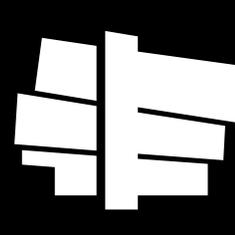
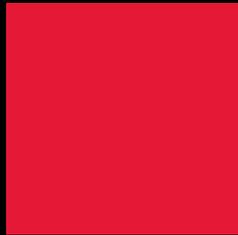
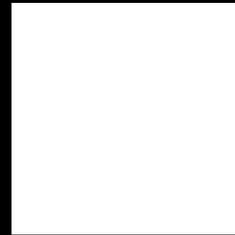
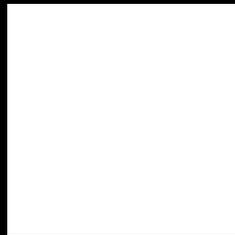
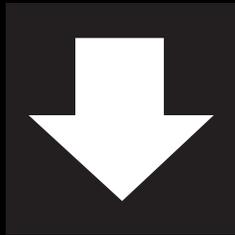
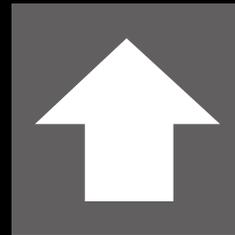
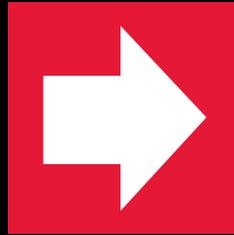


DESIGN FOR ALL



The Next Generation
Students perspective, accomplishments,
and leadership in inclusive design

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CHAIRMAN'S DESK

December 2013 Vol. 8 Num. 12

Dr. Sunil Bhatia, PhD
Founder and Chairman
Design for All Institute of India

One day I was spreading the bed sheet over the king size bed that was placed at the corner of the room that was making my movement restricted to other side of the bed and there was no one who could help. I wished that it should have spread properly with minimum efforts and as I opened the sheet for spreading I float it in the air in such way that air should help in spreading the sheet so that I could quickly manage. That day I realized the role of air for spreading sheet. Role of air in design is significant and it is used in our daily life but we never bother to know what way we are using for better outcome for minimizing our efforts. When we spread clothes in open we invariably jolt it with jerks for straightening our cloth for attaining its right shape and extra wetness should be eliminated and hang in those places where wind and sunshine are directly falling on the clothes. Clothes quickly dry as compared to where anyone of two are missing adequately. We use the same concept in dryer machine for efficient & effective results. We generate hot air and design the machine for tumbling for even drying. Once I experienced minor cut on my finger and to control bleeding I kept blowing air from mouth over bleeding so that it helped in quick clotting. I feel it is natural practice among humans to act in this manner. There is another example when we are served with piping hot food and we know it might create burning sensation over our mouths, we adjust the temperature of the food by blowing air from the mouths. In modern times we are using the air for making our product deep fried without using too much edible oil because latest scientific findings recommend that too much oil is not good for health. Philips company has designed a unique 'rapid air technology' lets us fry with air to make that is crispy on the outside and tender, taste of deep fry with little oil or no oil brushing on the food item. Vacuum cleaner is purely based on concept of air technology. I noticed that pneumatic tubes in offices or banks are used for transferring of documents from one destination to another. 'Is it not role of air significant in our lives?' Cycle pump is the simplest form of technology to use high pressure air and valve of cycle is designed in such a simple concept that it never allow the air to come out of the cycle tube. To kill the insects we spray the insecticides by spray pump. It is purely based on air technology. Pressure cooker is another product in our daily life that is designed keeping in mind how to compress the air for faster cooking. Various type of washer, hydraulic pumps have developed based on air technology. Transferring of liquid from one container to another we use either pump or siphon. Pump's

basic principle is on air and siphon works on difference of air pressure on different level of liquid. Imagine life without air. We will not survive to think anymore if air is missing.

It is not new to us. It is centuries' old practice that our iron smith or bakery men use the leather bags for air supply for sustaining fire for high degrees of heat and it is known with different names in different cultures like ballooning, bellows, blast bag or blowing bag. Such use of air was known to our ancestors and they had designed different types of separators or winnowing fans. Masons uses century's old technique of checking the leveling of floor by using air bubble trapped in water in transparent pipe. Boat men were most intelligent since they used power of air for movement of boats to minimize the manual labor by using the clothes for sailing. It was further improved by changing the directions of boats through clothes are placed against the wind. In coastal areas, sometime weather is harsh and it is not allowing to venture into sea because of threat of losing life while hunting for fish. Fishermen developed the concept of drying the fishes by hanging them in vertical bamboo structure and they do in open where sunshine as well as wind should reach. Primitive man was aware that for breathing air is required and it is good if it is not stale. Stale air adversely affects the health and sometime kills the person because of lack of oxygen content. That was the reason our ancestors designed ventilators close to the roofs that was for prevention of entry of wild animals but meet their objective of fresh air. They also designed chimneys to exhaust smoke since that could affect breathing. Clay stove is designed in such a way that fire should get uninterrupted air from fire hole placed at the bottom and cooking pot sits on three raised platform designed in such way that are placed as three vertex of triangle at the mouth of the fire. It helps in improving combustion, ventilation & efficiency.

To get the good quality of air our designers have designed various types of air filter. These filters are used in combustion engines or for air conditioners etc. Even to improve the quality and level of sound in musical membranophone percussion instruments are based on the concept of air for increasing volume & pitch of sound and it is clearly visible in sitar, tabla or bongo or guitar or any chordophones. Some instruments are designed to use of vibration for enhancing sound volume because they had understood that air medium was essential for travelling of sound and that could be used for increasing its volume. Tabla or Dholak is designed in such a way that it traps the air by placing tanned animal skin over the mouth of earthen or wood hollow drum and designed in such way that skin tightness could be adjusted to throw up to produce suitable sound effects. How can our cooking escape from air? We cook puffed chapattis or rotis, it is possible when we prepare dough balls and this act air is trapped in it and as we heat the chapattis that air expands along with moisture and leave the layer for making fluffy. Air curtain at entrance door stops chances of entering insects, dust particles and prevent escape of maintained room temperature heat toward outside different environments. It is best example that is demonstrating the benefits of air-barrier control to energy efficiency and durability, and the multiplicity of ways that this control can be achieved. Air control and air-barrier technologies are making their

importance felt in modern world and ignoring it may cost heavily to our generation. Role of compressed air plays vital role in marine engine ignition as well as in airplane and railways where traffic of public is high and toilets should be used with minimal water. In these areas designers are introducing high intensity pressurize air to make the system more efficient and better control for flushing.

Another example of air knife as a tool used to blow off liquid or debris from products as they travel on conveyors. Air knives are normally used in manufacturing or as the first step in a recursive recycling process for separating lighter or smaller particles from other components for use in later or subsequent steps, post manufacturing parts drying and conveyor cleaning, part of component cleaning. The knife consists of a high intensity, uniform sheet of laminar airflow sometimes known as streamline flow. Air is all around and each person is carrying load of air equivalent to weight of four elephants and still we are unable to exploit properly for benefit of mankind.

There are many ways to develop the application of air either we can trap or compressed or by sudden or gradual expansion or sudden releases with pressure or release it gradually in controlled manner. When Nike sport shoe manufacturer designed the sole for better performance of athletes they designed the sole in layers and one of the layers is built in such a way that it traps the air and performs as cushion that helps the athletes to do better and experience light weight shoe. Trapped air in a ball behaves as floating valve that is used for controlling the supply of water in our storage water tank placed at the roof. Air brakes in automobiles are another application. Pneumatic elevators are mostly relying on air based technology. Air leakage is a major cause of energy loss, it is noticed that much high in old houses. The role of the designer is critical. Airtight products are in demand as on today because future is volatile and population is increasing and there will be shortage of foods in the time to come. Virtually all food products must be encased in packaging to protect them from the natural environment. To preserve the same for longer time it should be kept airtight containers away from the environmental effects as well as safe from rodents or insects and it should also be for easy to its transport without spillage. The main functions of air tight packaging are protection, containment, communication, unitization, sanitation, dispensing, product use, convenience, deterrence of pilfering, and deterrence from other human intrusions such as theft, tampering etc. Another area is transportation where our designers should focus. Transportation systems of the future must adequately account for the macro changes that we are seeing in modern times as minimizing the inefficiencies that we can see in modern systems. A roadmap for such a system is emerging, and it is up to transportation system leaders and operators, governments, service providers, and the users themselves to look for new ways for all efficiency. No one can ignore the role of air. The heart of the future is air technology.

Simply using the old technology of ballooning for removal of heart blocked is not sufficient rather we should invent new technology based on air. Efficiency of combustion engine is solely based on how efficiently we use mixing of

Chairman's Desk

air with automobile oil so that unburned portion should be absent. Edison realized the role of air while designing the bulb and his invention that has revolutionized the thought process and made the classification of man before the bulb or Dark Age and after the bulb or modern man. We should also learn from our ancestor's wisdom of achieving their objective of using the winnowing fan for separation of unwanted elements in grain when air was at the slow movement and never at the windstorm or tornado. Beauty of air is that its buoyancy and thermal difference is reasons of movements are and it is not yet fully exploited by us. Air as force is on the way of tapping by our designers but by designing wind farm for generation of power is taking place. Space technologies are using air and trying to design efficient jet propeller or space engine that can go out of our known space.

It is great pleasure that we have extended our invitation to conclude the Year of student Designer 2013 to Industrial Designer Society of America Chairman Mr. George McCain and he accepted and requested Professor Sooshin Choi, MFA PEP RCA IDSA who is Vice President Education of IDSA and Director of School of Design of University of Cincinnati. Ms. Krista Alley who is attending Master of Design Program at University of Cincinnati, is the Guest Editor of this special issue. This issue is special for us because it is forth occasions of collaboration with IDSA for bringing out special issue with us and it is great time that it is concluding part of our year 2013 Student Designer and format is truly international. Our team is thankful to Professor Choi and Mr. George McCain.

We have been most fortunate in receiving the generosity, all the kindness and support of so many people from the days of inception to till today for our publication. And to all of them we express our thanks and request them to shower the same love and affections as what they did in the past and thus keep support our noble cause of spreading the concept of Universal Design/ Design for All.

Merry Christmas and Happy and prosperous New Year 2014.

We have declared year 2014 A year of women designer and we are happy to inform our readers that our most of the months of special issues are already committed by women Guest Editors.

With Regards

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FORTHCOMING ISSUES

Women Designer Year of 2014



IMMA BONET

January 2014 Vol-9 No-1

Imma Bonet, Executive Patron of Design For All Foundation, has accepted the invitation of Guest Editor for our inaugural issue of our declared new series for highlighting the contributions of women in social movements of Design For All/ Universal Design.



DR. LALITA SEN

February 2014 Vol-9 No-2

Dr. Lalita Sen, Professor Urban Planning and Environmental Policy, Ph.D., Northwestern University, SPA/COLABS BLDG SUITE 402F

Areas of Specialization: Accessibility, Accessible Transportation and Mobility for Seniors Disabled, Housing, Accessible Tourism, Universal Design, Emergency Management of Vulnerable Population, Application of GIS in Spatial Analysis and Community Development, International Policy on Accessible Transportation, Smart Growth and Health Service Planning, International Policy on Accessible Transportation

FORTHCOMING ISSUES

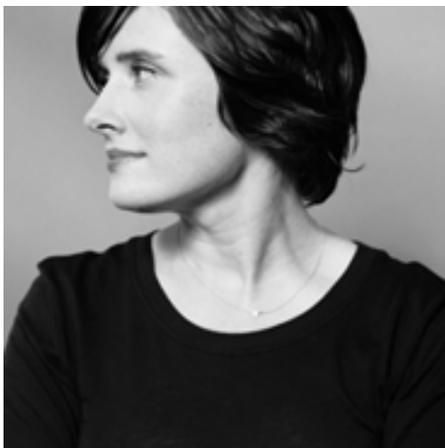
Women Designer Year of 2014



DR. MARGARET H. TEAFORD

March 2014 Vol-9 No-3

Dr. Margaret H. Teaford, PhD , Honors Director ,Associate Professor-Clinical, School of Health and Rehabilitation Sciences, The Ohio State University would like to focus on assessing the needs of women in designing environments and applying Universal Design. And she will be the Guest Editor of special issue.



DR. LALITA SEN

April 2014 Vol-9 No-4

Valerie Casey is a globally recognized designer and innovator. She is the Founder of the global social impact NGO, The Designers Accord, and the CEO of the US-based innovation consultancy, Necessary Projects. Casey was named a “Guru” of the year by Fortune magazine, a “Hero of the Environment” by Time magazine, a “Master of Design” by Fast Company, and one of the “World’s Most Influential Designers” by BusinessWeek. The World Economic Forum has honored Casey as a “Young Global Leader.” She will be Guest Editor of this issue focusing on women, design, and social impact.

FORTHCOMING ISSUES

Women Designer Year of 2014



MITZI BOLLANI

July 2014 Vol-9, No-7

Mitzi Bollani, Architect, Sculptor & Product Designer. She runs her own Architectural & Design Practice based in Piacenza since 1978, and focuses her work on the research of the psychological well-being for the users of her projects, acting as a primary target accessibility and safety for all individuals. Mitzi Bollani is one of the founders of the “Design for all” concept that she applied the first time in Genoa: “Civis Ambiente – Accessible mobility in the Historical Centre”: starting from the needs of people with activity limitation such as physical, sensory and mental or cognitive limitation, spaces, buildings and products were designed to be easily accessible to all, without losing the aesthetic value and above all without incurring in additional costs.



YASMEEN ABID MAAN

August 2014 Vol-9 No-8

Ms. Yasmeen Abid Maan, Assistant Professor, City and Regional Planning Department, LCWU Lahore College for Women University (LCWU), Jail Road, Lahore, Pakistan, is nominated as a Guest Editor and key Note will be by Prof Atiq Ur Rehman.

