
5. Shopping: Selecting items, comparing prices, reading ingredients, looking for expiration dates, locating items in store
6. Checkout: Waiting in line, self-checkout, loading groceries on belt, or watching clerk load them, paying via check, cash, credit/debit card
7. Bagging: Waiting for store employee to bag groceries
8. Loading: Self load into own car, or store employee loads, or hand carry bags on bus, bike, or walking
9. Arriving at destination: Navigating turns carefully with bagged groceries in car, or picking up bags from bus floor/seat
10. Unloading: Carrying bags into destination, putting groceries away

The ten steps helped to refine the research questions and narrow the focus of this study to steps 2-7; planning and the in-store process of shopping. In future design iterations of SCIP, empathy should be used to adapt the design and functionality to accommodate existing grocery-shopping behavior. Empathy is an integral part of design research. “Design research—an investigation based on empathy, insight and understanding—is a fundamental element of building successful digital experiences,” (AIGA, 2012) states the American Institute of Graphic Arts (AIGA). A large portion of reaching an empathic design solution is based on design research. I used empathy to inform the research methodology. I constantly and continually analyzed the data to inform and refine the research questions. During the
The second part of the design research process I used for this study was connectivity. The combination of activity theory and Kansei engineering—the Connectivity Model—was used in observation in the grocery retail environment. Observing shoppers in their natural environment, and tracking verbal and non-verbal cues was instrumental in guiding the research further. Coding the data during this stage was integral to tracking behavior and shopping preferences to indicate shoppers’ decision-making process. Consumers are concerned with pricing of products as shown in the Consumer Reports survey and individual interviews. My observation of shoppers showed visual comparison of products on the shelves, however, since I was not interacting with the shoppers I could not be sure what they were comparing. All of the interviewees asked if the grocery app would automatically apply coupons to products they had selected to purchase and would keep a running tally of the price of items in the cart. This would be an intuitive function of the app that could be added to decrease time spent clipping coupons. It would encourage those that do not currently clip coupons to use them, and would offer an easy way to apply them, and incentive to use the app.

The third part of the design research process was authenticity. The idea of using a registered dietician was suggested during two of the individual interviews. Hy-Vee advertises in their stores, as well as on TV and in flyers, their on-staff registered dietician. Since these two women shopped at Hy-Vee regularly, they wanted to meet with the dietician and learn of healthy choices for making meals. They felt that using the app with the dietician to create
recipes and shopping lists would aid them in making healthier choices. They also expressed the need for the app to remember the dietician’s recommendations, even if they did not purchase them each time.

The dietician would help clarify complex nutritional information that would increase their knowledge level of personalized food intake guidelines, thereby empowering their own decision-making (Shea, 2012). This is an example of using empathy and connectivity to create an authentic experience that would lead to trust between the person shopping, the dietician, and the store. The app becomes a mediating tool between these entities and should be viewed as equal partners in the design process (Shea, 2012).

The final part of the design research process was to build trust. Trust was built through using empathy, connectivity, and authenticity, through a mutuality of relationship. During observation I discovered no shoppers using a mobile device while in the store, which was also confirmed in the online survey. This prompted me to ask individuals during the interview sessions if they ever used a mobile device while shopping and if using one would be an unwanted distraction. Most indicated that they didn’t want to use their mobile device to aid in shopping. Mostly because there was not a convenient place to keep it while pushing a cart, and the existing apps didn’t seem to offer enough incentive for them to use while shopping. They felt it would slow down their shopping experience and they might feel “too connected,” as one interviewee stated. The respondents in the online survey also asked why they would want to use a mobile device while shopping, and did not see a large enough benefit to do so. A possible solution might be to forego this technology altogether within the store with the shoppers, and rely on personal interaction with a dietician. The dietician might
find the app useful while meeting with shoppers. However, this would need to be included in further design research to assess the needs and probability of having an in-store dietician. In summary, building trust “… requires full authenticity and relationship,” (Shea, 2012).

### 4.3 Conclusions

Evaluation is a political activity (Fitzpatrick, Sanders, and Worthen, 2011), because of a change in relationship that happens as a result of the evaluation. Realizing that many different stakeholders are involved in the grocery retail environment may mean that stores due to related costs, or their relationships with advertisers and suppliers, would not provide the device mounted on shopping carts for an in-store app, or personal time with a registered dietician in the store to assist with shopping. There are potentially other stakeholders that might be indirectly involved in the decision to implement or not implement an in-store program.

Empathy should be the overarching component used in all design research and interaction design, that leads and informs the designer through the entire process. As the first component in the e-CAT framework, empathy defined each step of the data collection process and analysis in the approach of this thesis.

### 4.4 Implications for further research

Further research is needed in the grocery retail environment with shoppers and mobile devices. The recommendation by two of the interviewees to have a dietician create a shopping list, recipes and load it into a mobile system to help them shop needs to be tested with multiple stakeholders. Some of the proposed solutions of the mobile app are contrary to
how manufacturers and stores currently conduct business with product placements, coupons, and pricings, and is an example of these entities exerting power-over consumers for things they do not want or need.

As design research might prove by using the e-CAT framework, technology is not always the answer and cannot be used to “fix” people. Rather, a larger more systemic issue might be at hand that would warrant a collaborative approach to design for social change. “Designers need to find ways to get to the root of the problem, which is often part of a larger, messier system of issues that need to be dealt with,” (Shea, 2012). With experience, designers can learn to identify problems, and by using the e-CAT framework can begin to offer inclusive “good design.”
APPENDIX A. INFORMED CONSENT FOR INDIVIDUAL INTERVIEW

Attachment 13: Informed Consent for individual interview

Informed Consent Document

Title of Study: Designing Decision Aids for the Retail Grocery Environment
Investigators: Principle Investigator: Cyndi Wiley, BA, MFA and PhD candidate
Co-Investigators: Paul Ruski, BFA, MFA; Debra Satterfield, BS, MFA

This is a focus group study about your grocery shopping experience. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time. No items will be purchased during the session. No personal or financial information will be collected during the session.

