DE-STIGMATIZING PRODUCTS: MAKING THE HEARING AID DESIRABLE

BY

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THESIS

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Abstract

Stigma in America creates heated controversy and is associated not only with people within defined social groups, but with a variety of products which are used daily. Many products (e.g. assistive walking devices, adult diapers and hearing aids) carry significant stigma, which prevents users from purchasing or using important assistive devices due to negative emotional responses. As people are living longer and experiencing more disabilities throughout an extended lifetime, designers need to be able to create products for users that are often outside their personal comfort zones. Products need to satisfy both the functional and emotional needs of the user to carry a lasting bond between the user and the object and promote product sustainability.

This paper begins with a brief overview of the issue of stigma, and a review of the products which are affected by stigma and the impact this has on the user. It will then address topics of product abandonment, the need for innovation in the emerging market of people with disabilities, and societal trends and culture in the United States using empathic design research methods to gain insight. This will reveal opportunities to improve user’s experiences and benefits and will be focused in the areas of urinary incontinence and hearing loss. The paper will conclude with hearing aid designs which focus on creating an exciting user experience and fostering enjoyment of a better quality of life though an object of desire.
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Chapter 1. Introduction

This paper will begin by looking at stigma in American society, what causes stigma, how it affects people, and how it affects the products which people consume. It will then explore in depth the stigma attached to two disabilities: urinary incontinence and hearing impairment, and the affects stigma has on the people with these disabilities and the products they need to function in life. Furthermore, the author will discuss solutions to initiating change in the design of hearing aids to become an object of desire in the American culture.

If a user develops a bond with a product which helps them function and improves their quality of life, they will be more likely to use that product regularly and proudly, reducing product abandonment due to stigma. After exploration into stigma as an issue in the American culture, products which carry stigma, and urinary incontinence as a stigmatized subject, this paper will cover an in depth discussion about the industry of hearing aids, the people who use them,
and the possibilities for bringing about change in public perception through empathic design.

A range of hearing aids have been developed that employ empathic design research methods which ensure the final design outcome will respond to functional (e.g. utilitarian needs) and emotional needs (e.g. supra-functional needs) (Weightman & McDonagh, 2004). Disability can affect any one at anytime unexpectedly; with the increase in people living longer it is more likely that individuals will develop disabilities.

With the invention of technology such as iPods which cause self-induced disabilities, and the numerous people serving in the military to return with war-related injuries, the younger generation unlike any other will be facing hearing impairments and difficulties into their adulthood. There needs to be a revolution in the hearing aid industry to make hearing aids a desirable object now since people will be needing hearing aids at a much younger age (Ackerman, 1990). It is essential that users have a bond with the objects in which they have regular interaction.

This is shown by consumer loyalty to brands such as Apple, Levi, and Honda; the customer will consistently purchase exclusively within that brand because they perceive the brand’s products to fully meet their needs. According to Robyn

“When the point of contact between the product and the people becomes a point of friction, then the industrial designer has failed.

On the other hand, if people are made safer, more comfortable, more eager to purchase, more efficient- or just plain happier- by contact with the product, then the designer has succeeded.”

-Dreyfuss, 1955
Waters in her book ‘The Trendmaster’s Guide’ (2005), users view products as an extension of themselves. Products which do not make the user feel good do not meet the emotional needs of the user lead to dissatisfaction and are more likely to be abandoned creating waste.
Chapter 2.  Stigma in America

2.1 Stigma

Stigma is defined by Merriam-Webster Dictionary as “Any mark of infamy or disgrace; sign of moral blemish; stain or reproach caused by dishonorable conduct; reproachful characterization” (Merriam-Webster Dictionary). It is society that defines which topics are taboo and this can vary between cultures.

Taboo topics in America tend to be associated with polarizing issues such as racism, sexism, homosexuality, religion, politics, money, and disability.

“Discomfort with these topics compromises our health and short-circuits our quality of life by keeping important information in the dark” (IDEO). Such topics can lead to ridicule, heated debate, embarrassment, and stigmatization of people within these controversial social groups, which can leave the individual feeling isolated and unwelcome. This could lead to reluctance on the part of the person in the stigmatized group to participate in social activities, and
employer discrimination against hiring people who are stereotyped within these categories.

According to Goffman (1963) in his book ‘Stigma,’ stigma is necessary within a society as it defines the boundaries between the ‘normal’ and the ‘abnormal’ and therefore could never be completely eliminated. Groups of ‘normal’ people only feel normal when compared to people who are differently-able. “In social situations with an individual known or perceived to have a stigma, we are likely, then, to employ categorizations that do not fit, and we and he are likely to experience uneasiness” (Goffman, 1963, p. 30).

2.2 The Stigma of Disability

People who have disabilities might be perceived by individuals in society as having lesser capacity, both mentally and physically than those living without disabilities. A lack of understanding and experience may cause these individuals to avoid interaction with people who have disabilities, or to a more extreme extent, persecute those with disabilities.

Typically all individuals will experience some degree of disability, whether it is temporary or permanent, either personally or through a family member or friend. “Out of a total population of 267.7 million non-institutional individuals, 52.6 million (or 19.7 percent) had some type of disability. The likelihood of having a disability increased with age” (McNeil). This is why it is crucial to transform perceptions of stigmatized objects into desired products, since most people will need these products at some time in their lives.

2.3 Stigma & Aging

An increasingly important stigmatized topic is that of old age. Aging almost inevitably leads to varying degrees of diminishing functional capacity which
carries negative response on both the part of the person who is aging, and younger populations surrounding them with their individual stereotypical feelings about people who are aging. Elderly people can sometimes be underestimated in the general perception of their mental and physical capacity. Consumers do not want to call attention to their aging, and would rather purchase product which is targeted at a universal audience. “Psychological and sociological factors heavily influence an individual’s willingness to use a product or service that is associated with the stigma of being ‘old’ or ‘disabled’ ” (Harper, 1995).

Most product designers are young and cannot rely on their own life experience to design accurately for others who may experience life differently. Designers need to overcome any bias they have for designing for older users, in order to design real solutions for real people. This will create a harmony between the upcoming baby boomer generation and the new era of designers entering the business.

“Born 1946-1964, Baby Boomers are used to challenging America’s assumptions and fighting for what they want… Emotional branding is about comfort, reassurance, and solutions for [the Baby Boomer] group, with the goal of further empowering this generation… Today’s brands romance the consumer and demonstrate understanding which supplements this generation’s youthful maturity.” (Gobé, 2009, pp. 3, 7)

By focusing designs to target younger generations will automatically entice older generations of people to adopt the stylish objects.
Chapter 3. Case Studies of Success

Figure 3.1. Which person has a disability?

Fifty people were asked the question 'which person has a disability' in response to the two images above (see figure 3.1). All of them responded 'the female with the hearing aid was the person with a disability.' None of them perceived
the woman wearing eyeglasses to have a disability; eye glasses have
transcended the stigma of being assistive technology, whereas hearing aids are
still widely considered a highly visual cue to having a disability.

“Eyewear is one market in which fashion and disability overlap...
glasses are often referred to as the exemplar of a product that
address a disability, yet with little or no social stigma attached. The
positive image for disabilities has been achieved without invisibility...
Wearers look forward to purchasing a new pair of glasses for the
opportunity to try something different and reinvent themselves a
little.” (Pullin, 2009, p. 15, 21)

According to Harper, objects designed for people with disabilities have merely
been assistive prosthetic extensions which, though functional, create a
psychological obstacle sacrificing the person’s dignity (Harper, 1995). In the past
two decades, designers have recognized the necessity of universal design as
the stepping stone to promoting equality among all users. “Universal design
[door levers instead of knobs, pens with grips, easily read dash displays] is
presented as intelligent innovation for all” (Gobé, 2008, p. 7). Designers can
bring balance and simplicity by creating products which accommodate users
of all physical abilities, without excluding or emphasizing people who have
different life experiences.