Ar.Yasmeen Abid Maan. Assistant Professor at Department Of City & regional Planning, Lahore College for Women University, Lahore, Pakistan.(Registered Member , Pakistan Council of Architects & town Planners.

With over ten years’ experience in architectural design, I have exceptional skills and experience in planning, detailing, designing and coordinating projects both in the public and private sectors. My communication, problem-solving and leadership skills, combined with knowledge of theory and practical subject teaching, make me a highly valuable instructor in both Architecture and City & regional Planning department.

FORTHCOMING ISSUES

Women Designer Year of 2014



LYLIAN MEISTER

September 2014 Vol-9, No-9

Prof Lylian Meister, Dean of the faculty of design at Estonian Academy of Arts, Estonia, will be the Guest Editor. This issue will be about Design for All field research and outcomes in Estonia.

GUEST EDITORS

December 2013 Vol. 8 Num. 12



SOOSHIN CHOI

Sooshin Choi is the Director of School of Design and Associate Professor of Industrial Design at University of Cincinnati. He studied industrial design and transportation design at Seoul National University of Technology, Hongik University Graduate School, Royal College of Art, and The Ohio State University. Before joining UC, he worked over 25 years as an automotive designer at Daewoo Motors and Kia Motors, design director at Fursys and Iloom, and innovative design director at DEKA Research and Development in New Hampshire, USA. He was involved in a number of vehicles, furniture projects, and innovative products such as iBOT Mobility System.

He has been teaching industrial design studios, theory of industrial design, and universal design seminar at University of Cincinnati since 2003. His research focuses include product innovation and inclusive design, and he has been an active speaker at institutions and conferences in Canada, Japan, Sweden, Mexico, China, Korea, and in the USA.

Sooshin also has been actively serving the design community in various capacities - Vice Chair of Southern Ohio Chapter of Industrial Designers Society of America (IDSA), a member of Korea Industrial Designers Association (KIDA), US Director of Korea Society of Design Sciences (KSDS), and Founder and Moderator of Korean Designers in America.



KRISTA ALLEY

Problem solving and the opportunity to extend her knowledge, gives Krista Alley the most contentment in any situation. That and her creativeness is what strived her to earn degrees in both Industrial Design and Integrated Strategic Communications at the Ohio State University in 2010. Although she has been exposed to designing various types of products, she is mostly interested in medical devices because of the deep empathy needed for its intended users and to her, is a field that comes with an exciting challenge.

Krista has been an active member of the inclusive design community presenting and publishing for several conferences, including the I2P conference at Purdue University in West Lafayette, Indiana and the Include 2011 conference at the Royal College of Art in London, England.

Currently, Krista is pursuing a Master's of Design at the University of Cincinnati with a focus on medical device design. Passionate for proving the value design has on usability within the medical device industry, for her thesis, Krista is "Defining the Role of Industrial Design within the ISO/IEC 62366 (Usability Engineering Process) Standard."

AUTHORS

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ALEX BROERMAN

Fueled by a relentless optimism kept in check by a stern inner critic, Alex Broerman brings these opposing forces to bear on whatever his current creative outlet happens to be. An industrial designer by education, Alex graduated from the University of Cincinnati in 2012 after interning in various design studios across the US, including Ethicon Endo-Surgery, TEAMS Design, and Continuum Innovation. Since graduating, Alex moved to Boston to take a full-time position as a product designer at Continuum, where he works for a wide variety of clients in both medical and consumer categories.



AMANDA BOLTON

Amanda Bolton is a recognized designer for her efforts in inclusive design. Having previously worked for companies including Procter and Gamble & Johnson and Johnson, Amanda's professional, scholastic and social experiences contribute to her design philosophy.

"Every product [design] has the opportunity to include or exclude persons. Inclusive design emphasizes designer contribution and that understanding user diversity is a better way of thinking than just designing pretty products... the most rewarding thing about industrial design is that rarely will you design something for yourself--It will always be for someone else. Passion and empathy spliced with design is what makes a good product."

Amanda is a recent graduate from the University of Cincinnati, School of DAAP, and currently works for Design Central, a product design consultancy in Columbus, Ohio.

AUTHORS

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IMAN HASAN

With a personality full of energy and passion, Iman Hasan continues to take the opportunities that would let her satisfy her passion and love for design. A graphic designer by education, Iman graduated from Cincinnati State Technical and Community College in 2009 with a graphic design associate degree and bachelor's in media informatics from Northern Kentucky University in 2011. Iman has different career and intern experiences, from working at Zone CG, a media production company, in Cincinnati in 2009 to cooping at Children's hospital in 2013. Iman is a second year graduate student in the Master of Design program in the college of design at the University of Cincinnati where she is researching the effects of storytelling on bringing new innovations to the education system.



PHYLLIS BORCHERDING

Phyllis Borcharding is an Associate Professor of Fashion Design at the University of Cincinnati. Her research is primarily in Inclusive Design, Design Research Methodology and Product Development. Her recent research projects have involved future textile and apparel needs of the baby boom generation.

AUTHORS

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BHOOMA SRIRANGARAJAN

Bhooma Srirangarajan was born in India. After the age of 8, she has spent most of growing years in the United Arab Emirates and finished her undergraduate education from the American University of Sharjah. She enjoys music, art and reading. Currently, she is pursuing her Masters' in Design in the University of Cincinnati. Graphic Designer by profession, she is interested in the concept of universal design and enjoys working in interdisciplinary teams.



CAROLINA LEYVA

Curious and eager to learn, Carolina has always explored the boundaries between design and other disciplines, pushing the limits, finding new connections and possibilities, and building collaborative relationships with other areas. Industrial designer graduated from Universidad Javeriana (Colombia) in 1997, dedicated her next 12 years as a consultant in visual, communication and strategic design for both, public and private sectors in Colombia, US, and Oman.

Fulbright scholar 2011, recently graduated with her Master's of Design at the University of Cincinnati, after developing multiple collaborative projects in areas such as health, communication, consumer products and service categories.

Her current work focuses on understanding empathy and its impact in the design process, as well as its repercussion on product quality and the stakeholders' experience. Carolina has recently moved back to Colombia and works as a faculty member at The Universidad Javeriana in Bogota, and as a design consultant in innovation, communication, and design research.

EDITORIAL

December 2013 Vol. 8 Num. 12

Krista Alley
Master of Design in Industrial Design
University of Cincinnati

“With great power, comes great responsibility.” I apologize for the cliché of the overused line from the *Spiderman* movie, but I could not think of a more appropriate way to summarize what’s awaiting the next generation of designers. Design students do not realize the potential they have for persuading socially responsible solutions as future creative professionals. As designers, we are part of the growing generation of “culture creatives” and according to sociologist Paul H. Ray and psychologist Sherry Ruth Anderson’s book titled, *The Cultural Creatives: How 50 Million People Are Changing the World*, we are not alone. It will be through this movement and its new recruits, our students, that all future ideas and decisions will be made.

With so many influential minds in today’s society and special interest from institutions that drive the global social innovation agenda, such as the Rockefeller Foundation, Google, and the Bill & Melinda Gates Foundation, why haven’t we seen a large cultural shift already? The short answer is money. Marketability and profitability are still the driving factors that obstruct innovation. We all want to save the world, but how can we influence change when the market has never been more competitive as it is today?

...And the short answer to that is *inclusivity*.

As design educators, we engage our students in creating a positive impact on the quality of life by designing for all users regardless of physical or cognitive ability or differences in culture, gender, or age. However, a truly inclusive idea not only accommodates to the use of a wide audience, but also appeals to all. A solution that allows a larger market to benefit from and enjoy its use will create greater desirability and distribution.

With the so-called “design thinking” and user centric approach more companies are adopting today, you would think it would be known to companies that by limiting their products and services, they were missing out on other potential consumers. “Design thinking” within businesses motivates creativity and drives innovation. However, most businesses who implement “design thinking” as an innovation tool are disregarding the key element of how designers truly think, and that is *empathy*.

In the creative world, empathy is an essential skill developed in design education. It is defined in an article later featured in this issue, as “the ability step in and out of another’s viewpoint by recognizing, understanding, and sharing their feelings, without losing one’s own perspective, and responding with the appropriate behavior, that in case of designers, translates to the appropriate [design]” (Leyva, 2013). It is because of a lack of empathy in business leaders that many products and services fail to be inclusive. By increasing empathetic understanding among decision makers, designers can increase the awareness other potential consumers that may have otherwise been overseen. In addition, a deep understanding of what consumers really want or feel can create greater insights resulting in more differentiating solutions. With technology becoming more easily obtainable and more a commodity, empathy and inclusivity will be the new drivers to innovation.

True inclusive design has grown further than its architecture and industrial design origins. Not only does the approach span across all creative disciplines, such as visual communication and textile design, but it has also transformed into a new form of designing thinking and strategy. This special issue will showcase how students and educators from the University of Cincinnati are progressing the inclusive design movement within marketing strategies, cross-disciplinary collaboration, macro-system design, universal communication systems, classroom culture, innovation tools, and teaching empathy.

MARKET FRIENDLY INCLUSIVE DESIGN

Bringing Inclusive Design To The World Successfully

Sooshin Choi
Director of School of Design
University of Cincinnati

Krista Alley
Master of Design in Industrial Design
University of Cincinnati

1. Abstract

Inclusive design is not inclusive enough. Successful inclusive design should have the benefit for the business as well as the users in mind. The beneficial aspect of inclusive design can only enhance society if it has the potential to drive profitability in the commercial market. Many innovative and socially beneficial inclusive design solutions do not leave the concept phase because of a lack of measurable market value. In most cases, designers do not see the business potential or have the ability to communicate the business opportunities in their designs.

The solution would be guiding designers to see the market value of inclusive design from the early stage of the design process. However, most designers are not well trained for it and most design curricula do not prepare the students to be aware of the value finding and proposition. Therefore many designers fail to develop or prove the benefit of the designs.

Using examples of inclusive design profitability, case studies and surveys are conducted to understand the success and failure in processes used and to gain insight of the challenges faced. This research explores the value of business thinking as part of the design process and how it can help break the industry driven barrier between inclusive design and society. The paper includes a sample design process with a built-in tool for designers to consider while developing inclusive designs.

2. Introduction

As designers, or design educators, we have a social responsibility to create a positive impact on the quality of life by designing for all users regardless of physical or cognitive ability or differences in culture, gender, or age while having little-to-no impact on the environment. In recent years, the design process has evolved to include these forward thinking ideas but designers are still facing the challenge that many innovative and socially responsible solutions do not go through to production because of a perceived lack of market value. A research study conducted by the University of Cambridge and IBM's TJ Watson Research Center, found "The top two barriers from manufacturers are 'lack of business case' and 'perceived sacrifice of aesthetics.'" (Hua, Keates, and Clarkson, 2004). This may be due to the fact that many products

Market Friendly Inclusive Design

used by those with an ailment or disability are products specifically designed for that user group with more attention paid to its functionality rather than its appeal. *Figure 1* shows an example of a telephone and cellphone designed for low vision users. This example is a common misconception of what one may think of an inclusive product. Rather than adapting current phones to include users with low vision, separate products are created that just “slap on” large buttons onto the user interface, resulting in an unattractive device strikingly different from the everyday norm.



Figure 1: Failed Inclusive Design

“Lifestyle aspirations are held by a widening age group, with a vast range of abled and less abled people having the same desires, and wanting the same products.” (Anonymous, 2002) Those less abled want to be able to use the same stylish products as everyone else. However, many of the mainstream products are produced without inclusivity in mind, resulting in products that are difficult to use. This is where products fail. By creating products that are functional yet unattractive, or stylish with low usability, the industry is creating a significant loss in opportunity. A great example of this loss is in the Baby Boom market. One out of every four people in the United States are currently age 50 or older and account to over half of all expendable income (Administration on Aging, 2011). By creating products that cater to limitations of the aging population such as low vision, mobility, and dexterity in addition to creating an overall appeal, manufacturers have the potential to expand their market to an unthought-of range that could increase revenue considerably. One company who took advantage of this opportunity and is the leading example of successful inclusive design is Oxo Good Grips.



Figure 2: Successful Inclusive Design

Although the inspiration for the Good Grips product line was his wife's arthritis, entrepreneur Sam Farber was committed in creating mass-market appeal in Oxo's products from the beginning. In an interview with Design Council, Farber explains "We wanted to appeal to the broadest possible market, not just a very specific market of arthritics and the infirm. Why shouldn't everyone who cooks have access to comfortable, attractive tools?" (n.d.) Faber succeeded in the opportunity to not only help those with limited dexterity, but also created more comfortable tools that everyone could use.

3. Making a Successful Product

So what was it that made Farber's Good Grips so successful? To discover this answer, case studies were conducted on Oxo Good Grips along with 10 other successful companies ranging from houseware products to universal icon systems. Each company participated in a survey that explored the thought process and reasoning behind certain design decisions.

From the results, there were several notable discoveries. The most prominent, was a unanimous agreement that participants thought about possible business opportunities along with the inclusive solution of their products. Surprisingly, this business consideration did not occur during a specific part of the design process, such as during the beginning research phase or back-end marketing phase as assumed, but rather occurred throughout the design process. In addition, when asked which was easiest to persuade business partners, the ethical need or business impact, the results were surprisingly even.

The survey results were then compared with student answers, who participated in a similar survey, to determine their familiarity with inclusive design and its business potential. The 30 students who participated were able to correctly define inclusive design, but when asked to provide examples of inclusive products with strong business potential, the majority of examples given were of products that had little inclusivity. Being that the University of Cincinnati has a strong reputation for its co-op program, it was surprising to see the students' perspective of the "real design world." *Figure 3* shows an example comparing survey results from both professional and student participants asking them to rank a list of possible decision considerations in importance to their design's goal.