INTRODUCTION
This research aims to gather information on the grocery shopping habits of adults age 46 and over. Living independently is an important goal as we age. The information gathered will contribute to designing an in-store application that will aid in decision-making of consumers.

Our population is significantly aging. The first of the Baby Boomer generation (those born between 1946 and 1964) turned 65 in 2011. The ability to read product information in a clear, concise and consistent format is important to sustaining independence by knowing the nutritional value of foods. Participation in this research will not benefit them directly. However, the knowledge or information gathered in this research will help future design of grocery retail applications involving an aging population.

Participants will not get direct benefits. However, this knowledge can be expected to ultimately provide significant opportunities to improve usability of interface systems for the general public.

DESCRIPTION OF PROCEDURES
If you agree to participate in this study, participation will last for approximately 60 minutes.

During the study you may expect the following study procedures to be followed.

1) The researchers will contact prospective participants to schedule an interview and will send the informed consent document via email.

2) On the selected date of the interview, you will be given a copy of the Informed Consent Document for review and to sign prior to the start of the session. If you agree, and sign the Informed Consent Document the session will begin.

3) Information regarding the project will be read before the session.

4) The respondents will complete a questionnaire regarding demographic information and their familiarity with the technologies. You must be at least 46 years old on the date of testing.

5) The focus group study will take place at a mutually agreeable space either on the ISU campus, or private residence.

6) The researcher will record audio for transcription at a later time. No identifying factors will be gathered from the audio recording.

7) During the interview you will be shown some grocery apps on an iPad and an iPod Touch. You will be asked to fill out a questionnaire based on your perceptions of the apps and the two devices.

RISKS
There are no foreseeable risks in this study. However, you may leave the study at any time without penalty.
BENEFITS
Participation in this research will not benefit the participants directly. However, the knowledge of information gathered in this research will help future design of decision aids for the grocery retail environment.

COSTS AND COMPENSATION
There are no costs associated with participating in this study and you will not be compensated for your participation.

PARTICIPANT RIGHTS
Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide to not participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled. During the testing, if you feel uncomfortable at anytime you can quit.

CONFIDENTIALITY
Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken.
The participant’s identity will be anonymous all throughout the survey. Only the researcher will have access to the data. The data will be entered and kept in a password-protected computer located on the PI’s and CO-PI’s computers. The questionnaire will be shredded after all the information is entered into the computer. All data files will be destroyed once transcribed and entered in the computer for analysis.

QUESTIONS OR PROBLEMS
You are encouraged to ask questions at any time during this study. For further information about the study contact Cynéd Wiley, Principal Investigator, phone 515-943-9179, email clwiley@iastate.edu.

If you have any questions about the rights of research subjects or research-related injury, please contact IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, Office for Responsible Research, (515) 294-3115, 1138 Pearson Hall, Ames, IA 50011.

******************************************************************************

SUBJECT SIGNATURE
Your signature indicates that you voluntarily agree that you will participate in this study, that the study has been explained to you, that you have been given the time to read the document and that your questions have been satisfactorily answered. You will receive a copy of the signed and dated written informed consent prior to your participation in the study.

Subject’s Name (printed) ______________________________

(Subject’s Signature) ________________________________ (Date)
APPENDIX B. INDIVIDUAL INTERVIEW QUESTIONS

Attachment 15: Interview questions

What do you think of grocery shopping?
- Is it a necessary task?
- Is it good exercise?
- Is it a social activity?

How easy is it to locate what you need in the store?
Do you use the in-store signage to find what you need?
What section of the store do you spend the most time?

How does the grocery store make you feel?
- Does the size of the store matter?

Do you read the ingredient labels on products you purchase?

What do you think about the labeling?
- Is it easy to read?
- Is it easy to understand what’s in a product?

Does it matter to you what the country of origin is for a particular food product?
- If yes, on what foods is it important to you?

Do you look at the expiration dates prior to purchasing food products?
- If yes, for which foods do you look at the expiration date?

What influences your purchasing behavior at the grocery store?

Do you have dietary restrictions?
- If so, how does this affect how you shop?

Do you use a mobile device while you shop?
- If yes, do you use any grocery shopping related apps?
- Which ones?

If you don’t use a mobile device while you shop, why?
- Is the screen size too small?
- Do you think you might benefit from a system that would alert you if an item contained an ingredient that you have an allergy to?
- Or, for instance if you are watching your sodium?
APPENDIX C: IPAD PERCEPTION SURVEY INSTRUMENT

Attachment 16: iPad/iPod app perceptions

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Overall, I am satisfied with how easy it is to use an app</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>agree</td>
</tr>
<tr>
<td>2</td>
<td>It was simple to use the app</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>agree</td>
</tr>
<tr>
<td>3</td>
<td>I can effectively find what I need using an app such as this</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>agree</td>
</tr>
<tr>
<td>4</td>
<td>I feel comfortable using the app</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>agree</td>
</tr>
<tr>
<td>5</td>
<td>It was easy to learn to use the app</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>agree</td>
</tr>
<tr>
<td>6</td>
<td>Whenever I make a mistake using the app, I recover easily and quickly</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>agree</td>
</tr>
<tr>
<td>7</td>
<td>I can see and read the information easily in the app</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>agree</td>
</tr>
<tr>
<td>8</td>
<td>I would use an iPad app in the grocery store</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>agree</td>
</tr>
<tr>
<td>9</td>
<td>If the grocery store had a similar system mounted on the cart, I would use the app</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>agree</td>
</tr>
<tr>
<td>10</td>
<td>I would not want to carry my own iPad to the grocery store</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>agree</td>
</tr>
<tr>
<td>11</td>
<td>Using an iPad at the grocery store would slow down my shopping experience</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>agree</td>
</tr>
<tr>
<td>12</td>
<td>I would like the app to track my dietary restrictions and help me shop for healthier food.</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>agree</td>
</tr>
<tr>
<td>13</td>
<td>It’s hard for me to read the ingredients listed on the packages at the store</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>agree</td>
</tr>
<tr>
<td>14</td>
<td>I am not always sure what ingredients are included in the foods I buy at the store</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>disagree</td>
<td>agree</td>
</tr>
</tbody>
</table>
APPENDIX D. OPEN-ENDED SURVEY QUESTIONS

Open-ended Survey Questions

What would you like to have at the grocery store that is not currently offered that would help improve your shopping experience?