Eyeglasses are one example of successfully overcoming the stigma of disability
to become an object of desire. Other examples of companies which have
actively contributed to the reduction of product stigma include Target®, brand
medicine bottles, OXO Good Grips® kitchen utensil line, and the feminine care
line U by Kotex®. Thoughtful user-centered design research, product
development and intuitive product branding have elevated these product lines
above others in their field.
Chapter 4. Stigmatized Products

Controversial topics however are not exclusive to stigma. Products which are categorized within these subjects also have a stigma attached to them. This paper discusses stigma in the American culture as it is associated with disabilities, the products necessary to improve the quality of life for people with disabilities, and the emotional impact this has upon the user. It will then go further in depth with the subject of hearing impairment, looking at the history of hearing aids, current options in hearing aids, need’s of the user, trends in ear devices and accessories, and the future of hearing aids when impacted by thoughtful design.

“Within design for disabilities, where teams still tend to come exclusively from clinical and engineering backgrounds, the dominant culture is one of solving problems. A richer balance
between problem solving and more playful exploration could open up valuable new directions." (Pullin, 2009, p. xv)

A mind map was developed to identify products which carry stigma; these are all areas in which designers have the opportunity to bring about positive change. Figure 4.1 shows examples of products associated with stigma, and an index showing the level of intensity of emotions felt when buying and using those products.

![Mind map and emotion index](image)

**Figure 4.1. Stigmatized product mind map and emotion index**

Many people deal with health issues that limit their fully functional potential when performing daily activities. To have a higher quality of life, they must use personal assistive devices. The negative connotations attached to stigmatized products cause people to feel a range of emotions including isolated, depressed, incapacitated, judged and alone (see figure 4.2).
The author’s own empathic modeling experiences and interviews with users of personal assistive devices identified many common issues across stigmatized devices as a general category:

- Inconvenience
- Learning curve
- Cost is extensive
- Proper fitting
- Functionality can be improved
- Medical product appearance
- Reflection on personal image
- Physical capabilities limit use
- Indication of ageing
- Maintenance and care can be complicated
- Requires additional planning for activities
- Complicated for user
- Patience is necessary for adaptation

Many products designed for people with disabilities tend to take on the appearance of a medical device, which can call attention to a person’s disability. These include products such as urinary incontinence products and hearing aids (see figure 4.3), which will be the focus of this paper.
Figure 4.3. Visual mind map of urinary incontinence products & hearing aids
Chapter 5.  Urinary Incontinence

5.1 Introduction

This chapter includes work which has been previously published by the author in the book ‘Disability + Relevant Design: We are able’ ISBN 9781427619617 (Schneider & Youngquist, 2011, pp. 53-62). Editor Deana McDonagh and the School of Art + Design have provided permission to reprint.

This project will begin by exploring urinary incontinence (UI) in women through empathic modeling, interviews, and product reviews. It will conclude with key findings and recommendations. The goal of this is to de-stigmatize the activity of urinating; this activity is a stigmatized subject and often is left unaddressed.

People travel for many different purposes including business and leisure. Today, there are many options available to those who travel, from airplanes to cruise ships, cars to recreational vehicles, and buses to trains. Not only are these
options available, but travel is also quite affordable in its many forms. There are however restrictions to this leisure activity which limits its availability to those individuals with disabilities. According to a study of non-disabled individuals from 1992 completed at the University of Manchester, “The results show that for this sample of young adults in ‘white collar’ employment, both work and leisure are important for positive subjective states and psychological well-being” (Hayworth, 1992).

Women who use wheelchairs have challenges when traveling either alone or with an aid. When they need to avail themselves of the facilities at a rest stop, they vulnerable in needing physical help, or if traveling alone, could be imminent danger of attacks when they leave their vehicle in order to relieve themselves. This fear of being a victim could result in women with disabilities not stopping until they absolutely cannot wait any longer or they get to their destination.

Medical difficulties can ensue from delaying evacuation of the bladder including Urinary Tract Infections (UTI’s) that can lead to kidney, and bladder infections, as well as kidney stone formation and abscesses. According to the WebMD website, UTI’s are responsible for more than 7 million doctor visits per year and that 40% of women and 12% of men will experience at least one infection during their lifetime and most of these people will continue getting these types of infections (WebMD, 2010). Urinary incontinence can develop in women of any at any age; approximately 45%-50% of women ages 30-40 has experienced UI according to studies performed by the University of Bergen, Norway in 1995 (Sandvik). According to the National Association For Continence (NAFC), one in four women over the age of 18 are likely to experience short or long term urinary incontinence, brought on by child birth, sporting injury, stress or car crash (NAFC, 2010).
Though there are treatments and protection options against accidents, women are embarrassed by this issue to such an extent that they choose to remain in their homes rather than risk going out into public and having an accident.

There are social, economic, psychological and physical elements to having this condition.

“More than one half of women who have symptoms do not seek medical care... Others may feel ashamed or depressed or may avoid social or work events. Some women have the false belief that loss of bladder control is a normal part of aging” (ACOG).

A mood board was developed to help the authors communicate their understanding of the emotional distress felt by people who live with urinary incontinence (see figure 5.1).

![Mood Board Image](image_url)

*Figure 5.1. Representation of living with urinary incontinence*
A mood board is a tool used by designers as a form of visual communication of emotions and interpretations which transcend linguistic barriers which are frequently experienced with interdisciplinary projects. Images provide a basic common language to initiate conversation with all participants having an equal understanding of the problem, and allowing them to give relevant input utilizing their background and expertise.

5.2 Research

Currently, protective underwear is the most common solution to controlling embarrassing situations caused by urinary incontinence when a woman who suffers urgency and frequency cannot reach a toilet in time. Female urinals are another option offered to women who do not have access to, or are incapable of using a bathroom. These products have demonstrated poor function and form, and are generally undesired by users.

This section on urinary incontinence explores the current urinal products available for women, their deficiencies, approaches to new designs specifically for women using empathic design research methods, feedback from our user and the resulting modifications, as well as our design approach, process, and our initial design outcome.

Is there a product that we can develop that allows these women to void their bladder without getting out of their car? We spoke with two women that use wheelchairs to assess the possibility of developing a new product to eliminate the fear and other issues these women encounter by just needing to visit a rest stop during their travels. They mentioned that in leisure situations they have to locate the facilities at any venue they would be visiting and make sure there was an accessible stall in the facility. Other issues arise if they were travelling on a specific mode of transportation other than their own vehicle, such as an
airplane whereby they would need to have assistance to access the small facilities available.

According to Cornell University’s Disability Statistics, in 2008 “an estimated 8.1 percent (+/- 0.06%) of non-institutionalized, females, all ages, all races, regardless of ethnicity, with all education levels in the United States reported an ambulatory disability” (Cornell, 2010). This translates to 11,496,800 out of 142,487,100 total females in this group in the United States who reported an ambulatory disability. This report does not specify the number of women who use a wheelchair, however, all women in this group could have significant issues in accessing facilities that are not considered accessible according to the Americans with Disabilities Act of 1990 (ADA).

5.3 Case Study

Concentrating on designing our product for a specific market, we spoke with “Carrie” (name used is a pseudonym to protect the participant’s identity) who was born in Canada and has Cerebral Palsy (CP) (see figure 5.2).