Rank considerations in importance to initial goal

| Professionals | Students |
|--------------------------|--------------------------|
| 1. User Experience | 1. User Experience |
| 2. Innovation | 2. Problem Solution |
| 3. Problem Solution | 3. Innovation |
| 4. Environmental Impacts | 4. Inclusive Design |
| 5. Inclusive Design | 5. Society Value |
| 6. Market Value | 6. Market Value |
| 7. Society Value | 7. Environmental Impacts |
| 8. Social Impacts | 8. Social Impacts |

Figure 3: Ranked Decision Considerations

Market Friendly Inclusive Design

Each group of participants ranked the user experience as the most important consideration when designing a product, but ranked inclusive design only fourth. It was believed that this was because “User Experience” was understood as the quality of using a product to all potential users. But wouldn’t this be a factor of inclusive design also? If it is agreed that it is the user’s experience that drives business value, inclusive design should be marketed as part of that user experience.

4. Creation of a Tool

In 2003, the Center for Universal Design at North Carolina State University released the designers’ version of the Universal Design Performance Measures for Products, the guide to Evaluating the Universal Design Performance of Products. The purpose of the guide is “...to provide a procedure for evaluating how well products satisfy the Principles of Universal Design and their guidelines.” The tool is helpful in promoting inclusivity during decision making and evaluation of concept development or when comparing existing products. *Figure 4* lists the seven Principles of Universal Design and their 29 associated guidelines.

Each of the 29 guidelines listed are statements that “guide assessment of the usability of products by people with a diverse range of capabilities and in a wide variety of circumstances.” The Universal Design Performance Measures for Products guide is utilized by marking boxes to indicate how much you agree or disagree with each statement. *Figure 5* shows the example provided in the tool.

| PRINCIPLE ONE EQUITABLE USE | | Not Applicable | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree | Comments |
|-------------------------------|--|----------------|-------------------|----------|---------|-------|----------------|--|
| 1A. | All potential users could use this product in essentially the same way, regardless of differences in their abilities. | | | O | X | | | |
| 1B. | Potential users could use this product without feeling segregated or stigmatized because of differences in personal capabilities. | | | O | | X | | O: The voice output needs a headphone jack. X: The headphone jack could be better integrated into the overall design. |
| 1C. | Potential users of this product have access to all features of privacy, security, and safety, regardless of personal capabilities. | X | | | | | | |
| 1D. | This product appeals to all potential users. | | | | X | | | |

Figure 5: The Universal Design Performance Measures for Products usage example.

In the example above, the “X” and “O” symbols represent assessments of different products. You may find it useful to “connect the dots” (omitting those Measures that are Not Applicable) to create a graphic map of your assessment of each product against all the Performance Measures. The shape of each line will indicate an overall trend and emphasize particular strengths and weaknesses of that product. The resulting line will make it easier to compare different characteristics of the same product as well as the same characteristic of comparable products.

In order to implement business thinking into the design process, findings from the surveys were cross analyzed with common marketing strategies to look for patterns and themes. The noted themes were then summarized into five statements to include into a new eighth Principle of Universal Design: Market Value. *Figure 6* lists the eighth principle.

| PRINCIPLE ONE EQUITABLE USE | | Not Applicable | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree | Comments |
|-------------------------------|---|----------------|-------------------|----------|---------|-------|----------------|----------|
| 1A. | All potential users could use this product in essentially the same way, regardless of differences in their abilities | | | | | | | |
| 1B. | Potential users could use this product without feeling segregated or stigmatized because of differences in personal capabilities. | | | | | | | |
| 1C. | Potential users of this product have access to all features of privacy, security and safety, regardless of personal capabilities. | | | | | | | |
| 1D. | This product appeals to all potential users. | | | | | | | |

| PRINCIPLE TWO FLEXIBILITY IN USE | | Not Applicable | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree | Comments |
|------------------------------------|---|----------------|-------------------|----------|---------|-------|----------------|----------|
| 2A. | Every potential user can find at least one way to use this product effectively. | | | | | | | |
| 2B. | This product can be used with either the right or left hand alone. | | | | | | | |
| 2C. | This product facilitates (or does not require) user accuracy and precision. | | | | | | | |
| 2D. | This product can be used at whatever pace (quickly or slowly) the user prefers. | | | | | | | |

| PRINCIPLE THREE SIMPLE AND INTUITIVE USE | | Not Applicable | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree | Comments |
|--|--|----------------|-------------------|----------|---------|-------|----------------|----------|
| 3A. | This product is as simple and straightforward as it can be | | | | | | | |
| 3B. | An untrained person could use this product without instructions. | | | | | | | |
| 3C. | Any potential user can understand the language used in this product. | | | | | | | |
| 3D. | The most important features of this product are the most obvious. | | | | | | | |
| 3E. | This product provides feedback to the user. | | | | | | | |

| PRINCIPLE FOUR PERCEPTIBLE INFORMATION | | Not Applicable | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree | Comments |
|--|--|----------------|-------------------|----------|---------|-------|----------------|----------|
| 4A. | This product can be used without hearing. | | | | | | | |
| 4B. | This product can be used without sight. | | | | | | | |
| 4C. | The features of this product can be clearly described in words (e.g., in instruction manuals or on telephone help lines). | | | | | | | |
| 4D. | This product can be used by persons who use assistive devices (e.g., eyeglasses, hearing aids, sign language, or service animals). | | | | | | | |

Figure 4: Principles of Universal Design and Guidelines

Market Friendly Inclusive Design

| | | Not Applicable | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree | Comments |
|--|---|----------------|-------------------|----------|---------|-------|----------------|----------|
| PRINCIPLE FIVE TOLERANCE FOR ERROR | | | | | | | | |
| 5A. | Product features are arranged according to their importance. | | | | | | | |
| 5B. | This product draws the user's attention to errors or hazards. | | | | | | | |
| 5C. | If the user makes a mistake with this product, it won't cause damage or injure the user. | | | | | | | |
| 5D. | This product prompts the user to pay attention during critical tasks. | | | | | | | |
| PRINCIPLE SIX LOW PHYSICAL EFFORT | | | | | | | | |
| 6A. | This product can be used comfortably (e.g., without awkward movements or postures) | | | | | | | |
| 6B. | This product can be used by someone who is weak or tired. | | | | | | | |
| 6C. | This product can be used without repeating any motion enough to cause fatigue or pain. | | | | | | | |
| 6D. | This product can be used without having to rest afterward. | | | | | | | |
| PRINCIPLE SEVEN SIZE AND SPACE FOR APPROACH AND USE | | | | | | | | |
| 7A. | It is easy for a person of any size to see all the important elements of this product from any position (e.g., standing or seated). | | | | | | | |
| 7B. | It is easy for a person of any size to reach all the important elements of this product from any position (e.g., standing or seated). | | | | | | | |
| 7C. | This product can be used by a person with hands of any size. | | | | | | | |
| 7D. | There is enough space to use this product with devices or assistance (e.g., wheelchair, oxygen tank, or service animal). | | | | | | | |

Figure 4: Principles of Universal Design and Guidelines

| PRINCIPLE EIGHT MARKET VALUE | | Not Applicable | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree | Comments |
|--------------------------------|---|----------------|-------------------|----------|---------|-------|----------------|----------|
| 8A. | This product has an aesthetic that promotes value. | | | | | | | |
| 8B. | This product has competitive advantage in market. | | | | | | | |
| 8C. | Product will be profitable after considering manufacturing and marketing costs. | | | | | | | |
| 8D. | This product clearly communicates the user's benefit. | | | | | | | |
| 8E. | The user need is great enough that product is worth pursuing. | | | | | | | |

Figure 6: Eighth Principle of Universal Design

5. Tool Implementation

Once the new principle and guidelines were created, a small scale test was conducted to evaluate the comprehension and success rate of the tool. Ten graduate design students were recruited to participate in the testing. Each student was asked to evaluate an existing product using the original Universal Design Performance Measure for Products guide and identify key areas to help improve the inclusivity of the product. For this example an electric pencil sharpener was used. Then taking 30 minutes, each student was asked to roughly redesign the product using the new opportunities discovered on the checklist. Once redesigned, the students were then asked to reevaluate their new concepts using the new eighth Principle of Universal Design. Then taking another 30 minutes, the students were asked roughly redesign their new concept considering any new market value opportunities discovered. Figure 7 shows examples of testing results.

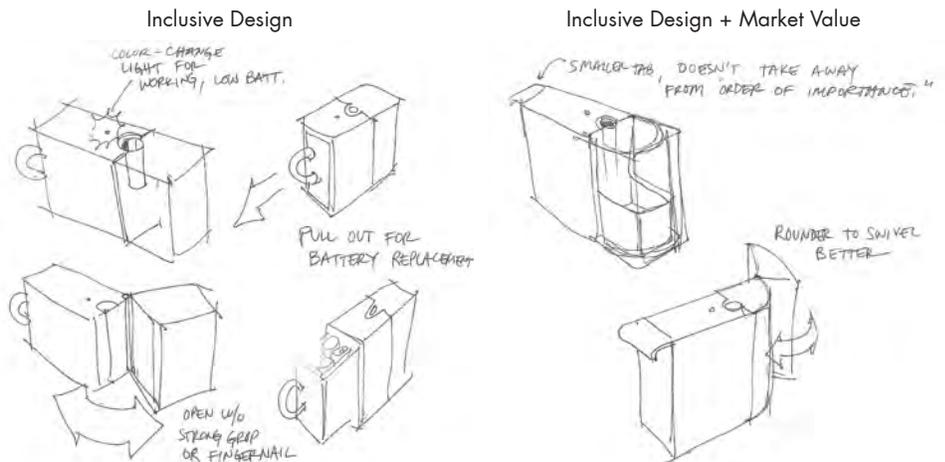


Figure 7: Tool Testing Example

The student in the example above began the assignment by exploring areas for improvement. Notes left in the comment section of the Universal Design Performance Measures for Products guide suggested that the student found room for improvement in the flexibility, intuitiveness, and the perceptual information of the pencil sharpener. The first redesign of the pencil sharpener included a notification light that indicated the status of the pencil sharpener, such as when in use or low battery, an easy pull-out tap for battery replacement, and a less forceful way to open the compartment containing pencil shavings. The student also took into consideration the safety of using

the pencil sharpener. The opening for the pencil was designed in a way that prevented small fingers from entering and potentially being cut.

When asked to incorporate the eighth Principle of Universal Design, the student felt the market value of the pencil sharpener could be improved by changing manufacturing material and pointed out that the commodity of the product may not warrant complex features that add to cost. After reevaluating the first concept, the student revised the pencil sharpener making the newly added features more incorporated into the visual language of the product. The tab used to open the battery compartment was made smaller, yet still easy to grip, and opening to the pencil shavings compartment was rounded into a half-circle, making the hinge straight and easier to swivel. The student also took the aesthetic of the pencil sharpener into consideration, making the revised pencil sharpener more attractive than the first.

6. Next Steps

Feedback was provided from the graduate students to help simplify the assignments using the tool. Once revisions are made, we would like to implement and test the tool on a larger scale among undergraduate students. If proved successful, we would like to further the tool into a studio based project promoting inclusive design.

7. Conclusion

The barrier between inclusive design conceptualization and society introduction can be broken if designers communicate the value of their designs by finding the value of business and social impacts and applying them within the design process. By marketing inclusive design as a benefit of the user experience, designers will have greater success in progressing their designs into production. Further study will be needed to determine if the eighth Principle of Universal Design addition to the Universal Design Performance Measures for Products guide is the right tool to create this persuasion.

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TOUCH TO SEE

Designing tactile pill bottles for low-vision users

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1. Abstract

What is “inclusive design”? It is not, of course, designing for one disability at the expense of other disabilities, nor does it ignore the needs of the majority. In its ideal form, inclusive design appeals to all. When our team set out to design a prescription pill bottle for low-vision users, the issues brought to light in research and testing were not simply the issues of the vision impaired alone (though they often experienced the problems most severely). The issues were inherent--though perhaps less obvious--across nearly all use scenarios.

In this article, I will share the experience of working in a collaborative capstone project that encourages true inclusivity. Our team, pairing interaction and industrial design skillsets with a user-centered process, was ultimately able to improve pill bottle differentiation and ease-of-use for low-vision users while also creating solution attractive to a wide range of users.

2. Background

For the blind, differentiating between prescription pill bottles can be difficult, and often times impossible. Additionally, the consequences of taking incorrect medications can be disastrous. Recognizing this issue, there are already several pill bottles on the market that are sold as solutions “for the blind.” Most of these products rely solely on aural feedback to identify and describe the medication to the user. These systems are costly and can be quite intimidating to vision-impaired users who may not be particularly tech savvy. In fact, the majority of the low-vision population is considered elderly. Possibly the worst failing of the current solutions is the fact that none provide a way to recognize the bottles in the manner that is most natural to the vision impaired: tactile feedback.

The American Foundation for the Blind provides low-tech, tactile-based suggestions for vision-impaired users to help differentiate between objects of similar shape and size. These methods include rubber bands wrapped around objects, tape, and Braille labels for those who can read Braille. Unfortunately, only about 10% of the blind population can actually read Braille, as most have become blind and severely vision-impaired later in life (NFB, 2009).

This project centered around creating a tactile-based pill bottle set that considered the issues of the vision-impaired community, while remaining highly accessible to the general population. The redesigned pill bottles pair a series of textures and colors to assist in differentiation, as well as an improved bottle architecture, created based on the unique needs of visually-impaired users.

3. Discovering the Problem

My partner in this endeavor, fellow student and interaction designer Ashley Ma, began developing the framework of the project a few months before I joined on. Ashley initially became interested in designing for the blind when she was introduced to the story of Emilie Gossiaux, a friend of a friend, who had been in a horrible bicycle accident and was left suddenly blind. Her experience was a tragic yet inspiring case, putting the difficulties vision impairment on Ashley's radar in a big, sudden way. Soon after realizing she wanted to find a way to help the blind community, Ashley began a detailed background investigation to find a more specific issue that could be tackled in the limited timeline of our 20-week university capstone project.