What is the most frustrating thing about the grocery store?

Additional comments about your grocery shopping experience:
APPENDIX E. ONLINE SURVEY QUESTIONS

Attachment 18: Online survey questions

1. Age
   
2. Occupation
   
3. What is your total household income, including all earners in your household?
   - $24,000
   - $40,000-$59,999
   - $60,000-$79,999
   - $80,000-$99,999
   - $100,000-$119,999
   - Above $150,000

4. Gender
   - Male
   - Female

5. Native language
   - English
   - Other (Please specify:______________________)

6. How comfortable are you using the following:
   - Computer:
     - Uncomfortable
     - Slightly Uncomfortable
     - Slightly Comfortable
     - Comfortable
     - Don’t Use
   - Tablet/E-reader:
     - Uncomfortable
     - Slightly Uncomfortable
     - Slightly Comfortable
     - Comfortable
     - Don’t Use
   - Mobile Device:
     - Uncomfortable
     - Slightly Uncomfortable
     - Slightly Comfortable
     - Comfortable
     - Don’t Use
   - Web:
     - Uncomfortable
     - Slightly Uncomfortable
     - Slightly Comfortable
     - Comfortable
     - Don’t Use

7. What kind of computer do you use?
   - Macintosh
   - PC (Dell, HP, IBM, Sony, Asus, Gateway, eMachine, etc.)
   - Don’t know

8. How often do you use the following?
   - Web/Internet:
     - Less than Monthly
     - Monthly
     - Weekly
     - Daily
     - Never
   - Facebook:
     - Less than Monthly
     - Monthly
     - Weekly
     - Daily
     - Never
   - Twitter:
     - Less than Monthly
     - Monthly
     - Weekly
     - Daily
     - Never

9. How often do you grocery shop?
   - Monthly
   - Weekly
   - Daily
   - Every other week
   - Other:______________________
10. Do you cook at home?
   - Yes
   - No
   - Sometimes
     - How often:
     - Breakfast, lunch, dinner:

11. What type of food do you cook?
12. Who do you cook for?
13. Do you buy prepared meals?
   - If yes, do you buy at the deli counter or in the freezer section?
14. How many adults and children live in your house? (including yourself)
15. What store do you prefer to shop?
16. Do sales make a difference of where you shop?
17. Do you clip coupons?
   - Yes
   - No
   - Sometimes
     - How often:

18. What day of the week do you typically shop?
   - Monday
   - Tuesday
   - Wednesday
   - Thursday
   - Friday
   - Saturday
   - Sunday
   - No particular day
19. What time of day do you typically shop?
   - before 8am
   - 8am-noon
   - noon-3pm
   - 3pm-7pm
   - 7pm-10pm
   - after 10pm
   - No particular time
20. How much time on average do you spend in the store?
   - less than 20 minutes
   - 20-60 minutes
   - an hour or more
22. Does anyone come with you when you shop?
   - Yes
   - No
   - Sometimes
     - Who:
     - How often:
23. Do you shop for anyone not living in your house? Like your parents or your children?

- Yes
- No
- Sometimes

Who?

How often?

24. How much on average do you spend each time you grocery shop?

- under $25
- $26-$50
- $51-$75
- $76-$100
- $101-$125
- $126-$150
- $151-$175
- $176-$200
- $201-$225
- $226-$250
- $251-$275
- over $275

What do you think of grocery shopping?

- Is it a necessary task?
- Is it good exercise?
- Is it a social activity?

How easy is it to locate what you need in the store?

Do you use the in-store signage to find what you need?

What section of the store do you spend the most time?

How does the grocery store make you feel?

- Does the size of the store matter?

Do you read the ingredient labels on products you purchase?

What do you think about the labelling?

- Is it easy to read?
- Is it easy to understand what’s in a product?

Does it matter to you what the country of origin is for a particular food product?

- If yes, on what foods is it important to you?

Do you look at the expiration dates prior to purchasing food products?

- If yes, for which foods do you look at the expiration date?

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Do you have dietary restrictions?

- If so, how does this effect how you shop?
Do you use a mobile device while you shop?

- If yes, do you use any grocery shopping related apps?
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If you don’t use a mobile device while you shop, why?

- Is the screen size too small?
- Do you think you might benefit from a system that would alert you if an item contained an ingredient that you have an allergy to?
- Or, for instance if you are watching your sodium?

Open-ended Survey Questions

What would you like to have at the grocery store that is not currently offered that would help improve your shopping experience?

What is the most frustrating thing about the grocery store?

Additional comments about your grocery shopping experience:
APPENDIX F. ONLINE INFORMED CONSENT FORM

Attachment 19

Informed Consent Document for Online Survey

Title of Study: Designing Decision Aids for the Retail Grocery Environment
Investigators: Principle Investigator: Cyndi Wiley, BA, MFA and PhD candidate
Co-Investigators: Paul Brooks, BFA, MFA; Debra Satterfield, BS, MFA

This is a focus group study about your grocery shopping experience. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time. No items will be purchased during the session. No personal or financial information will be collected during the session.

INTRODUCTION
This research aims to gather information on the grocery shopping habits of adults age 46 and over. Living independently is an important goal as we age. The information gathered will contribute to designing an in-store application that will aid in decision-making of consumers.