Figure 5.2. Project participant Carrie
She received her Master’s Degree in May 2010 in Rehabilitation from the University of Illinois at Urbana-Champaign. She has limited mobility and uses an electric wheelchair. When asked what the normal procedure is to void her bladder, Carrie stated that she must have assistance of both a Personal Assistant (PA) and a device called the E-Z Pivot. In order to proceed to the bathroom, her PA must assist in removing both her outer and under clothing prior to assisting her onto the E-Z Pivot. The PA must then move her into the bathroom and then use the device to pivot her onto the toilet. Once positioned on the toilet she can then relieve her bladder in private. This, she said, becomes more difficult when she travels as not everyone’s idea of an accessible rest room is the same. The E-Z Pivot she currently owns is not the portable version, so she must have either her parents or a PA with her when she travels in order to use a rest room. In addition to these issues that limit her travel for leisure she feels that she can ask only one of her friends to accompany her on these excursions if she is not travelling with her family. Carrie says,

“She is the only person that I could even think of taking with me because she has the emotional and physical capabilities as well as the willingness to help me. I have not travelled anywhere other than the United States and Canada, because of these issues.”

5.4 Empathic Modeling

We began our research by speaking with Carrie, who was in our targeted user group, to determine what design features a product would need to be a viable solution to this problem. We then employed empathic modeling to understand a different lived experience from the viewpoint of a woman in a wheelchair. This began with one of the designers navigating up and down a ramp in a wheelchair. The problems associated with this exercise included placing the chair in the appropriate
position in order to move onto the ramp, maneuvering the wheelchair up the ramp and through the door, while keeping the door open, then maneuvering the chair into the building. The designer also attempted to transfer from the chair to a regular chair (see figure 5.3).

![Figure 5.3](image)

**Figure 5.3. Designer moving up and down ramp in wheelchair (top) & designer transferring from wheelchair to a bench (bottom)**

The use of empathic modeling helped the designers to discover exactly how difficult it is to move in a manual wheelchair. The designers also found that the amount of strength needed to not only move themselves in the chair but also transfer from the wheelchair to another chair was enormous.

We then began searching for urination devices made specifically for women. Many urinary devices made for women do not appear to have the correct dimensions; are made of cardboard or inferior material; do not look as if one could be used comfortably. Our findings revealed that most of the devices currently in use were not sufficient for use in a wheelchair, or by individuals with impaired motor skills. Carrie told us that she has never used a urinary device but would be willing to try one should it be convenient and portable. She would like to be able to travel to Europe without worrying about finding a restroom. She
would be pleased to be able to use a portable device which would take less time.

5.5 Existing Product Reviews

We compared products on the market to evaluate their overall efficiency, and accessibility to be used by people who have disabilities. These products are either provided by hospitals and medical professionals, or are purchased by a customer online, or in retail stores; they can range in price from $3.00 for the disposable devices, to $39.95 for the reusable containers.

Figure 5.4. Urinal and urinary device product comparison

The first products looked at were portable and made of cardboard. The Magic Cone P-Mate (B), Whizzy (C), and Urinelle (D), seem to be practical solutions, however if one does not have the dexterity to convert the flattened cardboard to the funnel type of device in order to use it properly, it is not a viable solution. Although seemingly quite functional as a “point of purchase” product at a public facility, women in wheelchairs would not be able to use these products because they cannot safely stand. The next group of products looked at were portable devices made of plastic or another “cleanable” material. The first, the “Shewee” (E) is a molded silicone funnel that incorporates an extension tube, comes with a case and is washable for easy reuse. This device is similar to the Magic Cone in function and is to be used standing up. The “Uribag” (F) is a collapsible, latex, collection bag that can accommodate 1200 ccs. of fluid and
has a snap lock cap. Additional molded or plastic devices included the Feminal (H) or Urineall, Uriwell (I), Universal Portable Urinal (J), and the Cygnet Female Urinal (K), none of which would be suitable for use in a wheelchair.

The final group of products we viewed contains a liquid absorbing component. The TravelJohn™ (L) is advertised as being a uni-sex design (a plastic bag), containing a nontoxic, odorless, and spill-proof gel in a durable plastic pouch. The solidified gel is safe for disposal in the garbage. Pipinette (M) and Pipinette Travel (N) is a plastic, lidded container. Pipinette is used standing up and the lid insures that spillage is not a problem nor is odor. The Pipinette Travel contains an added pad which absorbs liquid and within one minute turns the liquid into a solid for easy disposal. Although females could use all of these devices none of them are viable solutions for women in wheelchairs, because of their special needs (see figure 5.4, A-N).

5.6 Design Process

As a result of this research, we began thinking of ways we could provide the user with a comfortable, yet effective method of absorbing the fluid evacuated from a woman’s bladder that is self-contained, portable, durable, disposable, and able to be cleaned. In addition to these design goals, the product must be hypo allergenic, have an ergonomic form, be easily slid into and out of a pair of trousers or pants, eliminate residual liquid after voiding the bladder, be environmentally safe, and has easy user-interaction. We used a brainstorming technique called a mind map to document these project goals and discover more opportunities for improvement (see figure 5.5).
Figure 5.5. Mind map of innovation possibilities for urinary incontinence devices
In order to accomplish this we began with the products we researched to see if any of the components would be adaptable to our concept. The Pipinette Travel and the TravelJohn™ both contained the absorbency factor our product required. However, we realized that because the person using this device would be sitting constantly, we needed to come up with a design which would accommodate this factor while incorporating the gel/pad components we found in our research.

![Sketch ideation - applicators and pad.](image)

*Figure 5.6. Sketch ideation- applicators and pad.*

The initial sketches were created and further research was done to find an absorbent product that we could use in our design (see figure 5.6). After thorough research we found a possible solution in a Polyacrylate product which could absorb fluid.

The products we found to test were Snow Powder, Water Jewels, and Dri Splendor. We ran absorbency tests on the products to find the one that best suited our needs. The Snow Powder far outweighed the other products in the amount of fluid it absorbed compared to the amount of Polyacrylate used and we chose to use this for our model.
The next element was to determine how the Polyacrylate would be contained in order to provide the sanitary absorption needed. This led us to research products that would fit into the prototype such as sanitary pads and urinary incontinence pads. We looked at the makeup of several different pads including Depends, Poise, Kotex, and Always. They each had a component for which we were looking to incorporate into our design. The makers of Depends included an odor-free component while Poise also included an absorbency factor. The Kotex pads had wings to prevent bunching and a “CleanSorb” cover. The makers of Always™ included a component which absorbs 10 times its weight in fluid. The Always pads also allowed for adhesion to the tray/container, one end which was wider and wings to prevent leakage which all suited our needs. We then did an initial test to identify the amount of liquid the pad would absorb (see figure 5.7). The pad alone was able to absorb 8 oz. of liquid without leaking.

![Figure 5.7. Testing pad absorbency.](image)
We then placed two teaspoons of the Snow Powder inside an Always pad and sealed the pad with a hot glue gun to prevent the powder from escaping. We then poured liquid into the pad, 4 ounces at a time, and determined that the two teaspoons of Snow Powder absorbed a total of approximately 24 ounces of fluid without leakage.

The first functional mock-up device was created using a polypropylene tray and polystyrene tubing to provide skin protection along the sides of the tray. In order to test the urinary device we built a section of a woman’s body between the waist and lower legs, and inserted a bladder made of a balloon.

Our model, Eunice (see figure 5.8), was created to experiment with our initial device. The water used in our test was dyed blue for easy photographing. Eunice was placed in a wheelchair and once the device was prepared with the pad insert, it was inserted under Eunice. There were minimal issues with inserting
the device; however upon examining the device, Carrie observed that because she had limited movement of her legs, it might be difficult for her to maneuver it into place without assistance. The bladder containing 20 ounces of liquid was then put into place and voided into the device.

With the test concluded, we found that the pad containing the Snow Powder, although it absorbed the entire 20 ounces of fluid, expanded quite dramatically which made removal and disposal difficult as well as physically uncomfortable (see figure 5.9).