It all began with meeting Dr. Terry Schwartz, Director of Pediatric Ophthalmology & Adult Strabismus at Cincinnati Children's Hospital, who encouraged her that the project was worth undertaking, and also put her in touch with Darren Burton, a National Program Associate for Technology at the American Foundation for the Blind (AFB), in Huntington, West Virginia. Darren has been blind since he was about 20 years old, and oversees and tests new technology and products being designed for the low-vision community. He gave invaluable insight on the current state of products for the vision impaired—not only the failures, but also the successes, such as the Accessibility feature on the iPhone.

Ashley continued to reach out to various blind and vision-impaired individuals, interviewing them to form a broader picture of the unique challenges and common issues within their everyday lives. Ultimately, the issue that truly resonated was that of quickly differentiating between objects of the same shape and size. It was also around this time that she posited the idea of using textures to assist identification, utilizing the sense most natural for the vision-impaired. Realizing that creating a solution would involve a significant physical component, she reached out to me for my expertise in product design and physical prototyping.

4.1 Process: Collaboration

Before our collaboration started, Ashley was studying Digital Design at the time, but had worked at a number of product design companies (Smart Design, Teague) and had a very broad perspective on design, considering herself more an interaction designer than solely a digital designer. So from the start, she knew she wanted something that reached beyond her major. I felt the same way about my major, Industrial Design. Conveniently, I had also signed up for an independent study that had fallen by the wayside in the midst of my capstone project. Just as I was considering dropping it, Ashley

came to my studio hoping for ID input on her capstone and, because we didn't understand how large the project would actually be, it seemed like the perfect independent study side-project. Then to my fortune, the project grew, and grew, until it became the topic for my capstone as well.

At every point along the way our professors were extremely supportive of the endeavor, and I think we helped push the envelope a bit in terms of making the two different groups of design faculty more comfortable with design methodologies that are different than their own. We always reminisce about how serendipitous the affair was—but it wouldn't have happened without our collective interest.

4.2 Process: Target Market

After joining Ashley, our first item to tackle as a team was to narrow in on the target user group. We eventually settled on designing for the senior age group (60+ years), as this group makes up the majority of prescription pill users with multiple medications. In addition, the elderly population has a host of other challenges, such as loss of fine motor control in their hands and reduced sensitivity to touch. By deciding to focus on this user group, we incidentally ensured that our result would be as “universal” as possible—by designing first for the users most challenged by lack of dexterity.

4.3 Process: Ideation

Having identified our key problem and target market, we then began with rounds of brainstorming—involving ourselves and multiple members of the student and professional design communities—to begin focusing in on the possible physical qualities of our pill bottle. We posed a number of brainstorm prompts, including how to handle textures, how to communicate warnings to the user, and how to open the pill bottles without spilling the contents. We used the ideas generated during our group brainstorm to inspire our continued design ideation, grouping features into a series of pill bottle design concepts.

During this time, Ashley explored the various label options. Traditionally, prescription pill bottle labels are crammed with tiny and often illegible type and abbreviations, without much decipherable organization. We decided that the label should be primarily designed for a secondary user—a caretaker, friend, or nurse—while redesigned with high legibility and readability in mind.

For a number of reasons, this part of the process was extremely unique from any other project I've worked on. In most product design projects, designers are usually concerned with communicating information visually, through a visual hierarchy. In this case, we knew we had to communicate everything about how the pill bottle worked through touch. I noticed that in spite the fact that product designers usually try to minimize part gaps as much as possible, that maximizing these gaps could actually help the user's understanding of the product. Also when ideating, I had to consider the overall form with careful intent. For example, making the bottom surface the only truly flat

surface, so it's clear through touch alone which side should be up. Keeping these attributes in mind, we ultimately settled on four different pill bottle architectures we wanted to take forward into formative user testing.

4.4 Process: Concepts

Many factors drove this round of concepts, but one goal we had with them was to create a spectrum from, on one end, a highly traditional pill bottle, to (on the other end) more unique pill bottle forms. Testing concepts in such a spectrum helped us get through one of the biggest challenges of the project, which was the admission that current pill bottles are not an ideal solution (small openings, hard-to-open lids) but are understood by all due to their ubiquity. Less traditional architectures would have to be understood by touch alone.



Figure 1: Preliminary Concepts

Our four concepts are shown above. “*Cap*,” being the most conservative option, is simply a regular pill bottle with a textured lid. “*Symmetry*” is similar, though the line between the cap and lid is blurred such that there no longer remains a perceived “up” and “down”. The “*Flip*” concept has a sturdy, square base and a flip-top lid. “*Drawer*” features a pull-out drawer to access the contents. For each concept, I created a simple 3D-printed prototype that we put into the hands of our test users.

4.5 Process: Testing

We reached out to administrators of the Samuel Bell Home for the Sightless in Cincinnati, Ohio, whom graciously assisted us in recruiting six vision-impaired participants in our target age category. We decided to perform our user testing as a series of one-on-one observational interviews, as we were interested in gaining information about the user’s current methods of object differentiation in addition to their unbiased opinions on the pill bottles. Before handing the users the pill bottle concepts one at a time, we were careful not to reveal any specifics about how each concept worked, intent on letting the user determine it through tactile exploration.



Figure 2: Prototypes

5. Findings

It is impossible to overstate the impact this user testing had on the project. We spent days combing the amassed data for insights, and a pattern began to emerge across all participants. For the first two concepts (*Cap* and *Symmetry*), users could clearly understand the method of use (simple twist-cap) but found the traditional child-lock cap too difficult. Users were also worried about losing the cap, which separates easily from the bottle, as well as the narrow size of the pill bottle opening. Such a narrow opening necessitated pouring the pills into their hands, opening them up to the potential for spills.

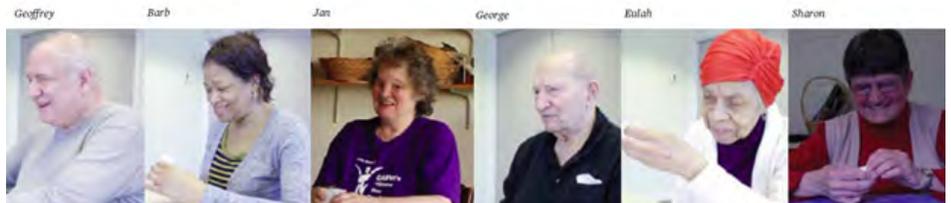


Figure 3: Participants

The fourth concept, “*drawer*,” could be understood by most users, but they picked it up and pulled at the two halves in such a way that would have caused pills to spill out. It was our third concept, “*Flip*,” that successfully communicated its method of use to all users, while also avoiding the pitfalls of the other concepts: the lid doesn’t come off and thus can’t be lost, while the opening was large enough for the users to reach in and pluck pills out one by one, a great advantage over “pouring.” Users also appreciated the square base, which enables an easy “lineup,” as organization is another important way vision-impaired users differentiate between objects.



Figure 4: Voice Recorder



Figure 5: Different Textures

We also tested a series of textures with our users, which assisted our development of eight textures which I then applied to the tops of the “flip” concept during the design refinement phase. In this phase, we finalized the form and added a few backup measures to assist with identification: a dot-numbering system and a color for each texture, for individuals who can see fields of color. We also included a simple voice recorder in the cap, for the pharmacist, caregiver, or family member to record a simple message for the user. Major contradictions and dosage information can be communicated in this way.



Figure 6: Final Direction

6. Conclusion

Overall, we considered this project a successful exploration in problem-solving through a user-centered design process. For the most part, Ashley and I agreed that we wouldn't have changed our general approach to the design process—particularly the extremely valuable user research and formative user testing.

One of the great struggles in inclusive design is knowing when is too much; that is, when to stop adding features in an effort to make the product more universal. In our opinion, the voice-recorder function is a great example of this kind of “feature creep;” if we were to pursue this product as a commercial offering, it would be the first feature to go, as it is quite expensive and potentially takes away from the immediacy of the tactile elements.

We were extremely inspired and humbled by everyone we spoke to in the vision-impaired community, who were all so gracious in sharing their lives with us—they truly made the project not only possible, but also worthwhile. After over a year since the project's formal completion, we still get hopeful emails from individuals, all wondering: “...when will these be available?”

It is my hope that students can look at this project and decide to collaborate on their thesis or capstone projects. With another designer, or even with a non-designer, you can do so much more, and your solution will be all the more robust. The experience from this project has helped me tremendously, as collaboration is an essential component of working in the design business.



Figure 7: Final Models

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B-PAC

An argument for inclusive design for the visually impaired

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1. Abstract

Today, we are seeing a conscious movement towards inclusion and universal design. In the public environment, guidelines are evolving to ensure consideration for the disabled consumer; yet there is very little inclusivity for the visually impaired. The blind and visually impaired are being recognized with the use of Braille on signage and packaging (mostly in the European market), however this is ineffective when only a fraction of the registered blind population can read it. Both specialized and mainstream products lack universality and host a large opportunity area for design. This article will explore an inclusive design case study of the B-PAC collection, a set of tactile cooking utensils, demonstrating how inclusive design can foster innovation and improve user experience for both visually impaired and sighted individuals.

2. Inclusive design

Every design decision has the potential to include or exclude perspective users. Inclusivity emphasizes the designer's contribution to understand user diversity, and allow the manifold to inform design decisions. For this case, user diversity refers to variation in capabilities, needs, and aspirations. Inclusive design being neither a new category of design, nor a removed specialism, is an approach in which a product recognizes the needs of the widest possible audience, able-bodied and not.

Two trends contribute to inclusive design methodology—the aging population and the integration of the disabled into conventional culture. The increasing number of people with disabilities has a weighty effect on new product development and innovation. In respect, design is now taking special consideration for populations holistically, embracing the inclusive design thinking. It is a common misconception that inclusive design limits creativity. If designers were to incorporate modules that are intuitive to the impaired, then it would create a better environment for its users, irrespective of ability.

3. The story begins with a vision

The enthusiasm prompting B-PAC is not exclusive to academics, but also to the emotionally driven. In the summer of 2010, I was Barbara Woods'

secondary caregiver. Barbara was legally blind after developing a severe case of macular degeneration, having previous scar tissue from cataract correction laser eye surgery. Macular degeneration is caused by deterioration of the macular, or the center of the retina. Macular degeneration affects the center of the eye, leaving the person with only the outermost peripheral vision. It is rare that this condition results in complete blindness, but in cases of wet macular degeneration, the martyr is left severely visually impaired.

For two years, I was Barb's companion, chauffer, cleaning assistance, and social advisor. I became her on-hand jewelry matcher often, for she was unable to see to match her earrings outside of what she could feel. Seeing objects and understanding what she was touching was often more trivial than matching earrings; often Barb would mistake dog food for canned beans.

One occasion, Barbara encountered a product packaging dilemma that influenced a key adaptation to her visual impairment. While brushing her teeth, she accidentally applied Bengay, a topical arthritis cream, to her toothbrush instead of toothpaste. Both the toothpaste tube and Bengay products have similar packaging with no physical cues to differentiate between them through unseeing eyes.

Embarrassed and frustrated, Barbara took a bottle of nail polish and began designing her own system of communication through raised surface cues. She counted each stroke applied to the product, noting the subtle differences in texture and height. The emboss markings became Barbara's own form of Braille. And such was the spur of B-PAC.



Figure 1: Nail Polish Markings

A method used to communicate between products by noting surfaces with raised tactile cues.

4. Blinding Facts: The need for innovation

If not restricted to verbal interaction, communication can be used as an instrument to exchange various types of information including interaction within the product environment. This mode of communication is not often utilized. Becoming conscious of holistic communication value and its complexity is possible only upon experiencing the loss of a sensorial function such as sight.

The B-PAC collection was designed with the intent that it can be used as a universal tool, therefore suggesting a solution to overcoming the visual communication hindrances of the visually impaired. To suitably find where this design would have the most impact, I accessed information

from pragmatic research sources: quantitative demographic information, qualitative research, community engagement, and immersion into the blind community.

As my preliminary research was focused on inclusion and vastness of the visually impaired community, I analyzed quantitative and demographic information and found specific areas to target my research. I then explored the vision impairment network and provided a vivid description of the culture through principles of primary research methods including contextual inquiry, observations, and interviews. The following is a summary of my findings:

- There are four levels of visual function, according to the International Classification of Diseases-10: normal vision, moderate visual impairment, severe visual impairment, and blindness. Globally the major causes of visual impairment blindness are: uncorrected refractive errors (myopia, hyperopia or astigmatism) 43%, cataract 33%, and glaucoma 2% (World Health Organization, 2004).
- Most vision impairment occurs after the age of 50—this is 20% of the world’s population, an aggressive demographic number (Media Center, 2013). 65% of visually impaired persons fall into this age group—a number is likely to increase as the human life expectancy grows with consideration to health care improvement. Globally, data indicates around 37 million people are completely blind, and 124 million suffer from low vision. This suggests that two thirds of the blind and visually impaired community population has a small amount of sight left, ignoring the common misconception that the blind cannot see at all.
- There are two groups of visually impaired persons: the congenitally blind and the adventitiously blind. Congenitally blind refers to a person who was born without sight, whereas an adventitiously blind person develops blindness over the course of their lifetime. The preliminary research suggests most visual impairment is accrued adventitiously.

B-PAC, although designed for inclusion, targets the adventitiously blind. It is important to note that a congenitally blind person has an advantage over the adventitiously blind person. For example, a congenitally blind person is more perceptive of their surrounding environment and generally begins relying on other senses at birth; whereas the adventitiously blind individual might find it challenging adapting to other senses.



Figure 2: Barbara's Perspective

Barbara was adventitiously blind. Above is a representation of what Barbara might have seen while watching the television set. Suffering from Macular degeneration, one would be able to see peripheral light forms and shadows, but certainly not enough detail to fully understand the space and product.