Our population is significantly aging. The first of the Baby Boomer generation (those born between 1946 and 1964) turned 65 in 2011. The ability to read product information in a clear, concise and consistent format is important to sustaining independence by knowing the nutritional value of foods. Participation in this research will not benefit them directly. However, the knowledge or information gathered in this research will help future design of grocery retail applications involving an aging population.

Participants will not get direct benefits. However, this knowledge can be expected to ultimately provide significant opportunities to improve usability of interface systems for the general public.

DESCRIPTION OF PROCEDURES
If you agree to participate in this study, participation will last for approximately 20 minutes.

During the study you may expect the following.

If you agree to participate, but clicking the “I Agree” box at the bottom of this page, you will complete a survey regarding your behavior and experiences at the grocery store, as well as demographic information, and your familiarity with mobile technologies. You must be at least 46 years old on the date of this survey.

RISKS
There are no foreseeable risks in this study. However, you may leave the study at any time without penalty.

BENEFITS
Participation in this research will not benefit the participants directly. However, the knowledge of information gathered in this research will help future design of decision aids for the grocery retail environment.

COSTS AND COMPENSATION
There are no costs associated with participating in this study and you will not be compensated for your participation.

PARTICIPANT RIGHTS
Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide to not participate in the study or leave the study early, it will not result in any
penalty or loss of benefits to which you are otherwise entitled. During the testing, if you feel uncomfortable at anytime you can quit.

CONFIDENTIALITY
Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your records for quality assurance and data analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken.
The participant’s identity will be anonymous all throughout the survey. Only the researcher will have access to the data. The data will be entered and kept in a password-protected computer located on the PI’s and CO-PI’s computers. The questionnaire will be shredded after all the information is entered into the computer. All data files will be destroyed once transcribed and entered in the computer for analysis.

QUESTIONS OR PROBLEMS
You are encouraged to ask questions at any time during this study. For further information about the study contact Cyndi Wiley, Principal Investigator, phone 515-943-9179, email clwiley@iastate.edu.

If you have any questions about the rights of research subjects or research-related injury, please contact IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, Office for Responsible Research, (515) 294-3115, 113 Pearson Hall, Ames, IA 50011.

******************************************************************************

SUBJECT SIGNATURE
By checking the “I Agree” box below, it indicates that you voluntarily agree that you will participate in this study, that you have read the document and are ready to begin the survey. You may leave the survey anytime without penalty.

☐ I Agree

☐ I do not wish to continue with this survey
APPENDIX G. STATISTICAL RESULTS

2. How often do you grocery shop?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monthly</td>
<td>12</td>
<td>3%</td>
</tr>
<tr>
<td>2</td>
<td>Daily</td>
<td>21</td>
<td>5%</td>
</tr>
<tr>
<td>3</td>
<td>Every other week</td>
<td>34</td>
<td>8%</td>
</tr>
<tr>
<td>4</td>
<td>Other (please specify)</td>
<td>66</td>
<td>16%</td>
</tr>
<tr>
<td>5</td>
<td>Weekly</td>
<td>282</td>
<td>68%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>414</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Value</td>
<td>1</td>
</tr>
<tr>
<td>Max Value</td>
<td>8</td>
</tr>
<tr>
<td>Mean</td>
<td>6.45</td>
</tr>
<tr>
<td>Variance</td>
<td>5.43</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>2.33</td>
</tr>
<tr>
<td>Total Responses</td>
<td>414</td>
</tr>
</tbody>
</table>

3. How often do you cook at home?

<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>Never</th>
<th>Daily</th>
<th>2-3 Times a Week</th>
<th>Once a Week</th>
<th>Less than Once a Month</th>
<th>Once a Month</th>
<th>2-3 Times a Month</th>
<th>Responses</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Breakfast</td>
<td>42</td>
<td>226</td>
<td>74</td>
<td>38</td>
<td>9</td>
<td>1</td>
<td>1</td>
<td>416</td>
<td>2.59</td>
</tr>
<tr>
<td>2</td>
<td>Lunch</td>
<td>42</td>
<td>78</td>
<td>187</td>
<td>76</td>
<td>11</td>
<td>3</td>
<td>3</td>
<td>416</td>
<td>3.04</td>
</tr>
<tr>
<td>3</td>
<td>Dinner</td>
<td>2</td>
<td>278</td>
<td>120</td>
<td>13</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>416</td>
<td>2.46</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Breakfast</th>
<th>Lunch</th>
<th>Dinner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Value</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Max Value</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Mean</td>
<td>2.59</td>
<td>3.04</td>
<td>2.45</td>
</tr>
<tr>
<td>Variance</td>
<td>1.73</td>
<td>1.64</td>
<td>0.71</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1.31</td>
<td>1.28</td>
<td>0.84</td>
</tr>
<tr>
<td>Total Responses</td>
<td>416</td>
<td>416</td>
<td>416</td>
</tr>
</tbody>
</table>
4. Do you buy prepared meals at the grocery store?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
</table>
| 1 | Never                    | 84       | 20%
| 2 | Less than Once a Month   | 131      | 31%
| 3 | Once a Month             | 54       | 13%
| 4 | 2-3 Times a Month        | 94       | 23%
| 5 | Once a Week              | 41       | 10%
| 6 | 2-3 Times a Week         | 12       | 3%
| 7 | Daily                    | 0        | 0%
| Total |                      | 416      | 100% |

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Value</td>
<td>1</td>
</tr>
<tr>
<td>Max Value</td>
<td>6</td>
</tr>
<tr>
<td>Mean</td>
<td>2.79</td>
</tr>
<tr>
<td>Variance</td>
<td>1.96</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1.40</td>
</tr>
<tr>
<td>Total Responses</td>
<td>416</td>
</tr>
</tbody>
</table>