Figure 5.9. Testing functionality of prototype materials using model ‘Eunice’
5.7 Design Outcome

After refining our concept and sketches to allow for what was gleaned during our testing phase and input from our user group, our final design is a device consisting of a tray or container made from polypropylene and silicone with an absorbent pad containing a Polyacrylate to absorb the liquid and lock it inside the pad. The pad is adhered to the tray with strips of Velcro™ at the sides and front and has a segmented dry area at the back which will remove excess liquid to prevent infections and rashes. It will be available in three sizes, small, medium, and large, to fit women of different body types (see figure 5.10).

The design team will continue to refine the design and experiment with a variety of designs in order to perfect the final prototype. This will entail interaction with a company that can provide us with materials more suited to our product design.

*Figure 5.10. Sketch models and first prototype final model.*
The resulting collaboration should provide a prototype that the user group can test. Further user feedback from this personal interaction with the final prototype will provide the design team with a more extensive and perfected product to benefit the many women who use wheelchairs and eliminate their fear of being victimized while trying to enjoy an independent travel experience. Carrie is excited to try out the prototype and is looking forward to having a device to carry with her on her travels, first to Italy this summer and then wherever the mood takes her in the future.

5.8 Key Findings

After exploring the many products created for women’s urination needs, we found there was a desperate need for a portable device for our user group. Through our research we realized that in order to create a product for a specific user population we would have to employ empathic design methods to come up with a viable and portable product, which can be used with the minimum of effort and dexterity on the part of the individual using the device. Research, teamwork, ideation and experimentation have resulted in the beginning of a product which we believe will be of significant assistance to those women using wheelchairs. This initial research and ideation phase has lead the author to continue research into the intimate experience of living with urinary incontinence on a daily basis with the goal of identifying areas for improvement in bettering the quality of life for these people.
Chapter 6. Empathy in the Design Research Process

Generally, designers strive for products to satisfy users functionally as well as emotionally, and this can be achieved by integrating a blended approach to research with an emphasis on a deeper empathic understanding (McDonagh, 2008). The model in figure 6.1 was developed by McDonagh et al. (2009) and illustrates how the prior practice using the designing process involved the user towards the final development stages, while more recently users have become more involved throughout the design process from the early stages to final product feedback.

As designers shift towards more empathic designing, it has proved more effective to collaborate with users before the designing process begins, as this provides the opportunity to clarify the designing process, develop a shared language and understand between the user and designer, and ultimately
support more intuitive design outcomes (McDonagh et al., 2009). When a more empathic approach is utilized to discover and meet users’ needs, the resulting end product provides a more holistic and balanced experience for the user.

Figure 6.1. User-centered designing process (McDonagh et al., 2009)

6.1 Empathic Modeling

Walking into a store to buy a package of adult diapers is an awkward experience for the customer. The point of purchase displays are overwhelming with poor organization and a lack of privacy in shopping for an extremely personal and intimate issue. Once the customer has chosen a product and proceeds to purchase, they may have to wait in a line with people watching them until it is time for their turn to interact with a cashier, who can make them feel judged in an embarrassing situation. The person purchasing the product may not be the person using it, either due to the physical limitations of the user, or embarrassment felt at coping with the condition.

The packaging of incontinence products has the appearance resembling baby diapers, making it undesirable by adults. Opening the packaging is difficult, especially if the user has limited function in their hands. The materials used in disposable adult diapers feels cheap and rough and recently the female
product market has expanded into a few varieties of colors, most of which are purple. The size and shape of the diapers looks as uncomfortable as it physically feels. Urinary incontinence can be experienced at any age, not just the elderly population, yet adult diapers are not designed toward a young market, nor are they advertised as being for the younger generations. This could result in people of all ages being reluctant to use such products, and possibly prevent them from speaking with their physicians about this issue.

A person using protective underwear experiences many emotions throughout the day including uncertainty, fear, worry, embarrassment, relief, panic, and discomfort; this is compounded by feeling physically uncomfortable. These problems can be so severe that some people choose to remain in their homes instead of participating in social activities to avoid potentially embarrassing situations. The area of urinary incontinence products should be one for designers take seriously; if great designers address this issue, the possibilities for improvements are endless.

6.2 Empathically Experiencing Urinary Incontinence

The design researcher spent a day wearing adult diapers for 16 hours, going through typical daily activities to begin to gain understanding of the experience and emotions involved in dealing with urinary incontinence in day to day life. A photographic record of this experience is shown in figure 6.2, with the designer opening the package for the first time, attending class, running errands, cooking, and trying to relax at home. Through this experience, the designer learned much more information through firsthand experience than could have been learned from secondary research methods.

In addition to the buying experience described above, opening the packages was physically difficult as seen in figure 6.3, even for a fully functioning adult with no signs of arthritis or other debilitating illnesses.
The initial reaction to the undergarments when removed from the package for the first time was one of horror that such a clumsy and large product was widely accepted as sufficient to meet the physical needs of urinary incontinence. Putting on the garment felt awkward and uncomfortable, partly physically, and partly mentally, knowing that your body has reached a point beyond human control. Wearing the garment throughout the day made the user feel self-conscious that everyone knew about their physical issues and were quietly judging them. This greatly reduces the desire for social interaction and increases a preference to remain in the privacy of their home.
Figure 6.2. Empathic modeling experiences with adult diapers
Through this experience, the designer learned much more information through firsthand experience than could have been learned from secondary research methods.

In addition to the buying experience described above, opening the packages was physically difficult, even for a fully functioning adult with no signs of arthritis or other debilitating illnesses (see figure 6.3).

Figure 6.3. Opening UI packaging

The initial reaction to the undergarments when removed from the package for the first time was one of horror that such a clumsy and large product was widely accepted as sufficient to meet the physical needs of urinary incontinence. Putting on the garment felt awkward and uncomfortable, partly physically, and partly mentally, knowing that your body has reached a point beyond human control. Wearing the garment throughout the day made the user feel self-conscious that everyone knew about their physical issues and were quietly
judging them. This greatly reduces the desire for social interaction and increases a preference to remain in the privacy of their home.

The designer welcomed the end of the experiment and was relieved to remove the undergarment, and appreciative to not have to deal with incontinence daily at this point in her life. This experience revealed several areas in strong need of improvement:

- Design fits for a variety of styles of clothing
- (low rise/ high rise pants)
- Storage in the home
- Disposal of product
- Point of purchase displays
- Packaging displays
- Materials used
- Form
- Improvement of absorbent materials
- Marketing

While the designer will not continue discussion into urinary incontinence for the purposes of this paper, the project is ongoing and will be presented in future publications.
Chapter 7. Hearing Loss

There are four levels of hearing loss: mild, moderate, severe and profound; these are defined by the percentage of hearing loss, and the range of frequencies which cannot be heard. The National Institute on Deafness and Other Communication Disorders states,

“Audiometric testing [performed by audiologists provide] A convenient summary of the audiogram for each ear is the pure-tone average (PTA) of thresholds measured at specific frequencies.... Normal hearing for speech is observed in adults with PTAs of 25 dB of hearing loss or less. At a PTA of around 40 dB HL in both ears, most people are considered functionally impaired and could benefit from amplification. Severe to profound losses are present when PTAs are greater than 70 dB HL. At this level, hearing
aids provide limited benefit and cochlear implants may be considered” (Gates & Hoffman).

There are a few terms to describe people who live with hearing loss including deaf, hard of hearing, and hearing impaired; these terms can be viewed as being politically incorrect since they imply having a limiting disability. For the purposes of the discussion, hearing loss and hearing impairment refer people who have a degree of hearing loss which impacts their everyday life, affects their interaction with people, and would benefit from the use of a hearing aid.