Partnership with the Cincinnati Association for the Blind and Visually Impaired (CABVI), neighboring universities, and personal resources all contributed to concept exploration of B-PAC. One important contribution, in particular, occurred while with Josh Haldeman, the Ohio Southwest IDSA chapter chair. I had the opportunity to observe an inclusive design guest speaker at Cincinnati State. Jennifer Holladay, a one-on-one volunteer coordinator from the CABVI, exposed intimate details of her personal life as a conjunctively blind woman. Through her story I noticed how much she relied on certain products in order to function in daily activities. With the increasing trends of technology and customization demands, tools are becoming a dependable feature used widely by the visually impaired.

The collaboration with the CABVI allowed me to explore the dependency of tools and technology within the blind community. As I began to trial these tools, I recognized the products available to the visually impaired were not necessarily adequate or accepted. Among these products, the most popular incorporate braille into their communication. Such products include note takers, calculators, braille packaging, and braille label makers. In truth, only about 3% of the visually impaired community can actually read braille—therefore using braille to communicate to the conjunctively blind actually excludes the adventitiously blind (Nuckols, 2009).

Products that target the adventitiously blind are often tools such as magnifiers, reader pens, stickers, and adaptive ware. Observations from using these products suggested they do not function as perceived or become more burdensome than beneficial. Often the visually impaired will come up with home solutions in order to adapt to their vision impairment before moving to a specialized tool. Using common household items such as tape, rubber bands, altering the product material by folding or tearing, and Barbara's exemplary nail polish system are simple ways to communicate between and manage products. The challenge, however, is that using this system is 100% reliant on memory.

5. Losing Vision, Gaining Sight

To understand the physical, mental, and emotional stress visual impairment might have, it was crucial that I imbed myself into their environment and recognize the small intimate details of the user's emotional journey. For three days, I engaged in an empathy training exercise in which I wore blackened goggles and experienced life as an adventitiously blind person. The experience was anything short of surprising and arduous.



Figure 3: Existing Visual Aids

During my experiment, I performed tasks such as cleaning, light walking, using remotes (including cell phone use), laundry, and cooking visionless. With assistance, I used different sized tapes to mark buttons and controls in order to ease navigation around appliances and product environment. While measuring liquid laundry detergent, I quickly learned that measuring any kind of liquid would be a trying and messy task. On the second attempt, I used my hand to measure and prevent excess spillage. I became aware of natural instincts such as inserting my fingers into the cup and feeling the rim to indicate fullness. This was fascinating; without prior education dealing with blindness, I used the primary sense of touch as a tool.

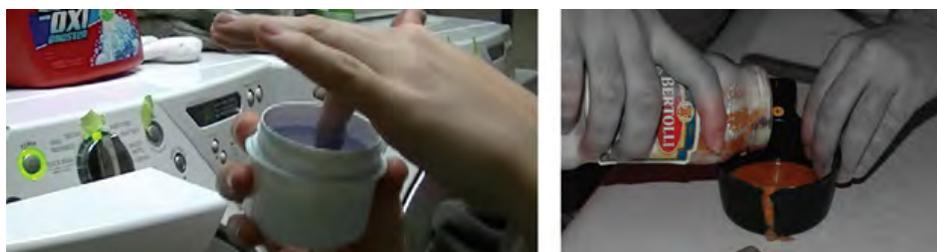


Figure 4: Measuring Challenge

This provocative idea led me to consider viable solutions. I came to accept the standard in excellence with the Tide Pods To Go. They are pre measured and one dose capsules that provide a clean and comforted experience for the user. However, laundry is not the number one use for measuring—kitchen use is where measuring takes par.

6. Blind Cooking: Three Challenges

Aware of the opportunity areas for dosing and accuracy, I spent a great deal of my time in the kitchen measuring liquids, and dry and gelatinous materials. It became clear that liquids posed the greatest challenge—as dry and gelatinous materials were packaged just so; there tended to be less overspill, wasted material, and it could be more comfortably handled by hand.

In the current market, there are several variations of measuring cups available to blind cooks. There is a range of brightly colored individual measuring sizes (which would be used similar to that of the liquid laundry dosing cup), but for the sake of the inclusion argument, I will discuss the Speaks Volumz-Talking 3-cup measuring unit. The Speaks Volumz cup targets the blind cook and can be used without the prerequisite of being able to read braille. It is very similar to any multiple cup measuring device—except it allows you to pour material into to the cup and alert you how much is in the cup by an audio signal. The substance poured into the cup is measured by weight and not volume—therefore the user must have the ability to type the substance into the remote located on the front of the scale. When exploring the accuracy

of the Speaks Volumz cup at the CABVI, it was clear that the cup was not a reliable measuring source. Volumz was anywhere from $\frac{1}{4}$ cup to $\frac{1}{2}$ cup off; this is not a forgivable difference when used as a cooking instrument. The CABVI staff then directed me to further solutions, one being to use the stackable measuring cups and learn to adapt to using your hands as your own fullness indicator.

Point of Inquiry: The conjunctively blind person is frequently hands on—especially in the kitchen. Whereas handling liquids by hand, the adventitiously blind may find this uncomfortable and continue to rely on prior cooking tools and methodology. Adapting to using one’s hands is a key evolvment in accepting and advancing oneself with vision impairment. If you or someone you know is developing a VI, encourage them to dig in! Instead of using a mixer, use your hands! Use your cupped hand as a marker and feel what 1 cup of dry mix is. Cooking will become intuitive thus improving the experience.

While I was making one of my favorite pasta dishes, I came to a question: how does one without vision work in hazardous environments such as cooking with boiling water on a stove? Although I was aided with help, I sought expert advice on this situation and how do people adapt to cooking blindly. According to the CABVI, the conjunctively as well as the adventitiously blind both continue to cook on stove top well after the onset of vision loss. They do however vary slightly in practice.

Fascinated with the opportunity areas of containment and location, I found two main differences in the adventitiously blind and conjunctively blind ways of thinking while cooking on stove. The conjunctively blind generally hover their hands above the pot and feel the direction of heat rising. This gives an overall idea of the pots location and creates a mental map of the pot. An adventitiously blind person may not be as in tune to these senses and may tap the air until their knuckles come into contact with the pot. This can burn skin and become a hazard to the user. A challenge to both consumer and designer is that it is assumed that this method may be the only way to cook blindly. Repetitive scaring and burns reinforce the need for innovation.



Figure 5: Cooking Challenge

Following the exploration of measuring and cooking, it was time to manage leftovers. There are many storage containers and the only difference is usually a slight variation in size. Once in the fridge, one may find themselves challenged days later with, “what was in the container, and when was

it put there.” One might use different shaped clips and tapes applied to bags and containers, but these communication tools often fall off and lose effectiveness. Aside from labeling, inserting fingers into, smelling and or even tasting are the only ways to cue the mind with knowing what it is and how old it has been in the fridge; even though this is not the desired option.



Figure 6: Container Challenge

The discoveries from these three challenges were validated upon interviews with conjunctively blind persons and visually impaired experts. In agreement from our discussions and the experience from the 3-day experiment it was suggested that the largest opportunity for design was in the kitchen. Through the empathy training, quantitative data, and community based findings, I concluded that there are three genres where a product could assist the visually impaired user in the kitchen: Prevention, Accuracy, and Communication.

8. B-PAC: The Design Form

In the kitchen we rely heavily on visual cues to manage tasks, so how does a person with visual impairment manage? Without the use of sight, the visually impaired cook must be in tune to other senses such as touch, smell, and sound. Designing a set of universal cooking tools with intuitive, tactile cues provides a solution to navigating common kitchen obstacles.

With inclusivity in mind, findings from both the conjunctively blind, adventitiously blind, as well as sighted cooks are integrated into the B-PAC design methodology. The B-PAC collection includes a pot guard and heat protectant brace, a tactile measuring cup, and a set of communicative food storage containers.

8.1 Prevention: The Pot Guard

A cover for the standard cooking pot, the *pot guard* aids in guiding food in and out of the pot reservoir, while protecting the user from burning themselves on the pot's rim. When used, the funnel shape allows the user to locate the collar and funnel food into the base of the pot. While cooking, the silicone collar flips over the edges of the pot creating a flat rimmed surface. This allows the visually impaired cook to leave the cooking space and return to it with the ability to locate the pot without burning themselves with the traditional knuckle tapping method. The silicon food grade rubber adds to the collar's durability, flexibility, and heat resistance up to 400 degrees Fahrenheit. Preventing burning while locating the pot opening, the guard allows the user to visualize a mental grid of the cooking work space. Although used primarily for locating the pot, this product is inclusive because it provides a benefit for both the visually impaired and sighted cooks. Unlike a specialized product, the pot guard can be used more than one way by people with various skills. It is therefore more likely to achieve more acceptance in the mass market than an independent living product with one specialized task focus.



Figure 7: The Pot Guard
The pot guard helps prevent food spillage while protecting user from burns while locating the pot.

8.2 Accuracy: The measuring Cup

The measuring cup is a 2 cup measuring unit with an outer skin holster and inner reservoir. A silicon film at the measuring points allows the user to feel along the outside of the container for a material change as the liquid is poured. For a more ergonomic use, the user may insert their forefingers into the material cavities and feel when the measured liquid hits the desired marker on the bottom, sides, and top of the fingers. This system enables user feedback without putting fingers into the measured liquid. Users are able to feel the pressure and temperature change through the film material as a transitional vantage.

The measuring cup is not only used for measuring, but also as a training tool. It encourages users to use their hands as sensory tools—eliminating an uncomfortable transition from sight to touch.



Figure 8: Measuring Cup
Due to the specificity of each measurement cavity, the reservoir is designed to the correct amount of liquid per measurement marker. The step design displaces the correct amount of liquid per measurement.

8.3 Communication: Food storage containers

The third product in the collection is a set of food storage containers. Each unit has a lid with seven flexible and invertible beads with raised letters featuring each day of the week—Sunday through Saturday (S, S). These containers suggest a solution to understanding the two pressing concerns about food storage: what day did the food go into the fridge and what is in the container. Made from food grade silicone rubber, the lid is reversible and the beads invertible. This enables the tactile day cues on the flipped side to be accessible to the consumer in braille. Inspired from the familiar pill box, it was important to include both embossed lettering as well as braille. Because only 3% of the blind population can read braille, it is necessary to include embossed lettering as well.

Point of Inquiry: Although a conjunctively blind person can read tactile lettering, i.e. A, B, C, the subtle material contours take longer to read than it would braille. By including both tactile lettering and braille, it is inclusive to both adventitiously blind and conjunctively blind users.



Figure 9: Concept Validation

These images were taken during validation where both conjunctively blind, adventitiously blind and caregivers handled and evaluated prototypes of this concept. Throughout validation, prototypes of the pot guard, measuring cup, storage containers, and other concepts were presented to users for concept appeal, functional testability and accuracy.

To emphasize communication through tactile cues, the containers size, shape and color were chosen selectively. With assistance from CABVI rehabilitation therapist Meridith Owensby, I was directed to exploring higher contrasting colors such as white and black, as well as distinct shapes.

Because the containers only vary slightly in size, differentiating between a small, medium, and large containers visionless can be troublesome. During validation, a panel of experts and visually impaired users were given a set of containers with different sizes and colors. The notable colors of highest contrast were hues of bright green, bright purple, and light cyan. These colors are different enough for a person with moderate vision impairment to tell the difference between, yet also bright enough to find in a cabinet.

When matching lids or identifying food, shape is a key form of product communication. The traditional rectangle container is widely accepted in product form; however, the medium size proves the greatest challenge when trying to tell the difference between the medium, large or the medium, small. Rounding the edge of the medium container creates an effective differentiating signal to the user.

The third tactile cue is the tab extending from the lid. The tab is used for easy removal of the lid, as the majority of the visually impaired community also experience limited dexterity challenges. Each tab has tactile cue that gives the user another reference as to what is in the container. Each emboss shape takes the form of an abstracted eating utensil: knife, fork, and spoon. One way this feature might be used is, for example, if a user chooses to store cooked spaghetti leftovers, they might place the noodles in the container with the fork detail, or squiggly lines emboss. This allows the user to take note of the color, size and shape of the container they put their food in, suggesting that placement will become more intuitive as opposed to reliant on memory.



Figure 10: Food Storage Containers

9. Conclusion

Through a process of research, conceptualization, validation, and refinement, the B-PAC collection of tactile cooking utensils was created to aid in the process of cooking for the visually impaired. Although the containers could be categorized as a specialized or independent living product, the all-inclusive nature of the B-PAC system addresses the needs of adventitiously and conjunctively blind persons, as well as sighted individuals.

An inclusive design product should communicate to the consumer what it does and how to use it—Industrial design at its purist form. The B-PAC collection enables user feedback without putting fingers into the food products to measure, provides a safety net in a rather hazardous environment, and subsides the need to ask for help identifying a product (an excruciating emotional aspect of visual impairment). One of the greatest challenges for a person living with adventitious visual impairment is the loss sense of interdependence. The fascinating thing about industrial design is that any product which a designer creates is not for themselves—it is always for someone else. Understanding inclusive design comes down to the roots of industrial design—and why a designer does it—*empathy*.



Figure 11: The B-PAC System

Acknowledgment

I would like to acknowledge the time and experience shared by my mentor, Meridith Owensby and the employees of the Cincinnati Association for the Blind and Visually Impaired. Their knowledge and expertise provided clarity and direction for B-PAC.

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Finally, I would like to acknowledge Barbara Woods and Terry Bolton. Barbara was both the moderator and inspiration to B-PAC. I am privileged to have been her granddaughter and secondary caregiver, all of which fueled the passion and design journey of B-PAC. As Barbara's caregiver and daughter, Terry continues to inform the design methodology of the collection. She

has supported B-PAC in monumental ways; all of which I am ever grateful for. Both women were truly an inspiration to the B-PAC collection. Stunning embodiments of empathy and compassion.