5. How many adults live in your house, including yourself?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
</table>
| 1 | 1      | 92       | 22%
| 2 | 2      | 269      | 65%
| 3 | 3      | 43       | 10%
| 4 | 4      | 12       | 3%
| 5 | More than 4 | 0   | 0%
| Total |          | 416      | 100% |

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Value</td>
<td>1</td>
</tr>
<tr>
<td>Max Value</td>
<td>4</td>
</tr>
<tr>
<td>Mean</td>
<td>1.94</td>
</tr>
<tr>
<td>Variance</td>
<td>0.44</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.66</td>
</tr>
<tr>
<td>Total Responses</td>
<td>416</td>
</tr>
</tbody>
</table>
6. How many children (under age 18) live in your house?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None</td>
<td>340</td>
<td>62%</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>38</td>
<td>9%</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>32</td>
<td>8%</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>3</td>
<td>1%</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>8</td>
<td>More than 6</td>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>414</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Value</td>
<td>1</td>
</tr>
<tr>
<td>Max Value</td>
<td>8</td>
</tr>
<tr>
<td>Mean</td>
<td>1.29</td>
</tr>
<tr>
<td>Variance</td>
<td>0.50</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.71</td>
</tr>
<tr>
<td>Total Responses</td>
<td>414</td>
</tr>
</tbody>
</table>

8. Do weekly sales make a difference of where you shop?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
<td>85</td>
<td>21%</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>182</td>
<td>44%</td>
</tr>
<tr>
<td>3</td>
<td>Sometimes</td>
<td>147</td>
<td>36%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>414</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Value</td>
<td>1</td>
</tr>
<tr>
<td>Max Value</td>
<td>3</td>
</tr>
<tr>
<td>Mean</td>
<td>2.15</td>
</tr>
<tr>
<td>Variance</td>
<td>0.54</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.73</td>
</tr>
<tr>
<td>Total Responses</td>
<td>414</td>
</tr>
</tbody>
</table>
9. How often do you clip coupons?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Never</td>
<td>112</td>
<td>27%</td>
</tr>
<tr>
<td>2</td>
<td>Less than Once a Month</td>
<td>94</td>
<td>23%</td>
</tr>
<tr>
<td>3</td>
<td>Once a Month</td>
<td>45</td>
<td>11%</td>
</tr>
<tr>
<td>4</td>
<td>2-3 Times a Month</td>
<td>58</td>
<td>14%</td>
</tr>
<tr>
<td>5</td>
<td>Once a Week</td>
<td>90</td>
<td>22%</td>
</tr>
<tr>
<td>6</td>
<td>2-3 Times a Week</td>
<td>13</td>
<td>3%</td>
</tr>
<tr>
<td>7</td>
<td>Daily</td>
<td>2</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>414</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Value</td>
<td>1</td>
</tr>
<tr>
<td>Max Value</td>
<td>7</td>
</tr>
<tr>
<td>Mean</td>
<td>2.92</td>
</tr>
<tr>
<td>Variance</td>
<td>2.63</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1.64</td>
</tr>
<tr>
<td>Total Responses</td>
<td>414</td>
</tr>
</tbody>
</table>

10. What day of the week do you typically shop?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monday</td>
<td>8</td>
<td>2%</td>
</tr>
<tr>
<td>2</td>
<td>Tuesday</td>
<td>15</td>
<td>4%</td>
</tr>
<tr>
<td>3</td>
<td>Wednesday</td>
<td>14</td>
<td>3%</td>
</tr>
<tr>
<td>4</td>
<td>Thursday</td>
<td>18</td>
<td>4%</td>
</tr>
<tr>
<td>5</td>
<td>Friday</td>
<td>23</td>
<td>6%</td>
</tr>
<tr>
<td>6</td>
<td>Saturday</td>
<td>107</td>
<td>26%</td>
</tr>
<tr>
<td>7</td>
<td>Sunday</td>
<td>23</td>
<td>6%</td>
</tr>
<tr>
<td>8</td>
<td>No particular day</td>
<td>205</td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>413</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Value</td>
<td>1</td>
</tr>
<tr>
<td>Max Value</td>
<td>8</td>
</tr>
<tr>
<td>Mean</td>
<td>6.56</td>
</tr>
<tr>
<td>Variance</td>
<td>3.33</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1.83</td>
</tr>
<tr>
<td>Total Responses</td>
<td>413</td>
</tr>
</tbody>
</table>
11. What time of day do you typically shop?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>before 8am</td>
<td>9</td>
<td>2%</td>
</tr>
<tr>
<td>2</td>
<td>8am-noon</td>
<td>77</td>
<td>19%</td>
</tr>
<tr>
<td>3</td>
<td>noon-3pm</td>
<td>40</td>
<td>10%</td>
</tr>
<tr>
<td>4</td>
<td>3pm-7pm</td>
<td>172</td>
<td>42%</td>
</tr>
<tr>
<td>5</td>
<td>7pm-11pm</td>
<td>33</td>
<td>8%</td>
</tr>
<tr>
<td>6</td>
<td>after 11pm</td>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>7</td>
<td>No particular time</td>
<td>82</td>
<td>20%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>414</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Statistic** | **Value**
---|---
Min Value | 1
Max Value | 7
Mean | 4.14
Variance | 2.69
Standard Deviation | 1.70
Total Responses | 414

12. How much time on average do you spend in the store?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>less than 20 minutes</td>
<td>104</td>
<td>25%</td>
</tr>
<tr>
<td>2</td>
<td>20-60 minutes</td>
<td>287</td>
<td>70%</td>
</tr>
<tr>
<td>3</td>
<td>an hour or more</td>
<td>18</td>
<td>4%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>409</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Statistic** | **Value**
---|---
Min Value | 1
Max Value | 3
Mean | 1.79
Variance | 0.26
Standard Deviation | 0.50
Total Responses | 409