Social Effects of Hearing Loss

Hearing loss can have a significant impact on a person’s sense of independence, self confidence, the ability to socially interact with others, function within the work place, and become aware of high alert situations such as fire alarms, emergency sirens and tornado warnings.

Hearing loss affects not only the person who has the impairment, but the friends, family and co-workers who surround them. Communication becomes difficult and frustrating when a person is consistently missing words or pieces of information causing the speaker to repeat them self constantly. This can lead to changes in behavior such as withdrawal from conversations and social interaction, exclusion from meetings in public settings and isolation. “Not having understood what was said in groups…I would chime in and say the same thing someone else had just said- and everyone would laugh. I was so embarrassed, I wanted to fall through the floor.” (Myers, 2000, p. 6)

Communication is a vital aspect of life for everyone to feel connected to others, and hearing loss threatens to sabotage that social engagement which is critical for people to thrive. Overtime, this can erode the individual’s confidence and can limit their personal and professional achievements.
Environments with background noise become dreaded situations, thus diminishing participation in leisure activities including going to a Movie Theater, bars, restaurants, sporting events and outdoor activity. Daily routines become more challenging with work and school as information is lost in translation. Two Hundred years ago, Ludwig Van Beethoven wrote a letter to his brothers revealing his hearing impairment.

“It was impossible for me to say to people, “Speak louder, shout, for I am deaf.” Ah, how could I possibly admit an infirmity in the one sense which ought to be more perfect in me than others, a sense which I once possessed in the highest perfection, a perfection such as few in my profession enjoy or ever have enjoyed.” (Beethoven, 1802)

It is clear that the stigma of hearing loss and the emotional response to it has not changed much in over 200 years. Today, people who have hearing loss struggle with their identity feeling like they do not fit into a hearing society, but also not belonging to deaf culture. The impairment leaves them in a state of limbo feeling frustrated, embarrassed, misunderstood, and resigned.

7.1 Case Study

The designer had the opportunity to speak with a woman who will be named ‘Nancy.’ Nancy is 33 years old, and lives in a house with her partner in Florida. She has a Bachelor’s degree in photography, and is also a theatre stage designer. The mood board is a reflection of a conversation the designer had with Nancy, who was born with severe hearing loss and has experienced growing up in a hearing world.

“Going digital, I’ve heard crickets for the first time, birds outside my window...It’s been amazing.”

-Nancy
“I’ve worn a hearing aid all my life… [Some emotions I experienced were] lonely, isolated, lost, free, open, focused, determined; these all correlate to different situations I encountered growing up” (see figure 7.1).

Figure 7.1. ‘Nancy’ & the visual translation of her emotions experienced while living with hearing loss: lonely, isolated, lost, free, focused, and determined

She spoke about the changes she encountered when switching from an analogue hearing aid to a digital hearing aid. According to this user, she could not imagine surviving in everyday life without having her hearing aid.

Why then would there be resistance to the acquisition of hearing aids if that is the sole means of regaining an active, involved existence? There are many reasons; however, the top three are appearance, admission of ageing and cost. There is an economic impact when one considers that insurance companies consider hearing to be a luxury as hearing aids are seen as a cosmetic device and do not provide coverage in their policies. Therefore
purchasing hearing aids can be price prohibitive for many, and hearing becomes beyond their means.

In 2008, only 30% of the cost of hearing aids was covered by an outside party (excluding Veterans’ Administration coverage); the other 70% was out-of-pocket payment by the consumer; the average expense for the user is $1789 per hearing aid (Kochkin) (see figure 7.2).

While the United States Government is discussing the implementation of tax write-offs for hearing aids, it will not be effective in the next year if at all. Health insurance, Government assistance, campus funding assistance, or lower payment plan installations would help relieve the financial burden hindering the adoption of hearing aids.

Figure 7.2. Cost chart of expense for consumer
8.1 Demographics of Hearing Aid Users

For the young, loss of hearing (and vision) is perceived as an outcome of aging, yet this is simply not the case. “Of the 36 million people with some form of hearing loss, only 30 percent are 65 or older” (Schacter). Figure 8.1 shows the demographics of users with hearing aids by age.

Portable music players came onto the scene in the 1980’s with the boom box. They have since evolved from the

Figure 8.1. Percentage of people by age who use hearing aids in the U.S. (Kochkin, 2008)
cassette player to the CD player, to the MP3 player, and now into the iPod. The accessibility of this technology has increased the use of headphones, and they have become very popular among children, teenagers, and young adults. Headphones and ear buds allow the listener to get lost to the world and relieve some of the stress that surrounds them. The negative to head phones is the lack of volume restriction regulations during design and manufacturing. This gives the user the option to listen to music at harmful volume levels, thus causing permanent damage to the listener’s hearing.

While discussing her experience of living in a dorm with sophomore male college students in her book ‘A Natural History of the Senses,’ Diane Ackerman states: “The diabolical noise [heavy-metal rock] didn’t seem to bother any of them…In part, they were prematurely deaf, as frequently happens these days among loud rock addicts…Unfortunately, hearing can be permanently destroyed by loudness.” (Ackerman, 1990, p. 187)

Because of the increased popularity of ear buds and headphones, people are beginning to show signs of hearing loss at younger ages. This in turn will lower the average age of first time hearing aid adopters (see figure 8.2). It is essential that the stigma of hearing aids be addressed now so that people of all ages with hearing loss will be able to enjoy the voices of their loved ones and the sounds of the world that surrounds them (see figure 8.3). The new experience with hearing aids is represented by the mood board shown in figure 8.4.

![Figure 8.2. Age of first time hearing aid adoption is growing younger](image-url)
According to the National Institutes of Health, noise induced hearing loss (NIHL) can be caused by both sudden and/or long term exposure to sound “such as an explosion, or by continuous exposure to loud sounds over an extended period of time, such as noise generated in a woodworking shop” (NIDCD). Long term exposure to sounds exceeding 80 decibels of noise can cause irreversible damage to one’s hearing. They strongly recommend ear protection when exposed to continuous noise to prevent hearing loss from occurring.
8.2 Empathic Modeling: My Own Personal Experience with Hearing Loss

My hearing loss became noticeable when I was about 16 years old. I realized I would not catch the last word of sentences first. Then certain consonants would go missing such as ‘s’ and ‘t.’ I could not tell from which direction sound was coming and would often look in the opposite direction of a person calling to me. I have more loss in my right ear than I do in my left ear, therefore I always walk on the right side of people talking to me, and I must always sleep on my right side if I want to hear my alarm in the morning. These are just a couple of the many minor adjustments I find myself making to live more efficiently with hearing loss.

As my hearing has deteriorated over the past 15 years, I have become reluctant to participate in crowded events with loud noise from all directions. I become lost, confused, frustrated, and withdrawn in these situations. I stopped attending lectures when attendance was not required because I could not hear most of the lecture when sitting in the front row and felt I would learn more from the books.

In 2003, an audiologist told me after an exam I would be a good candidate for hearing aids. At that time, I did not feel I was old enough to need hearing aids and decided to wait. In 2010, I was becoming increasingly frustrated with how little I was hearing that I was ready for the acquisition of hearing aids. I did not care what they looked like, or really what people thought. A significant barrier for me was the cost.

After the hearing exam, the audiologist started to go over the available options in technology, as well as the options for price. I was not prepared for the barrage of information he was throwing at me in a matter of minutes. What I did absorb was that there were three levels of technology available for moderate
to severe hearing loss, and each level came with a larger price tag. The cheapest unit containing low-end technology started at $1595. By contacting my insurance company, I discovered that hearing aids are considered a cosmetic luxury and would not be covered. The expense would be entirely out-of-pocket. It was at that time I decided to equip only my right ear. After some research, I made another appointment to choose and order a hearing aid. This was the next thing I was not prepared for: the amount of time involved, from the initial hearing test to the finalized adjustments for better hearing. This process for me took about 3 months of 1-2 appointments per week.