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UNIVERSAL ICONS

A Student's Perspective on the Importance of a Human-Centered/Universal Approach on Icon Design

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1. Abstract

Practically speaking, from the time we wake up in the morning until we go to bed at night, icons occupy a big portion of our lives without us realizing their impact. I started paying greater attention to icons after I worked, with few other designers, on recreating the United States Pharmaceutical Convention (USPC) icon system as part of a class project at the University of Cincinnati. The USPC sought out the aid of the University of Cincinnati to help improve the comprehension of the icons in the system. To be able to solve this problem we realized that a human-centered/universal design approach would be best; therefore in order to achieve inclusivity, we used different research methods that included people from different backgrounds, ethnicities, ages, gender, education and literacy levels, to help co-design possible solutions. The methods used allowed us to evaluate the proposed solutions and continued to lead us until we achieved a settled opinion in which our team decided to act upon. Iterative evaluation design research was integrated into the design process and informed design practice as it unfolded. As a result, the team's efforts to improve the comprehension of the USPC icon system proved successful, being that only four to five of the newly designed icons needed further revision when compared to the 60 original USPC icons. Having to revise fewer icons after the completion of the evaluative design research, I've grown a self-belief that a human-centered/universal design approach is a very valid and important approach to be considered when designing icons. As more people engage in the process and provided their feedback, better results and designs can be obtained, which can eventually lead not only to micro-change but also to a macro one that will impact people's lives.

2. What is icon design?

The word "icon" has had many meanings and uses in society. Generally, an icon by itself is a representative symbol, picture, image, or other representation of something. Historically, the word "icon" is referred as a depiction of some religious personage that may have been painted on a wood-surface, for example, and is venerated as a sacred work of art. An icon can also be defined as "a sign or representation that stands for its object by virtue of a resemblance or analogy to it." However, more commonly in today's computer world, an icon is referred to as a picture or a symbol that appears on a monitor and is used to represent a command. (*Dictionary.com*, 2013)

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As technology advances and information is provided to us more rapidly, icons are becoming more frequently used as the tools that convey this information. If well designed, icons can provide quick and clear knowledge of their visual representation. Susan Kare, one of the early professional icon designers, who designed many of the icons contained within the original Mac OS, states: “Good icons should be more like road signs than illustrations, easily comprehensible and not cluttered with extraneous detail.” (2013, para.3) Icons are only useful and can lead to concise communication if their form is kept simple. If successfully designed, their comprehension can be unanimous.

However, simplicity alone is not enough. As Mike Zender, a professor at University Cincinnati, states in an article about *The Interaction of Symbols*: “[An] icon’s intended message is clear, unambiguous and generally well-defined from the start of the design process. This gives icons an established measure of comprehension success” (2012, p.2) Although icons are perceived to have simple form and appearance, they are actually a complex combination of individual symbols. Speaking from a pharmaceutical icon creation perspective, finding the correct symbols to be assembled together to create an icon that identifies its intended meaning proved challenging. However, through our iterative evaluative research, I realized that as the icons became more intuitive, the design process became easier. Less thinking was needed in creating the set of symbols within each icon, and consequently, the more successful the icons became.

A group of symbols put together with logic and intention leads to a successful icon. Icons can combine several symbols to construct their meaning as several icons have a multi-symbol nature. For example, the icon in *Figure 1* shows one of the icons we redesigned in this project that scored 100% in the icons test analysis.



Figure 1: Pharmaceutical Icons - Eye-Dropper
An eye-dropper with blue drops being dropped in a sick eye (with a redish lower eyelid) gives the indication that drops must be placed in lower eyelid to treat eye.

To sum this section of the article, icons are a distinct and simple form of visual communication. Icons are not only a picture, pictogram, sign/glyph, or symbol, but rather a combination of some or all of these components. To clarify these terms more, in his paper, *The Interaction of Symbols*, Zender (2012, p.3) lists the following definitions:

SYMBOL - Image referring to something else – a referent

SIGN/GLYPH - non-representational symbol, arbitrarily assigned with a wholly learned connection to a referent.

PICTOGRAM - a particular use of symbols or combinations of icons and glyphs to communicate a narrative or story or data set.

PICTURE - representational symbol of a particular, individual referent.

It is very important to understand what icons are before designing one. Understanding icons, their definitions, and their rules will give a designer a pool of inspiration and information to drink from.

3. Methods

The redesign the USPC icon system class project was broken down into four major phases that started in Fall 2012 and extended to Spring 2013. Before the main phases, preliminary research was conducted in which each student picked 3 icons from the USPC icon system to analyze, with 60 chosen by the class in total. We analyzed the icons by understanding what each icon does, what it relates to, and what their root-symbols were. Then, each one of us selected three to four root-symbols to explore. The root-symbols I chose were: an “eye drop”, the action of a “hand holding” something, and the location of “under tongue.” These were identified as root-symbols because each can be a component or an element for more than one icon. For example, the “eye drop” can be a root-symbol for the “place drops in nose” icon.

3.1 Phase I: Image Survey (Co-Design)

An image survey, or what we nicknamed the “Draw Something” survey, because of its similarity to the game, is a useful human-centered/universal design starting point in icon design because it helps inspire and motivate the search for inclusive solutions. It’s a way to engage the audience in the design process from the beginning with what is called Co-Design. Co-design is a useful method for a human-centered/universal design approach as “it encourages the blurring of the role between user and designer, focusing on the process by which the design objective is created.” (Wikipedia, 2013, para.1) For our project, we asked people to draw the root-symbols, the way their minds’ see or understand it. For example, the root-symbols drawn in *Figure 2* show the collection of sketches participants drew to communicate the root-symbol “place under tongue.”



Figure 2: Image Survey - Place Under Tongue
Participants spent most of the time perfecting their drawing to match the image in their mind.

50% drew the anatomy of the mouth and tongue

33% drew the process of placing pill under tongue

17% drew an arrow leading where the pill should go

33% drew people in side profile

The image survey was very helpful to let us understand what people think or how they understand certain actions, gestures, or words. After completion of the surveys, we were able to begin ideating ideas based on common themes or patterns identified in the results.

3.2 Phase II: Comprehension Estimation Test

The image survey left us with a pool of ideas to work with which lead to the early ideations and testing of Phase II. Figure 3 shows the early sketches I completed inspired by the image survey results.



Figure 3: Pharmaceutical Icons - Eye-Dropper
An eye-dropper with blue drops being dropped in a sick eye (with a redish lower eyelid) gives the indication that drops must be placed in lower eyelid to treat eye.

In the next stage of ideation, I began combining root-symbols to make icons. The icons I was challenged to convey were: “place drops in lower eyelid,” “take pill” and “dissolve pill under tongue.” For each icon, I sketched three different concepts with a total of nine redesigned icons. Once each concept was designed, I tested them for comprehension against each other and the corresponding original USPC icon for the control. I surveyed 13 people by distributing printouts including the four total concepts for each icon and asked participants which icon they thought people will understand the most. After the responses were collected and analyzed, comprehension estimation for each icon was scored. When reviewing the results, I noticed that the responses may have had the potential to be biased, since I only asked participants who were conveniently available to me. In order to reach a broader audience, I conducted an additional survey on my fan-page on Facebook. To my astonishment, I collected over 40 responses for the Facebook survey. *Figure 4* shows an example of the printed survey compared to the Facebook survey.

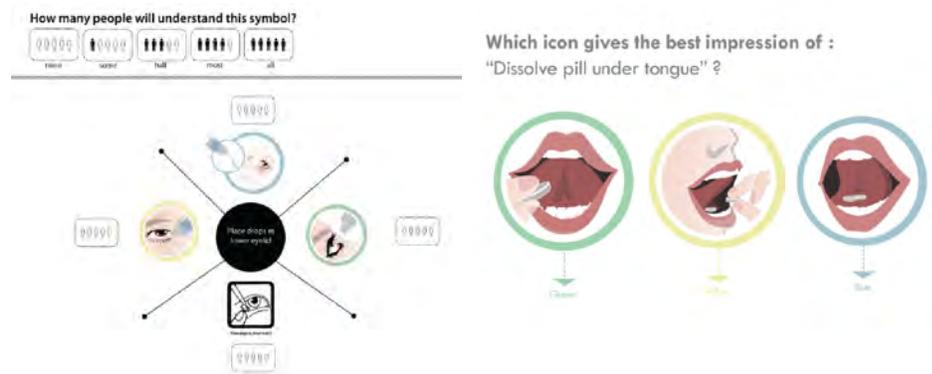


Figure 4: Designed Icons for Phase II

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I realized, as we get more people involved in the testing process, our results became more accurate. After the next round of comprehension estimation tests were complete, I found that certain root-symbols from differentiating icons were favored. With this in mind, I pulled the root-symbols from each icon that made the most sense to people into one icon. In *Figure 5*, I show an example of one of the icons I revised after analyzing the comments and reviews in the comprehension estimation test.

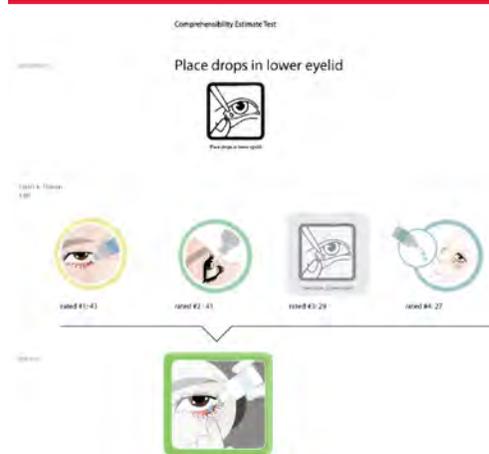


Figure 5: Comprehension Test Score
Participants understood the first icon the most because of the root symbols used: eye-dropper, liquid drop, finger pulling the lower eyelid down, and the inflamed lower eyelid. However, the callout in the fourth icon was a strong point. The favorable symbols were combined to create a new icon.

Working alone on these three icons made me realize a great deal about an icon's design, but I learned even more so as I got to work with others. After completing this phase, our professor asked us to come together in groups of three to redesign the whole USPC icon system. What was helpful about this part of the project is the fact that each student already designed a set of root-symbols that we compiled into a group resource for the class. This left the class only needing to pick a system style and color palette, and group the root-symbols into new icon designs. My group decided to work on a style to follow first. Each one of us took 17 USPC icons to redesign, but due to the fact that my group involved members who were not native English speakers, we made sure to work closely together in the beginning. This was to ensure we had a mutual understanding of the icons' intended meanings and their overall look and feel. Our style included a distinct color palette, characters that were not too realistic and yet not too cartoony (head as a circle shape), uniform aesthetic details to make our system look unique, and used universal shapes and contexts that helped us build a complete comprehensible system. I believe the various perspectives of our multicultural team also provided great contribution to creating an inclusive icon system that could be understood across cultures.

After working in Phase II, and in a bigger scope, I realized that along with cultural context, intuition plays a big role in creating successful or semi-successful icons. I also learned that icons do not always need to be abstract looking or contain fewer components. As a matter of fact, when creating icons, more root-symbols are actually preferred, especially if a designer is trying to communicate crucial and/or multiple types of information to a viewer.

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Figure 6: Revise USPC (set 2) Fall 2012
 This figure shows the second set of icons we created for our final presentation in Fall 2012. The icons were compared to the original USPC system.



Figure 7: Root Symbols
 This figure shows the root-symbols we re-designed to match the style we chose.

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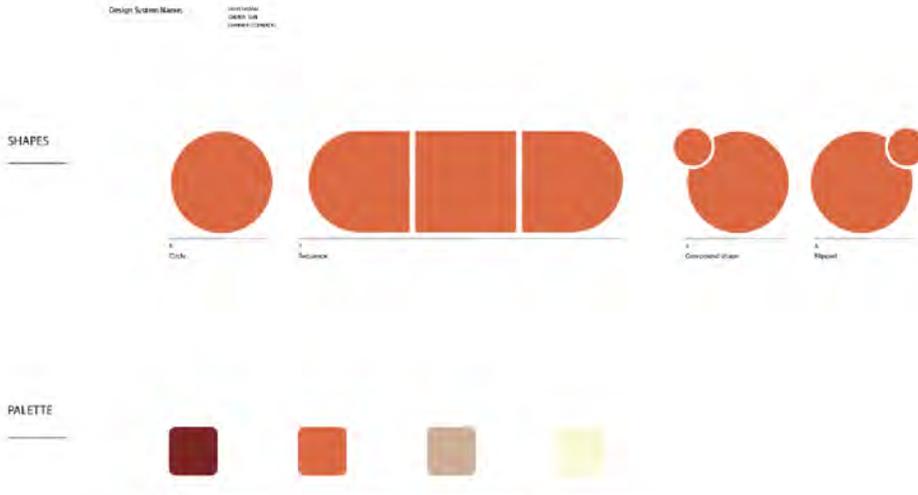


Figure 8: Shape and Color Palette

This figure shows the shapes we used in our system. The single circle is what contained most of our icons. The divided half-circles and square, that resembles a capsule, were used for directions that involved a sequence. For example, for the icon “This Medicine Will Make You Dizzy, So Don’t Drive,” multiple actions must be followed: taking the medication, feeling dizzy, and warned not to drive. The circle with the smaller circle in the upper left corner was used for callouts. An example of such an icon would be “Take Medicine With Dairy.” The larger symbol would indicate dairy as the most prominent subject, and the callout would indicate the action of taking medication, as repeated in other icons.