11. Do you typically use your own credit card or debit card when shopping?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes (who?)</td>
<td>72</td>
<td>18%</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>194</td>
<td>48%</td>
</tr>
<tr>
<td>3</td>
<td>Sometimes (who?)</td>
<td>142</td>
<td>35%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>408</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Statistic** | **Value**
---|---
Min Value | 1
Max Value | 12
Mean | 3.60
Variance | 2.88
Standard Deviation | 1.70
Total Responses | 413
15. 14. What do you think of grocery shopping? (Check all that apply)

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is it a necessary task?</td>
<td>397</td>
<td>97%</td>
</tr>
<tr>
<td>2</td>
<td>Is it good exercise?</td>
<td>61</td>
<td>15%</td>
</tr>
<tr>
<td>3</td>
<td>Is it a social activity?</td>
<td>61</td>
<td>15%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Value</td>
<td>1</td>
</tr>
<tr>
<td>Max Value</td>
<td>3</td>
</tr>
<tr>
<td>Total Responses</td>
<td>410</td>
</tr>
</tbody>
</table>

16. 15. How easy is it to locate what you need in the store?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very Difficult</td>
<td>2</td>
<td>0%</td>
</tr>
<tr>
<td>2</td>
<td>Difficult</td>
<td>2</td>
<td>0%</td>
</tr>
<tr>
<td>3</td>
<td>Somewhat Difficult</td>
<td>39</td>
<td>9%</td>
</tr>
<tr>
<td>4</td>
<td>Neutral</td>
<td>58</td>
<td>14%</td>
</tr>
<tr>
<td>5</td>
<td>Somewhat Easy</td>
<td>128</td>
<td>31%</td>
</tr>
<tr>
<td>6</td>
<td>Easy</td>
<td>150</td>
<td>36%</td>
</tr>
<tr>
<td>7</td>
<td>Very Easy</td>
<td>34</td>
<td>8%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>413</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Value</td>
<td>1</td>
</tr>
<tr>
<td>Max Value</td>
<td>7</td>
</tr>
<tr>
<td>Mean</td>
<td>5.16</td>
</tr>
<tr>
<td>Variance</td>
<td>1.31</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1.14</td>
</tr>
<tr>
<td>Total Responses</td>
<td>413</td>
</tr>
</tbody>
</table>

17. 16. Do you use the in-store signage to find what you need?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Never</td>
<td>8</td>
<td>2%</td>
</tr>
<tr>
<td>2</td>
<td>Rarely</td>
<td>57</td>
<td>14%</td>
</tr>
<tr>
<td>3</td>
<td>Sometimes</td>
<td>244</td>
<td>59%</td>
</tr>
<tr>
<td>4</td>
<td>Most of the Time</td>
<td>91</td>
<td>22%</td>
</tr>
<tr>
<td>5</td>
<td>Always</td>
<td>11</td>
<td>3%</td>
</tr>
<tr>
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<td>411</td>
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<table>
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</tr>
<tr>
<td>Max Value</td>
<td>5</td>
</tr>
<tr>
<td>Mean</td>
<td>3.10</td>
</tr>
<tr>
<td>Variance</td>
<td>0.54</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.73</td>
</tr>
<tr>
<td>Total Responses</td>
<td>411</td>
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</table>
18. 17. What section of the grocery store do you spend the most time?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Deli</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Meat</td>
<td>49</td>
<td>12%</td>
</tr>
<tr>
<td>3</td>
<td>Produce</td>
<td>174</td>
<td>42%</td>
</tr>
<tr>
<td>4</td>
<td>Bakery</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>5</td>
<td>Baby foods</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>6</td>
<td>Bulk foods</td>
<td>3</td>
<td>1%</td>
</tr>
<tr>
<td>7</td>
<td>Canned goods</td>
<td>12</td>
<td>3%</td>
</tr>
<tr>
<td>8</td>
<td>Candles</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>9</td>
<td>Dairy</td>
<td>5</td>
<td>1%</td>
</tr>
<tr>
<td>10</td>
<td>Frozen foods</td>
<td>16</td>
<td>4%</td>
</tr>
<tr>
<td>11</td>
<td>Pharmacy</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>12</td>
<td>Household products</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>13</td>
<td>Pet food</td>
<td>2</td>
<td>0%</td>
</tr>
<tr>
<td>14</td>
<td>Personal hygiene products</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>15</td>
<td>Snack foods</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>16</td>
<td>Beverages</td>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>17</td>
<td>No more time spent in any one section</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total 413 100%

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
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<tr>
<td>Min Value</td>
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</tr>
<tr>
<td>Max Value</td>
<td>17</td>
</tr>
<tr>
<td>Mean</td>
<td>8.45</td>
</tr>
<tr>
<td>Variance</td>
<td>44.60</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>6.58</td>
</tr>
<tr>
<td>Total Responses</td>
<td>413</td>
</tr>
</tbody>
</table>
19. How does the grocery store make you feel?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very Dissatisfied</td>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>2</td>
<td>Dissatisfied</td>
<td>4</td>
<td>1%</td>
</tr>
<tr>
<td>3</td>
<td>Somewhat Dissatisfied</td>
<td>24</td>
<td>6%</td>
</tr>
<tr>
<td>4</td>
<td>Neutral</td>
<td>126</td>
<td>31%</td>
</tr>
<tr>
<td>5</td>
<td>Somewhat Satisfied</td>
<td>74</td>
<td>18%</td>
</tr>
<tr>
<td>6</td>
<td>Satisfied</td>
<td>147</td>
<td>38%</td>
</tr>
<tr>
<td>7</td>
<td>Very Satisfied</td>
<td>36</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>412</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
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<th>Value</th>
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<td>1</td>
</tr>
<tr>
<td>Max Value</td>
<td>7</td>
</tr>
<tr>
<td>Mean</td>
<td>5.07</td>
</tr>
<tr>
<td>Variance</td>
<td>1.37</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>1.17</td>
</tr>
<tr>
<td>Total Responses</td>
<td>412</td>
</tr>
</tbody>
</table>