The adaptation to hearing aids takes patience, and an expectation of a period of frustration. The programming started out incorrect and had to be adjusted 12 separate times before it was comfortable and fully useful. The universally intended open ear fit for the ear insert did not work with the shape of my ear canal, so a special mold had to be made and ordered (figure 8.5).

*Figure 8.5. Ear mold for custom ear insert piece*
Because I chose to purchase only one new hearing aid, I had to learn how to hear again, and be retrained to accommodate a sudden shift in imbalance with my worse ear becoming my left side. This is a tiring process.

Slowly, I became accustomed to wearing hearing aids and over time they have become less uncomfortable to use all day. There are so many sounds I have forgotten about in the world: crickets and katydids, cats snoring (I did not know they did that), water dripping and now I can hear all of them. Additionally, I function much better in open rooms while working and enjoy going out to restaurants and bars to socialize without feeling excluded.

While I have spent most of my life concealing my hearing loss, now with my chosen career path and the success of having hearing aids, I have decided to make my disability both visible and the focus of my design research. This transforms my disability from being invisible and hidden to being celebrated and used as resource for product innovation.
Chapter 9. Hearing Aids: Past, Present & Future

9.1 History of Hearing Aids

Amplification devices have been in recorded existence at least since 850 B.C. They began as hunting and sailing equipment to better discern distant objects. In the late 18th century and through the 19th century, these tools were focused into aiding the hard of hearing; once it was proven that the deaf could be educated. There are six generalized categories of hearing aids: trumpets, tubes, concealed or camouflaged receptors, devices to increase the size and capacity of the natural mechanism, bone-conductor devices, and electrical aids (Bennion, 1994, p. 9). A visual history of hearing aids from the beginning of the 19th century to the present date is shown in figure 9.1.
Figure 9.1. A visual history of hearing aids
During this time, hearing aids were acoustic devices hand made for the individual user. There was an amazing amount of skill and craftsmanship involved in this work, using a variety of materials including silver, gold, bronze, brass, tortoise shell, and wood. They were designed to fit in with the fashion trends of the times, making the user feel stylish.

However, hearing aids did not evolve drastically until 1872 when Alexander Graham Bell was one of the first people to successfully apply electricity to the devices with the creation of a machine consisting of a transmitter, receiver, and battery. In 1902, electric hearing aids were put into commercial production (Bennion, 1994, p. 48).

Over time, they have seen an evolution from acoustic into the introduction of technology at the start of the 20\textsuperscript{th} century (see figure 9.1). This brought the trend of disguising hearing aids within other assistive devices such as canes and eye glasses.

As technology advanced, the hearing aid became purely about function, lacking attention to form and comfort. Over time they have become focused on functionality, diminishing form to a purely assistive device. The flesh tones of the casings were an attempt to disguise the device, but the size has made it stand out more as an undesirable medical product causing the user to delay purchasing the technology. This combined with the extensive out-of-pocket cost made the hearing aid a last resort when friends and family finally force the user to acquire them.

“Approximately 17\% (36 million) Americans report some degree of hearing loss. Only 1 out of 5 people who could benefit from a hearing aid actually wears one”

-NIDCD
9.2 The Current Market of Hearing Aids

Hearing aids went through major changes at the beginning of the 21st century. Manufacturers realized the need for more comfortable, smaller, and more attractive hearing aids; this became possible with advances in technology. From 2000–2010, companies such as Phonak, Siemens, and Oticon developed behind-the-ear (BTE) hearing aids which fit inside of a walnut shell, have clear tubes connecting the ear pieces, offer open fit ear inserts, and come in a wide assortment of colors (see figure 9.2). Figure 9.3 outlines the different levels of technology available in the various models, giving the consumer more options to fit their individual budget.

A comparison evaluation of one of the leading clinical dispensers and one of the leading online retailers of hearing aids was performed (see figure 9.4). This revealed that the online retailer can provide a decent product with minimal features which is affordable to the consumer. However they do not offer lifetime adjustments and other services which help the user during the adjustment period. This would lead to frustration and eventually product abandonment. The user would be more satisfied in buying a hearing aid from a clinical dispenser since they have the capability to continuously adjust the hearing levels of the individual unit until the user feels it meets all of their needs in most environments. Having this personal interaction guides a first-time user through the transition process, giving them the support necessary to accept and celebrate their new aids.

Figure 9.2. Hearing aid examples from main competitors among clinical dispensers and the internet retail market
<table>
<thead>
<tr>
<th>Features</th>
<th>Siemens</th>
<th>Phonak</th>
<th>Oticon</th>
<th>Resound</th>
<th>Widex</th>
<th>Hearpod</th>
<th>Songbird</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedback reduction</td>
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<td>Open fit ear insert</td>
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<td>Rechargeable</td>
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<td>Sudden sound damper</td>
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<td>Background noise management</td>
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<td>Wireless and Bluetooth capabilities</td>
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<td>Directional microphone</td>
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<td>Wind screen</td>
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<td>Speech intelligibility</td>
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<td>Instant adjustment to environment</td>
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<td>Sound compression of high frequencies</td>
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<td>Duophone phone signal expansion to both ears</td>
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<td>Multiple performance levels for price tiers</td>
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<td>Water protected</td>
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<td>Volume control options</td>
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<td>Voice recorded operating instructions in aid</td>
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<td>Zen sounds program</td>
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<td>📺</td>
<td>📺</td>
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<tr>
<td>Sold online direct to user</td>
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</table>

*Figure 9.3. Comparison chart of features in hearing aids from top competitors*
<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
</table>
| **Phonak** | • High quality product  
• Unique Technology  
• Effective at reducing background noise  
• Multiple price tiers  
• Blue Tooth & wireless capabilities  
• Discreet form  
• Strong global network  
• Acquisition of ReSound made Phonak #1 in market | • Small form compromises function  
• Difficult for users with low dexterity  
• High price  
• Overseas manufacturer raises cost to consumer | • Larger unit raises functionality  
• Sell directly to user  
• Work with insurance companies  
• Allow user to personalize appearance | • Main competitors: Oticon, Siemens, Widex, Audibel  
• Country economic situation  
• Health Insurance companies do not cover hearing aids  
• New market entries with lower prices: Hearpod, SimplySoft |
| **Hearpod** | • Low-cost  
• Accepts patient’s audiology exams  
• Technology incorporated offers options similar to high end hearing aids  
• Offers saving through manufacturing in house & selling directly to consumer | • No personal interaction when fitting/ adjusting  
• No channel personalization  
• Have not yet released design targeting Baby boomer generation as stated in 2006 mission  
• Not as automatic as higher priced units  
• Battery door is intrusive to design  
• Units are small and hard to handle | • Physical stores would increase interaction and comfort levels  
• Contract with hearing aid dispensers for fit and channel adjustments  
• Extensive Instructions on wear & use  
• Develop product form to better target specific audiences  
• Educational Webinars on hearing loss & family support | • Large, established competitors: Phonak, Oticon, Siemens, Widex, Audibel  
• Other internet sellers  
• Company is less than 10 years old, has not established reputation  
• Federal regulations on medical device internet sales are strict  
• American Speech-Language-Hearing Association advises against consumers purchasing through online retailers |

*Figure 9.4. S.W.O.T. analysis of a top competitor in clinic dispenser compared to a top competitor in the internet market*
9.3 Unique Concepts & Trends in Ear Wear