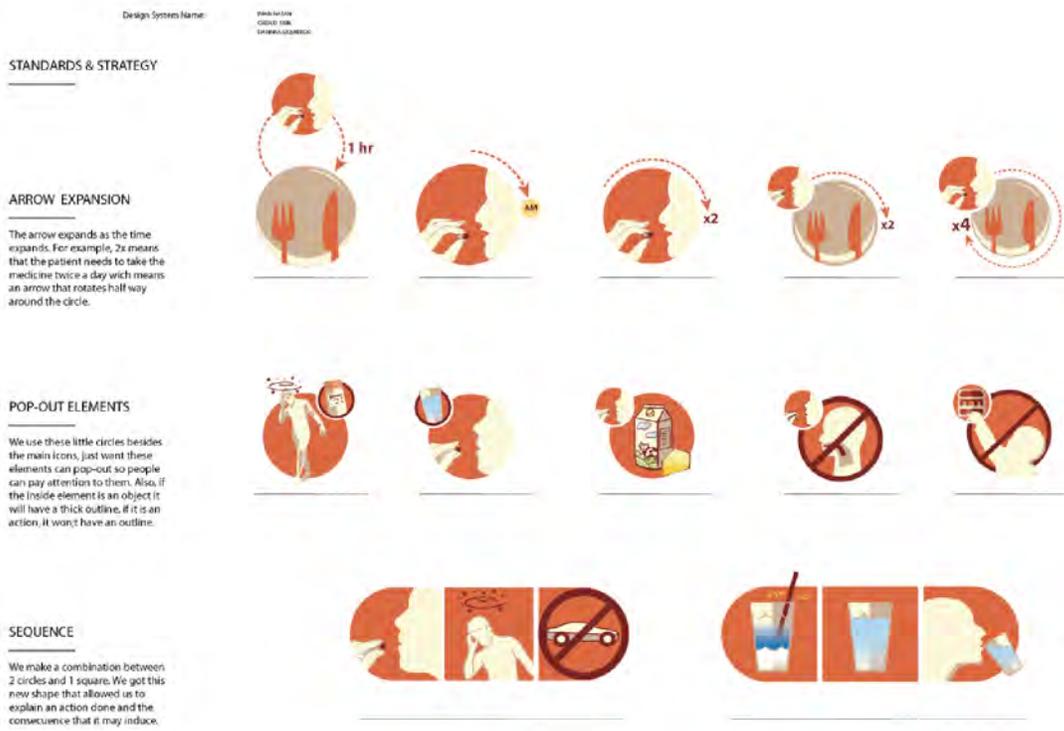


Figure 8: Strategies Used

This figure shows the strategies used in our style: Arrow Expansion, Pop-out Elements, and Sequence.

3.3 Phase III: Interviews for revised vs. control system

Phase III's purpose was to test the comprehension of our icon systems as a whole. Each member of the group was assigned to interview 6 people, totaling 18 participants per team. Conducting interviews rather than surveys gave us a broader and more exuberant scope of what interviewees think about the icons we created. Open-ended questions were asked that would make interviewees feel more comfortable to talk more about the icon; what they like about it, what they dislike about it, what's most comprehensible, what's least comprehensible, and how would they improve it or make it better. After transcribing, analyzing, coding, and scoring their answers, we fortunately discovered that the majority of our icons were successfully understandable. When scoring, the method we used was to code the interviewee's answers, according to keywords or a combination of keywords. The answers were then added up using excel sheets with a formula that totaled their score and provided a percentage for their answers. For example, a partial correct answer would score 0.5; a correct answer would score 1 and so on. Any icons that scored a comprehension success rate under 85% needed to be revised and retested. Our team only needed to revise 15 icons. The icon system's recognition degree was 70%, leaving the remaining icons (30%) needing to be redesigned.

3.4 Phase IV: Survey Standard Deviation and T-Test

Based on the results obtained from the interviews and the revision of the 15 icons, we tested our icons again, but this time with a larger audience. Using Survey Monkey, the online survey service, we surveyed over 90 people and asked them what they believed each icon to mean and what the action they would take after seeing the icon. At the same time, we made a duplicate survey for the control icons (the original USPC icons). The purpose of the control survey was the same as it had been throughout the evaluation processes, to compare how successful our revised icons were to the original system. The findings were very helpful in distinguishing the impact of our newly design system versus the previous failing icons.

However, to have more accurate answers and comparisons, we calculated the standard deviation and made a t-test between the control and the revised icons to see if there was a significant difference. Naturally, if the score on one was really high and on the other was really low, the level of significance will be also very high. For example, the two figures below show two of the latest revised icons with their T-test score and their degrees of difference. When there is a lot of variability it's going to be much harder to determine the "up normal" element. As variability lessens it becomes easier to find trends, especially when identifying an "outlier" or "abnormal" result.

4. Results & Conclusion

In conclusion, using the different evaluative research methods, such as the image survey, comprehension test, interview coding, and mass electronic survey analysis, our team was able to create solutions that were significant and accurate. If someone was to inquire the reason why one of the icons was more successful than one of the control ones, for example, we will be able

to answer with confidence and valid evidence. In addition to the evaluative research methods, the statistical analysis techniques completed also proves the significance of the comprehension improvement as a result of our testing.

Working in a group made a great deal of the research effort insightful and convenient. As Tim Brown states in his book *Change by Design*: "It is better to take an experimental approach: share processes, encourage the collective ownership of ideas, and enable teams to learn from one another." (2009, p.96) As a team we were able to involve a broader spectrum of participants within our evaluative methods, varying backgrounds, ethnicities, ages, gender, education and literacy levels. Every single answer we obtained from the different participants was worth the effort. As more people were involved, the more accurate, inclusive, and significant our icons became. Thus the reason I've grown a self-belief that a human-centered/universal design approach is a very valid and important approach to be considered when designing a universal icon system.

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INCLUSIVE APPAREL

Design Needs of the Actively Ageing

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1. Introduction

The Baby Boomer generation is the most highly educated cohort to ever enter their silver years. This generation is commonly considered to be inclusive of individuals born between the years 1946 and 1964. The name and significance of this generation has grown steadily throughout their lifespan – particularly in the United States and the United Kingdom – because of their market size, discretionary income, spending power, and love of consumer products. There are approximately 77 million baby boomers in the US and 76 million in the UK. This baby boom generation is responsible for over half of consumer spending currently in the US and 80% of leisure and travel expenditures. By 2015, baby boomers will make up 45% of their respective countries population (2002. World Health Organization). Baby boomers are healthier than any generation group that came before them and more active, though noting their bodies are changing. Subtle body changes that happen over time due to aging are being more noticed by this generation. Some changes they can combat by staying active mentally and physically by socialization and exercise, while others are out of their control. Changes such as bone density and strength, muscle tone and hand dexterity make both the act of dressing and finding appropriate apparel choices difficult. This generation is projected to live an average of six years longer than their predecessors so their bodies will need apparel products to adapt to their needs more than ever before.

Studies have shown that the older a person is, the more that they rely on others to stay physically active (2007. Smith, J.; Clurman, A.). Classes for aerobics, walking, Pilates and yoga are among the fastest growing group activities in the US. Hiking and biking tours are among the largest tourist draws in the US and parts of Europe. Actively ageing adults want to stay active and they make this a vital part of their life – and they want to do this with others. These activities need specific apparel that supports the user and enables them to feel comfortable and accommodated. The opportunity for consumer products manufacturers to meet the needs of this market is huge. It is vitally important for sport and apparel companies.

Boomers historically are large consumers of apparel. They have grown up with branded clothing options that have met all of their needs, from their Levi jeans and Keds sneakers in their high school years to the rise of

Contemporary sportswear and Bridge Designer work attire. They have sought out appropriate and desirable apparel for all of their social needs – casual, active or formal - their entire lives. They expected this to continue as they reached their retirement years but have discovered that the apparel industry is simply not responding to their needs in active apparel. Most companies are not even marketing to this generational cohort. Textile and apparel manufacturers need to study the user needs of this generation to develop a carefully crafted design strategy that connects the user to their apparel wants and needs. It is therefore important that the design students of today are introduced to the needs of this generation.

2. Design Research

Design research requires an introspective understanding of people, cultures, and social influences and needs a perspective that can only come from meaningful user engagement. Design research is crucial to developing innovative products or services that satisfy the largest possible market of consumers. Tom Plowman states, in *Design Research* “the majority of designed artifacts are planned, prototyped, and produced without the benefit of primary, ethnographic research on the intended audiences and the context of use” 2003. Laurel, B). This problem needs to be addressed by design educators.

Students are introduced to the design process early in their academic studies but the understanding of each step in the process is crucial to prepare them for work in the Industry. Current design training, in the area of clothing and textiles specifically, is predominately targeted toward the young female consumer. If given the opportunity to design for a specific market of their own choice, most students will choose either a consumer age 18–24 or age 23-35 who engages with her friends on social networks, has an active lifestyle and work or school life, and wants clothing that meets her needs. This market is familiar to them and they feel they know the needs of this consumer. They develop customer personas without much research because they know this customer so well. Design students need to learn the value of user research to design truly innovative products for more diverse populations. The research component of the design process informs all the steps that follow, leading to an ultimate design solution that accurately meets the needs of the identified user group. It is difficult to create the nuances of true design innovation into products unless the changes are user-driven. Design research interaction that is targeted to the behavior of the user provides designers with an understanding of their motivation and interaction with a product.

3. The Study

True research is necessary when young designers are confronted with a project for a less understood community, for example, the active ageing market.

The World Health Organization defines Active Ageing as “the process of optimizing opportunities for health participation and security in order to enhance quality of life as people age. Active ageing allows people to realize

their potential for physical, social, and mental well being throughout the life course and to participate in society, according to their needs, desires and capacities, while providing them with adequate protection, security and care when they require assistance.”(2002. World Health Organization).

A research study was conducted by a small group of senior design students learning design methodology in anticipation of future senior capstone projects.

The students did not know much about this market but realized it has its own distinctive design needs. In some ways the active ageing market needs appropriate apparel even more than younger users for support and health safety. For example, when discussing athletic apparel, older wearers would at least like to find clothing designed for their body shapes, with ease of movement for less supple limbs, in appropriate and less transient styling and in colors to suit older complexions. The lightweight, easy care, and thermal regulation provided by innovative textiles has potential to enhance the comfort and demands of their everyday lives. In terms of wearable technology, independence, and well-being may be improved through the application of vital signs monitoring, positioning, communication, and safety devices. Meaningful user engagement is needed to identify what older wearers will willingly wear and find easily usable.

Strategies such as focus groups, interviews, and ethnographic studies are appropriate research methods to establish persona profiles of the users. Personas are created to inspire and guide design and should be the result of a study of real people (2003. Laurel, B). The project brief was introduced to engage the design students with the active ageing community and to make them aware that there are as many distinctive lifestyles in this market. It is not one generic marketplace and has diverse needs that offer design considerations. This inclusive design process has been successful in raising empathy from students for users and appreciating their needs for new areas of design development.

4. Design of the Project

Design education has a history of combining process learning with studio work. To educate young designers about the rapidly growing market of older users, this design research project was presented to a group of senior level design students at the University of Cincinnati. This student group was presented, with permission, the initial findings of a UK research project called Design for Aging Well. The students were challenged to present how they might apply what they had learned in their senior thesis research class to inform the project. The Design for Ageing Well Model (2010. New Dynamics of Ageing Programme) looked at the interaction of clothing, user behavior, and technology.

Within the United States, the Midwest region is primarily made up of urban, suburban, and rural communities that are interconnected by a highway system – not public transportation, as you would find in the UK. Most people

who live in the Midwest, outside of urban areas, do not walk as a major transportation method – they generally walk to exercise and socialize. This was the profile of the women the students approached to be in this study. This user group was considered by the Design for Ageing Well primary investigator as new information for their study.

5. User Research

Marketing research has focused primarily on identifying generational market groups in order to better reach these consumers and connect them to their products. Market segments have been devised entitled Generation Y, The Millennials, Generation X, Baby Boomers, Grey Market, and many more. The design community, and apparel designers in particular, need to understand that what is important for good design is not the “age” of the market, but rather the lifestyle and behavior of an identified target group. Defining markets by demographics does not take into account their behavior in the marketplace. When it comes to leading an active lifestyle, the market has no age; it is more to do with attitude and behavior. Observation of any local marathon or walking event will show a cross section of ages, body shapes, and economic background. The daily lives of those living in “walking” cities such as London, New York, and Tokyo again show this cross-section of ages that engage in the activity of walking specifically.

The students became intrigued by the activity of walking and identified that it encompasses competitive walking, destination walking, and walking as a social activity. They chose to focus on a combination of questionnaires, interviews, focus group studies, and ethnographic studies leading to the development of user personas to provide information on user groups within the parameters of the Active Ageing. They developed a design-led research plan to study and profile active women over 55 years of age who walk on a regular basis for health and wellness.

5.1 Walking

The benefits of walking as exercise are numerous. Any health publication you review today from consumer publications such as Prevention magazine to studies at prestigious universities will confirm walking as an excellent exercise for all ages. Statistics from a study done by researchers at the Harvard School of Public Health involving 13,000 women, over 70 years of age, who walked daily, determined that “walking regularly at a moderate pace increases the odds of staving off disease and ageing successfully”. They found specifically that the benefits of walking as physical exercise included reduced risk of heart attack, lowered blood pressure, greater bone density, toned muscles, stimulated immune system, and enhanced moods. (2004. FDA Consumer Study). Research into the mental benefits of walking, however, did not result in as much information. There is quite a lot of research done about the benefits of conversation, interaction, and visitation on older adults but not much specifically about the interaction of these adults while participating in exercise. This was an area the students felt they needed to explore more in their research study.

The students began by identifying a small group of 55+ age women who walked for exercise on a regular basis. They contacted a local independent living adult complex close to the University; a retail store that sponsored walking groups and individuals identified separately by either relatives or University contacts. An initial interview process randomly selected the final group. The initial interview process yielded quite a bit of information about the act of walking and what it meant to these women. This information provided the basis for their research agenda. They learned that the women walked for exercise but also for socialization. This was an unexpected outcome for them but one they decided needed further exploration.

The students began to brainstorm and media dive into three primary areas of interest. They felt they needed to investigate the act of walking – why and how people walk and the benefits derived from walking. They researched what experts in the field defined as the benefits of walking – physical and mental. The students laid out research plans to determine user commonality of interest and purpose.

The group developed a definition of Walking as “...the most primal method of transportation. It improves an individual’s wellbeing by promoting both social interaction and solitary meditation, while exercising body and mind.” The students examined the physical action of walking and found it ranged from strolling to casual to purposeful to competitive. They also found that it involved walking with pets and/or other people and sometimes with technology such as media devices and walking instruments such as walking sticks or weights. The environments varied as well from walking inside gyms on treadmills to mall walking to outside in many different weather conditions. The seemingly simple form of exercise became much more complex in review.