20. Do you read the ingredient labels on products you purchase?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Never</td>
<td>11</td>
<td>3%</td>
</tr>
<tr>
<td>2</td>
<td>Rarely</td>
<td>45</td>
<td>11%</td>
</tr>
<tr>
<td>3</td>
<td>Sometimes</td>
<td>190</td>
<td>46%</td>
</tr>
<tr>
<td>4</td>
<td>Most of the Time</td>
<td>127</td>
<td>31%</td>
</tr>
<tr>
<td>5</td>
<td>Always</td>
<td>37</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>410</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Value</td>
<td>1</td>
</tr>
<tr>
<td>Max Value</td>
<td>5</td>
</tr>
<tr>
<td>Mean</td>
<td>3.33</td>
</tr>
<tr>
<td>Variance</td>
<td>0.78</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.88</td>
</tr>
<tr>
<td>Total Responses</td>
<td>410</td>
</tr>
</tbody>
</table>
21. 20. What do you think of about the readability of ingredient labels?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very Difficult</td>
<td>9</td>
<td>2%</td>
</tr>
<tr>
<td>2</td>
<td>Difficult</td>
<td>40</td>
<td>10%</td>
</tr>
<tr>
<td>3</td>
<td>Somewhat Difficult</td>
<td>135</td>
<td>33%</td>
</tr>
<tr>
<td>4</td>
<td>Neutral</td>
<td>93</td>
<td>23%</td>
</tr>
<tr>
<td>5</td>
<td>Somewhat Easy</td>
<td>83</td>
<td>20%</td>
</tr>
<tr>
<td>6</td>
<td>Easy</td>
<td>45</td>
<td>11%</td>
</tr>
<tr>
<td>7</td>
<td>Very Easy</td>
<td>7</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>412</td>
<td>100%</td>
</tr>
</tbody>
</table>

Statistic | Value
---|------
Min Value | 1
Max Value | 7
Mean | 3.88
Variance | 1.69
Standard Deviation | 1.30
Total Responses | 412

22. 21. Does it matter to you what the country of origin is for a product?

<table>
<thead>
<tr>
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<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes (on what foods is it important to you?)</td>
<td>208</td>
<td>51%</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>201</td>
<td>49%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>409</td>
<td>100%</td>
</tr>
</tbody>
</table>

23. 22. Does it matter to you what the expiration date of a product is?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes (on what foods is it important to you?)</td>
<td>381</td>
<td>93%</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>30</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>411</td>
<td>100%</td>
</tr>
</tbody>
</table>
25. Do you have dietary restrictions?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes, if so, how does this affect how you shop?</td>
<td>105</td>
<td>25%</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>308</td>
<td>79%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>413</td>
<td>100%</td>
</tr>
</tbody>
</table>

26. Do you use a mobile device while you shop?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
<td>21</td>
<td>5%</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>346</td>
<td>84%</td>
</tr>
<tr>
<td>3</td>
<td>Sometimes</td>
<td>44</td>
<td>11%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>411</td>
<td>100%</td>
</tr>
</tbody>
</table>

Statistic

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Value</td>
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<tr>
<td>Max Value</td>
<td>3</td>
</tr>
<tr>
<td>Mean</td>
<td>2.06</td>
</tr>
<tr>
<td>Variance</td>
<td>0.16</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.39</td>
</tr>
<tr>
<td>Total Responses</td>
<td>411</td>
</tr>
</tbody>
</table>

27. Do you use any grocery shopping related apps?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes, which one(s)?</td>
<td>14</td>
<td>3%</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>388</td>
<td>94%</td>
</tr>
<tr>
<td>3</td>
<td>Sometimes</td>
<td>10</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>412</td>
<td>100%</td>
</tr>
</tbody>
</table>
29. Do you think you might benefit from a mobile system that would alert you if an item contained an...?

<table>
<thead>
<tr>
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<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
<td>83</td>
<td>20%</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>191</td>
<td>46%</td>
</tr>
<tr>
<td>3</td>
<td>Maybe</td>
<td>137</td>
<td>33%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>411</td>
<td>100%</td>
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</tbody>
</table>

33. What is your age?

<table>
<thead>
<tr>
<th>#</th>
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<th>%</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>18 - 24</td>
<td>2</td>
<td>0%</td>
</tr>
<tr>
<td>2</td>
<td>25 - 34</td>
<td>5</td>
<td>1%</td>
</tr>
<tr>
<td>3</td>
<td>35 - 44</td>
<td>5</td>
<td>1%</td>
</tr>
<tr>
<td>4</td>
<td>45 - 54</td>
<td>175</td>
<td>43%</td>
</tr>
<tr>
<td>5</td>
<td>55 - 64</td>
<td>188</td>
<td>47%</td>
</tr>
<tr>
<td>6</td>
<td>65 and over</td>
<td>28</td>
<td>7%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>403</td>
<td>100%</td>
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</table>

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</tr>
<tr>
<td>Max Value</td>
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</tr>
<tr>
<td>Mean</td>
<td>4.55</td>
</tr>
<tr>
<td>Variance</td>
<td>0.55</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.74</td>
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<tr>
<td>Total Responses</td>
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</table>

35. Please indicate your approximate yearly household income before taxes. (Include total income of...

<table>
<thead>
<tr>
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<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Under $25,000</td>
<td>3</td>
<td>1%</td>
</tr>
<tr>
<td>2</td>
<td>$25,000 - $49,999</td>
<td>45</td>
<td>11%</td>
</tr>
<tr>
<td>3</td>
<td>$50,000 - $74,999</td>
<td>84</td>
<td>21%</td>
</tr>
<tr>
<td>4</td>
<td>$75,000 - $99,999</td>
<td>116</td>
<td>29%</td>
</tr>
<tr>
<td>5</td>
<td>$100,000 - $149,999</td>
<td>104</td>
<td>26%</td>
</tr>
<tr>
<td>6</td>
<td>$150,000 and over</td>
<td>42</td>
<td>11%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>394</td>
<td>100%</td>
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36. Gender

<table>
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<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Male</td>
<td>124</td>
<td>31%</td>
</tr>
<tr>
<td>2</td>
<td>Female</td>
<td>279</td>
<td>69%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>403</td>
<td>100%</td>
</tr>
</tbody>
</table>
38. How comfortable are you using the following?