This is not the first project to address hearing aids as a stigmatized product in need of change. The Royal National Institute for Deaf People (RNID) sponsored an exhibit at the V&A Victoria and Albert Museum in London from 2005-2006. The ‘Hearwear: The Future of Hearing’ display was a call to world renowned designers requesting them to put forth solutions to designing a hearing aid which people would want to wear. While these concepts are purely conceptual, this initiated discussions among designers and the hearing aid industry to re-evaluate the user experience of hearing aids. Other concepts seen in figure 9.5 include noteworthy student projects and design concepts from firms developed after the RNID display.
Figure 9.5. Unique concept exploration in hearing aids
Chapter 10. Design Process

10.1 Color & Design

Color effects humans at both the conscious and the subconscious levels, and evokes intense psychological responses. “We communicate through 12 languages of the mind. One of these languages is color” (Fox, 2008, p. 266). Color theory is a well-established field of design, and is being recognized as an important attribute in the design process. Extensive research is done into the colors applied to products, taking into consideration the end user, the environment, and the activity for which the product is designed to support. This significantly impacts not only the consumer’s decision to purchase a particular product, but the emotional bond that is developed between the user and the artifact as well.
Faber Birren discusses his findings from a 30 year study he performed in his book Color & Human Response. He concludes his discussion with the results of his observations on personal color preferences, detailing each color as defining the personality of people who generally tend to prefer that color (see figure 10.1).

<table>
<thead>
<tr>
<th>Color</th>
<th>Personality traits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Outgoing, impulsive, outspoken, emotional, courageous</td>
</tr>
<tr>
<td>Pink</td>
<td>Timid, intelligent, protective, trustworthy, indulged</td>
</tr>
<tr>
<td>Orange</td>
<td>Cheerful, friendly, quick witted, boisterous</td>
</tr>
<tr>
<td>Yellow</td>
<td>Spiritual, intelligent, innovative, introspective, serious</td>
</tr>
<tr>
<td>Yellow-green</td>
<td>Timid, self-conscious, perceptive, quiet</td>
</tr>
<tr>
<td>Green</td>
<td>Friendly, active, appreciative, easy-going, conventional</td>
</tr>
<tr>
<td>Blue-green</td>
<td>Sophisticated, extrovert, self-centered, sensitive, fussy</td>
</tr>
<tr>
<td>Blue</td>
<td>Conservative, devoted, cautious, steady, loving</td>
</tr>
<tr>
<td>Purple &amp; violet</td>
<td>Sensitive, temperamental, cultured, loyal</td>
</tr>
<tr>
<td>Brown</td>
<td>Rational, responsible, conservative, observers</td>
</tr>
<tr>
<td>White, Grey &amp; Black</td>
<td>Agreeable, sophisticated, steady, mellow</td>
</tr>
</tbody>
</table>

Figure 10.1. Color preferences and the personality traits of the people generally attracted to those colors (Birren, 1978, pp. 119-126)

According to Dorothee Mella, humans’ color preferences are determined by the time they are two years old. Likes and dislikes of certain colors can change with time as experiences cause people to grow. As adults, people have a basic psychological reaction to color based on memories and experiences through their lifetimes.
Leatrice Eiseman has furthered the research into color and psychological responses by defining color as a language which can be used as a universal form of communication in her book ‘Guide to Communicating with Color’.

“Among other uses, color stimulates and works synergistically with all of the senses, symbolizes abstract concepts and thoughts, expresses fantasy or wish fulfillment, recalls another time or place and produces an aesthetic emotional response...Color adds tremendous meaning to communication as it vitalizes the visual message, delivering an instantaneous impression that is, most often, universally understood” (Eiseman, 2000, pp. 6-9).

Additionally, she discusses the application of color to a product, and the messages those colors convey to the user. This can determine the success or failure of a product as people make a judgment about an object when viewing it for as little as .3 seconds.

Color is a factor in determining the success or failure of a product, and there are endless purposes for using color as a language. The designer has a felt sense that there is a relationship between the colors to which a person is naturally drawn and an array of forms they would find visually appealing. For example, if a user’s two preferred colors are green and blue, they may be more attracted to organic and playful product forms.

This can be used to develop programs in which the user inputs their favorite colors, and the program will find a range of product options for that user. This would make the products feel as though they are designed for the user as an

“Our color choices have established a personal language of our feelings—vitality, need, motivation, security, and fulfillment” (Mella, 1988, p.16).
individual while allowing companies to mass produce the objects with a reasonable cost.

10.2 Search for User Insight

Research into the current trends shows that to the user, one of the most important features of a product is the ability to customize that object to fit their personality. “People, not machines, determine what will be produced and how. The secret to success: customization and individuality” (Gobé, 2009; p.82). User customization has been shown as a way to form a bond between the user and the object. This defined a goal for the designer: to develop a line of hearing aids which would appeal to an individual through the application of color theory to create a profile for each user’s personality. The personality profile, along with user-designer collaboration, is then used to develop an aesthetic guide to direct the product development process.

Eight people were asked the top two colors to which they were most attracted (see figure 10.2). The individual responses were recorded in the chart a compiled alphabetic list of the meanings and symbolisms associated with color and coded according to one of the two colors chosen by the participants. Figure 10.3 shows the color coding chart used to sort the information gleaned from the user surveys. This evaluation is based on information drawn from the color-personality studies done by Birren, as well as a cross referencing of extensive lists of meaning and symbolism associated with color.

Figure 10.2. Profile survey filled out by participants
developed separately by Eiseman, Mella and the website Sensational Color. Each coded list was discussed with the participant who chose the top ten character traits they felt best represented them individually. A design aesthetic was then developed from the ten traits that would define a guide to create forms that would most appeal to that participant. The aesthetics developed were educated decisions made by the designer based on forms which would best represent the individual’s personality.

For example, participant 1 listed green and orange as their two favorite colors; upon discussion with the designer, participant 1 selected the following ten character traits they felt best described them:

- Balance
- Creativity
- Enthusiasm
- Flexibility
- Fun
- Generosity
- Grounded
- Wellbeing
- Nature
- Vision

From this personality description, the designer developed a collection of terms:

- Interactive
- Playful
- Metaphor
- Clean

These terms were used to guide the form of the physical object and experience of the design to create a product which resonates with the user. Sketch ideation developed options for hearing aids according to their defined design aesthetic (see figure 10.4). Each participant selected one sketch which the designer manifested into a physical prototype for them to test (see figure 10.5).
The users wore the prototype for one day and recorded a journal to reflect on the experience and provide feedback on the design of the hearing aids. They were asked to record their daily activities, and comment on their reactions to wearing a visible assistive device, how people they encountered reacted, and if they felt the design truly reflected their personality (see figures 10.6.1 -10.6.4).
Figure 10.3. Color theory profiling: results coded by participant
Figure 10.5. Compilation of data analysis results and final chosen sketch for prototyping
“I very much like the form of this hearing aid, and I think it fits my personality. It would be something I would like to wear.”

“This design is a bit too organic and feminine for my style. Wearing visible hearing aids is kind of awkward, but didn’t notice it in after a couple minutes.”

Figure 10.6 a. User feedback on wearing their prototype (1 of 4)
“This is a neat concept which matches me, and could work, but I wish it fit my ears better to be more comfortable.”

“I think it is a brilliant idea to make [hearing aids] into jewelry, but it needs to be simple, unobtrusive, neutral and small.”

*Figure 10.6 b. User feedback on wearing their prototype (2 of 4)*
“I would enjoy wearing this design occasionally, but I would prefer a form resembling the Jawbone Blue tooth earpiece. The design of the hearing aid should have the appearance of being clean.”

“The design represents my personality - it is simple and does not have a lot of featured curves in the shape. Having objects in my ears all day is very uncomfortable.”

Figure 10.6 c. User feedback on wearing their prototype (3 of 4)
“Putting hearing aids in is one more thing you have to remember in the morning; style and use of materials will make a positive difference.”