<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>Uncomfortable</th>
<th>Slightly uncomfortable</th>
<th>Slightly comfortable</th>
<th>Comfortable</th>
<th>Don’t Use</th>
<th>Responses</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Computer</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>395</td>
<td>0</td>
<td>403</td>
<td>3.97</td>
</tr>
<tr>
<td>2</td>
<td>Tablet/E-reader</td>
<td>4</td>
<td>11</td>
<td>39</td>
<td>173</td>
<td>176</td>
<td>403</td>
<td>4.26</td>
</tr>
<tr>
<td>3</td>
<td>Mobile Device</td>
<td>6</td>
<td>19</td>
<td>52</td>
<td>209</td>
<td>117</td>
<td>403</td>
<td>4.02</td>
</tr>
<tr>
<td>4</td>
<td>Web</td>
<td>3</td>
<td>1</td>
<td>7</td>
<td>389</td>
<td>3</td>
<td>403</td>
<td>3.96</td>
</tr>
</tbody>
</table>

39. What kind of computer do you use?

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mac</td>
<td>84</td>
<td>21%</td>
</tr>
<tr>
<td>2</td>
<td>PC with Windows (Dell, HP, IBM, Sony, Asus, Gateway, e-Machine, etc.)</td>
<td>318</td>
<td>79%</td>
</tr>
<tr>
<td>3</td>
<td>Do not use</td>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>403</td>
<td>100%</td>
</tr>
</tbody>
</table>

40. How often do you use the following?

<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>Never</th>
<th>Less than Once a Month</th>
<th>Once a Month</th>
<th>2-3 Times a Month</th>
<th>Once a Week</th>
<th>2-3 Times a Week</th>
<th>Daily</th>
<th>Responses</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Web/Internet</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>11</td>
<td>388</td>
<td>403</td>
<td>6.92</td>
</tr>
<tr>
<td>2</td>
<td>Facebook</td>
<td>121</td>
<td>20</td>
<td>11</td>
<td>20</td>
<td>36</td>
<td>53</td>
<td>140</td>
<td>403</td>
<td>4.38</td>
</tr>
<tr>
<td>3</td>
<td>Twitter</td>
<td>332</td>
<td>23</td>
<td>4</td>
<td>7</td>
<td>9</td>
<td>11</td>
<td>17</td>
<td>403</td>
<td>1.81</td>
</tr>
</tbody>
</table>
ACKNOWLEDGEMENTS

I would like to take this opportunity to express my thanks to those who helped me with various aspects of conducting research and the writing of this thesis. My major professor, Paul Bruski helped me combat my tangential nature and was instrumental in keeping me focused on a continued path. He also provided a safe place for me to vet my ideas and openly encouraged me to explore some self-indulgence. He also recommended some great resources for beginning my research that were invaluable to shaping this thesis.

Debra Satterfield took a chance by allowing me to both teach and conduct research during my tenure as a graduate student. I was enabled to continue my education and be involved with some incredible research projects! For this, I am deeply indebted. Her wisdom has offered comfort and much needed guidance.

Sunghyun Kang was a willing mentor to me in the Preparing Future Faculty program at ISU. Her casual presence and constant encouragement led me to complete my professional materials and apply for teaching positions. Working with her and Deb as a TA and graduate research assistant with the Design Information Research Group were both tremendous opportunities, for which I am thankful.

Dr. Warren Blumenfeld accepted the position of committee member for this thesis process without ever having me as a student. I reached out to him as an LGBT faculty member and have appreciated his sense of humor and laid back style. He shared his dissertation to give me a great example to follow. His input is beyond measure.

I would also like to thank the faculty and search committee at Grand View University in Des Moines, Iowa, (Mary Jones, Josh Ryther, Aaron Tinder, Dr. Therese Judge, Mark
Siebert, and Dr. Mary Elizabeth Stivers) who willingly hired me to begin a tenure track position as assistant professor of art & design. I am overjoyed and extremely grateful for the chance to begin my second career as an educator.

Mona Pett has been an immense help to me by answering my sometimes absurd questions. She was the first person that I met when I visited the College of Design and her friendly, warm presence is always evident.

Linda Galvin also helped me a great deal throughout my graduate education. She helped me find the appropriate forms for our research group and was incredibly diligent.

Deb Parker always had a fun story to share with me. I appreciate her bright demeanor and loved hearing about her family.

Dr. Troy Abel sat and talked with me about the PhD process at ISU. He provided the path for me to follow, book recommendations, class recommendations, and general advice. I am grateful the he was the trailblazer.

Finally, my family and friends continually bless me. My mom and dad (Bert and Carol) have always believed in me. They think I’m beautiful and smart even when I don’t. They hung my early art on the fridge doors, and instilled a deep sense of independence in me. I love them dearly. My brother Glenn and sister-in-law Alicia have provided me the opportunity to be Aunt Cyndi to wonderful nephews and a niece.

My partner Rev. Jennifer L. Hall, has provided unwavering support of me and especially my decision to attend graduate school. Through our struggles, fights, laughter, joys, many deep conversations, and many more light conversations, she has enriched my life beyond even my wildest imagination. She steered me toward using Relational-Cultural
Theory, as she uses it in her work in clinical pastoral education (CPE). I love her deeply and our life together. We have two boxers (Joppa and Cowboy) and two kitty cats (Pacha and Jack), that took turns laying at my feet and crawling across my keyboard during the writing of this thesis.
BIBLIOGRAPHY