“It is neither hard nor soft. Both thickness and thinness exist. I like its natural design and I think it represents me pretty well. It is unclear how the electronics would fit inside the design.”

Figure 10.6 d. User feedback on wearing their prototype (4 of 4)
10.3 Beckman Institute for Advanced Science and Technology
Open House

The designer had the opportunity to exhibit the research done into de-stigmatization and the resulting hearing aid prototypes at the Open House held by the Beckman Institute for Advanced Science and Technology. This experience provided valuable feedback from a public, academic, and professional audience reflecting on personal feelings on using a visible and attractive hearing aid, as well as responses on concept viability (see figure 10.7).

![Figure 10.7. Beckman Institute for Advanced Science and Technology open house exhibition](image)

There was overwhelming positive response to the concept as a way to bring about change in the expectations of the hearing aid industry. “Hearing aids that are attractive and reflect the user’s personality are a terrific idea and one that seems overdue! A powerful design concept- I hope your vision becomes a reality to the many [that] would benefit!” The Open house also provided helpful criticism to improve the functionality and accessibility of the design to reach a wider audience of people. “Some people like jewelry; I do not to, nor do most men... Hearing aids need to look more neural and could possibly resemble Blue tooth devices or headphones.”
This first generation of concepts seemed to appeal to women ages 35-60. One woman remarked, “This is an innovation to conventionalize such an unwanted stigma. I hope you find a way to make them at an affordable price…FAST! I am turning 50 this year and this is good, meaningful work!” Another woman commented, “I can’t wait to see hearing aids that are comfortable and attractive! At 50 I am already experiencing a decline in my hearing!” These comments show that women who are 50 years old do not believe themselves to be old enough to need hearing aids, just as students who are 20 years old feel. The number of people needing hearing aids is increasing and, though these thoughts may not be accurate in reality, people do not like to admit that they are aging, and with age come deterioration of health. Marc Gobé speaks about the need to design for a younger generation of users, as the older generations will be drawn to adopting the products in the image of remaining young in his book ‘Emotional Branding: The new paradigm for connecting brands to people’ (Gobé, 2009).

Many people viewing the prototypes, both men and women, were drawn to the pair worn as earrings (see figure 10.8). One man said, “My wife can’t hear anything anymore, but she is only 37 years old and hates the look of hearing aids. She would definitely buy hearing aids that she could wear as earrings!” A nurse practitioner responded, “I love the idea of taking a product that is looked at as mainly functional and letting various users add their own style.”

“This is an innovation to conventionalize such an unwanted stigma. I hope you find a way to make them at an affordable price…FAST!”
Figure 10.8. Hearing aids worn as earrings

This revealed the potential for a desire to adopt hearing aids if they have the appearance of an accessory or piece of jewelry which can coordinate with daily outfits, and look sexy while out and about on the town. This would successfully marry functionality with a product that resonates with the user.
The user feedback on their experience with the hearing aid prototypes designed to fit their unique personalities showed successes and revealed challenges to concentrate on with the next steps in the process. Upon further development, the method of using preferred colors could provide the user with personalized options for hearing aids which they would be proud to wear on a daily basis.

There are a few issues to be addressed. User’s preferences can change periodically depending on current life circumstances. This means they must have options to accommodate their mood of the day. Additionally, to sit down with each user individually using this method could be costly both financially and in time commitment. A more efficient system can be developed to quickly offer users a set number of choices which would appeal to them. This makes the
user feel as if the product were designed for them, while being able to provide these options on a mass production scale, making it an affordable and desirable process for both the user and the manufacturers.

Based on this, the goals for the second generation of the project focused on the development of a pair of hearing aids which are worn as earrings. These will consist of a universal base component which contains the electronic circuitry and the battery in a protective housing. Interchangeable attachments will connect to the base element allowing the user to express themselves through multiple designs with one electronic unit.

The earrings would attach to the user’s ears with either a clip-on or pierced backing of a hypoallergenic metal such as gold, platinum, iridium, or silver. According to the Mayo Clinic, this needs to be a metal which is not strengthened by an alloy such as nickel to have the lowest possibility of an allergic reaction (Mayo Clinic, 2011).

Currently, In-The-Ear hearings aids (ITE) are each manufactured by hand per the user’s anatomical specifications. Some manufacturers are experimenting with rapid prototyping of ITE hearing aids using a 3-D printer and this could lower the cost as it uses more machines in the process that human labor, however, the technology to manufacture ITE’s using this method is costly for manufacturers to switch. The circuitry for Behind-The-Ear hearing aids is produced by hand; however the housing and the ear inserts are generic, lowering the cost to both the manufacturer and the consumer.

The designer’s concept implements a combination of the two technologies. The electronic circuit board in the ITE allows the size of the unit to be smaller while the open fit ear insert reduces the cost of producing each custom ear mold for the user. Creating a larger base unit than would be used in ITE hearing aids could also reduce the cost for the user making the devices more accessible.
11.1 Prototyping

Utilizing the size of the electronics housed in an ITE hearing, a model was developed for the universal base unit (see figure 11.1). In this unit, there is space for the circuit board and wiring, and a battery compartment which swings open, replicating the current method of user interaction (see figure 11.2)

Figure 11.1 ITE hearing aid (left) & universal base unit for interchangeable hearing aid design (right)

Figure 11.2. Changing the battery in the new housing

Two pairs of interchangeable attachments were created to fit around the base housing. These were designed as accessories to compliment a “smart” type of attire. These may not be ideal for daily use as they are more formal, but the
purpose of this style is to catch attention to initiate conversations about the world of possibilities for change in hearing aids (see figure 11.3).
These hearing aids were intentionally designed to be larger than the current models on the market for a few reasons. First, the larger size accommodating the electronics could lower the cost of manufacturing and allow for greater amplification powers increasing the functionality of the device. Secondly, the latest fashion trends showcase over-sized statement pieces as accessories. Figure 11.4 portrays other trends in ear wear such as Blue tooth ear pieces, earrings, ear buds, and headphones. Both bold and neutral color palettes are seen throughout the 2011 fashion and product lines. Consumers are looking for products which identify them as being unique and up to date with the latest cultural fads. By offering designs which change with the evolving trends in the American culture, the user is always fashionable, creating a desire to wear their hearing aids (see figure 11.5).
Figure 11.4. 2011-2012 trends in accessories in the American culture
Figure 11.5. Modeling the new possibilities in hearing aids
Chapter 12. Key Findings

Users desire customization, versatility, and individuality in the products they consume to encourage sustainability through an emotional bond between the user and the object. The most common reason for an unwillingness to adopt hearing aids is their medical appearance, cost and an admission of aging. By developing affordable hearing aids which give the user a variety of choices to accommodate their daily situations while keeping up with the latest trends in technology and fashion gives the user control over what is viewed as a disability which is heavily stigmatized. This helps to dispel negative feelings about an unattractive device which indicates aging and physical deterioration.

Developing hearing aids using a collaborative process provides the user with customized devices which fit their unique personalities. While valuable, this method is not cost effective for the manufacturer or the consumer. Being able
to use this method on a more generalized scale would make hearing aids more accessible to a larger population.

The second generation of designs is targeted towards women ages 25-65. With further concept development this would expand into the male hearing aid market with masculine, neutral forms. The future of this generation of design is to develop forms which can be worn on a daily basis to match casual, business, and formal attire. This makes the concept more viable by encouraging daily use through attractive practicality, and gives the user versatility in their active and changing roles in life. This creates a desire for people who have correctable hearing impairment to explore the possibilities of hearing aids and experience a better quality of life. Additionally, it initiates the process of eliminating the stigma associated with the highly visual cues of a personal assistive device though an attractive and desirable hearing aid.

Figure 12.1. Final models in the second generation of design concepts
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