5.2 Walking: Competitive; Destination and Social User Groups

The user group was expanded in the second round of user research to inform the research plan. Each student was paired with one of six original participants. They then joined this user as they walked and expanded their research to include their entire group of walkers. The user group descriptions are in *Table 1*.

| | | |
|---------|------------------------------------|--|
| Group 1 | Store walking groups | Train for competition/challenge/groups |
| Group 2 | Walking groups training for events | At random group – competitive walking |
| Group 3 | Neighborhood group | Walking for exercise and social |
| Group 4 | Friends walking together | Casual but push each other to improve |
| Group 5 | Independent living complex walkers | Social director organizes for exercise |
| Group 6 | Solitary walkers at a local park | Interaction with nature; interactive media |

Table 1: User Group Participants

Inclusive Apparel

The students conducted mini focus groups, 1-on-1 interviews and on-line discussion groups. The students also conducted field ethnography by observing the groups, following them but not interacting in the process. Structured and semi-structured interviews and conversations allowed them to use the theme of walking as a focus to investigate aspects of daily routine, clothing, and technology usage. The students discovered in these interviews that although the initial reason the users chose to walk was for the exercise, what made them continue their walking routine was the socialization that occurred. They often mentioned that no matter what was going on in their day – the walking time was sacred and they felt better both physically and mentally when they completed their walk.

The students discussed their research results and found commonality and difference in their findings. The students developed a working matrix of information about their walking groups and found that age did not play a major role in how or why a woman walked but instead her lifestyle and motivation for walking was the key differentiating factors. They found that most women walk for the exercise but continue walking because of the socialization. Unless they were in training for a specific competition, they found they continued to look forward to their walking because of the interaction with their walking partners. Socialization was a key reason the walkers continued their walking regimens in five of the six user groups.

The students put all of the data they had gathered from their users on individual post-it notes and then formed a data tree of information. They then searched for common bits of data and began to group the information together. They developed the User Personas by identifying four key descriptive elements that formed neat buckets of information. These elements related back to the User Needs identified in the New Dynamics of Ageing. These three elements were: 1) Behavior 2) Clothing 3) Technology. The final three User Personas are detailed in *Table 2*.

| User Persona | Behavior | Clothing | Technology |
|------------------------------|--|--|---|
| Social Walker: Ruth | Social interaction strong Strength and flexibility Balance and weight Intentional grouping Minor physical limits | All-weather/layers Wants safety features Wants compression Easy access closures Needed fit to body | Technical Textiles 2 way zips/closures Easy doff and don Functional add-ons |
| Destination Walker: Susan | Does other exercise too Appearance important Social Interaction Minor medical limitations | All weather/layers 4 season wear Pockets for items Accessories for walk | Technical textiles Arthritis able Carried iPod, phone Utilize stick/monitor |
| Competition Walker: Nancy | Intense exercise Informal grouping Active social life Health monitoring | Age-appropriate apparel Styling important House medical monitors Fit/ access closures | Technical textiles Variety in fabrics Constant monitors Access to monitoring |

Table 2: User Personas

6. Study Conclusion

This project has identified key behavioral motivators for women who choose walking as their exercise. Each of the three persona groups stressed to the students that they have had a difficult time finding athletic apparel for women of their age group. They explained that their bodies needed more room in a top or jacket to accommodate a larger girth than younger women. All of the jackets they tried on were too tight and restricting. They also complained that the pants were not flattering at all – too tight in the wrong places – and not comfortable in the waist. They liked the fabrics that were offered in popular athletic brands but could not find those fabrics in the exercise garments that were comfortable to them. The women also mentioned zip closures that were difficult to work if they had arthritis in their hands and wished that they had garments that could accommodate their phones, their keys, and any other monitors they needed. All of the women, no matter their size or what group they fell into, emphasized that if there were any companies out there that had clothing that they might wear – no one was marketing to them. They all felt very marginalized as a consumer group.

Social isolation is a growing problem at all ages as we negotiate life in a digital world that gives us many “friends” but no one handy when we need actual companionship. A 2004 study by the National Science Foundation of 1500 Americans found that only half of the people sampled had a friend they could confide in. This was up from 3 out of 4 in 1984 (2006. McPherson, M., Smith-Lovin, L. and Brashears, M.). Social isolation can lead to depression, particularly in an older population and that can lead to neglect of health, stress-related disorders, and often death. Significant positive effects can come from interacting with others on a regular basis by boosting “feel-good” chemicals in the body and strengthening the immune system.

The students concluded at the end of this study that the women they worked with relied on the other women in their walking groups for varying degrees of companionship. All the women felt they kept up the exercising, which they knew was good for them, because of their companions and some even felt they took the exercise to a higher level because of the support of others. This project has successfully increased awareness, in a group of young designers, in the value of adopting user study to inform the research and technical design development of apparel with the potential to promote healthy exercise, social engagement, and wellbeing. They became aware of the needs of this actively ageing cohort and were much more sensitive to designing to meet the needs of these women.

7. Recommendations for Further Work

This project has set the scene for framing the design brief for subsequent practical design development work for the active ageing community. The knowledge elicitation methodologies adopted by the students may be applied for the identification of end-user needs for any inclusive apparel design development that should be fit for a given purpose. In order to verify wearers’ design needs and wants there is no substitute for embarking on an iterative design development in co-design practice with individual users

or user groups. It would be rewarding to document on-going research around this topic, by student designers, into the development of working prototypes. The work carried out to date could also be extended to look at appropriate strategies for bringing such design development for older people to market. Suitable apparel that meets user needs can enhance the experience of walking for the active ageing. This, accompanied by efforts to organize walking partnerships or groups to engage in the activity as exercise and socialization, offers an opportunity for the marketplace to partner with communities to make a difference in the quality of life for the active ageing population.

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MAKING LEAPS

Creative Ideation Through Combinations and Variations for Innovative Design Solutions

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1. Abstract

Trying to generate innovative design solutions using the primary and secondary research in a design project often leads to redundant ideas that may already exist or may not be a significant improvement on current solutions. The role of innovation is to ensure that the solutions created are not increments on existing solutions but “leaps” ahead of existing products and services. Ideally, they would be solutions that the consumers have not yet imagined or desired. However, displaying the level of creativity required for such a result is a product of in-depth domain knowledge, brainstorming and meticulous evaluation. This paper proposes a creative ideation tool that allows designers to use the opportunity gaps gathered from design research and the frustration and dissatisfaction of the users (user needs) with existing products and services to generate unconventional combinations and variations. It also briefly suggests methods to evaluate these ideas for reliability and validity to produce innovative design solutions.

2. Introduction

Using a matrix to create unusual combinations and variations has been a valid practice since Da Vinci’s time. While painting human figures, Da Vinci was known to have used a matrix of human features and characteristics of said features called Leonardo Da Vinci’s Ideabox. (Michalko, 2006) For example he would construct the following table:

| HEAD | EYES | NOSE | MOUTH |
|--------------------|---------------|-------------|-------------|
| Bullet | Google – eyed | Parrot-beak | Drooping |
| Furrowed -Forehead | Sunken | Hooked | Hair-lipped |
| Dome-like | Bulging | Thick-snub | Wafer-thin |

Table 1: Leonardo Da Vinci’s Ideabox

Da Vinci would then randomly choose one adjective for each of the features and sketch the resultant face. He was known to have used this technique to paint his masterpiece The Last Supper. (Michalko, 2006) This approach to producing unconventional solutions has been an inspiration for the tool proposed in this paper.

Another example of using matrices to generate unusual combinations is the tool *combinFormation*. This software tool was designed to promote unique combinations and variations that give rise to innovative ideas. This tool is based on information technology's ability to store larger volumes of information thus extending the human's cognition and increase his/her's capacity to think creatively. (Wood, Markman, 2009)

3. Hypothesis

The need for a tool that allows designers to brainstorm without constraints is an essential part of ideation. However, there is also a need to be considerate of important insights gathered from design research. Brainstorming should be uninhibited but still fall within the scope of the design project. This tool uses a similar approach to idea generation and brainstorming like that of Da Vinci's Ideabox. Using the two main parameters like nouns (features) and adjective (characteristics), which are a result of design research, we use a circular model that can help facilitate the generation of unconventional combinations and variations. The two parameters for the sake of a design undertaking would be opportunity gaps and user needs. The following task flow diagram displays the steps suggested for this model (Figure 2). A blank version of the ideation tool is displayed below (Figure 3).

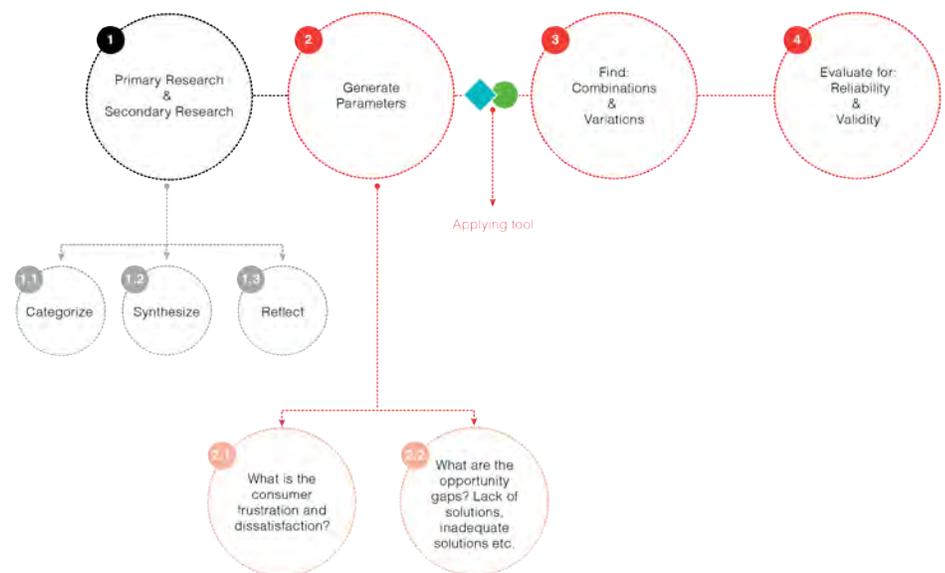


Figure 2: Task Flow Diagram

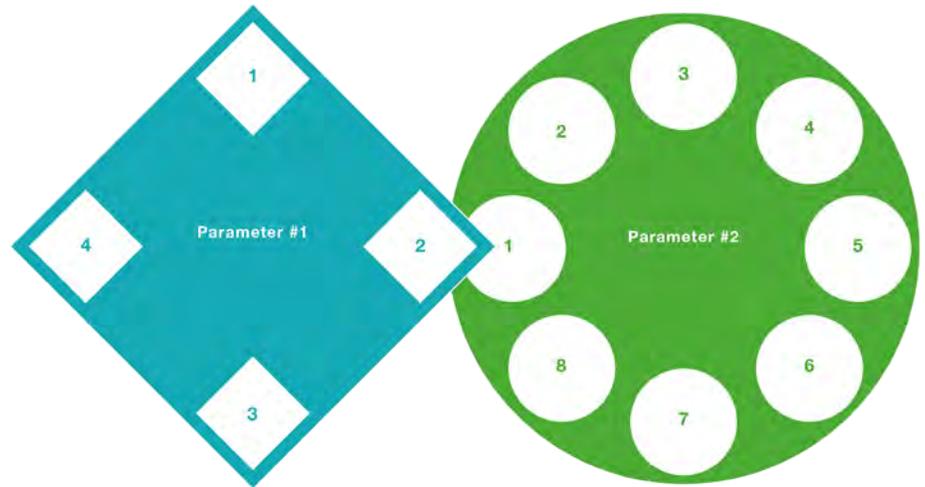


Figure 3: Blank Ideation Tool

4. Design of Tool

Before we begin the process of creating novel design solutions, we need to define the most important components needed for design innovation. There are some essential ideas we need to take away from design research and some of them are the opportunity gaps in the current market and the user needs (the issues that users are facing with those solutions). The example of Da Vinci's Ideabox to produce the most unique human faces is used to illustrate this model. However, a few modifications need to be made to his matrix before it can be used in the ideation model.

Step 1 – Primary and Secondary Research:

A few ways to analyze primary research are to categorize, synthesize and reflect on information. (Leonard, Ambrose, 2012) The two common terms used when categorizing data are typology and topography. Typology studies groups of things and topography studies the relationships between different components in an organized fashion. Synthesis, on the other hand, is the process of parsing through a large volume of information to select specific insights that might prove useful during ideation. Reflecting on the learning so far and organizing them in order of importance and relevance in the next step towards using the research to guide the ideation process.

In the case of our example, Da Vinci's Ideabox, we can begin our research by looking at a sample of 12 people. We categorize them by their features. For example, people with prominent or "interesting" (anything that stands out of the ordinary) eyes are in the Eye category. Using the same principle, people with "interesting" noses are placed in the Nose category and so on. Once they are placed in that category their features can now be synthesized by answering the question: what is it about their eyes, nose, head or mouth that makes them interesting? Somebody's eyes might be interesting because they are bulging or squinty. People in the Nose category might have a nose that is broad or hooked and so on. The analyzing part of the research phase comes in when we have to answer the question: why is it interesting? What is different about it? How do we compare this to others'

eyes or nose? What is the common characteristic prevalent between the different features? “The goal is to transform data into information and information into insight” – Carly Fiorina (Leonard, Ambrose, 2012)

Step 2 – Generate parameters:

In order to use the research that has been conducted and analyzed to support uninhibited ideation through the creative ideation model, we need to sort the information. For example, if we were to generate parameters using Da Vinci’s Ideabox, based on our research in the previous step, they would be: Nouns (features) and Adjectives (characteristics). The ‘Features’ dial would house the common features found on every individual in the study. In the ‘Adjectives’ dial, we would list every feature that is either unique or seen repetitively among the subjects in the study.

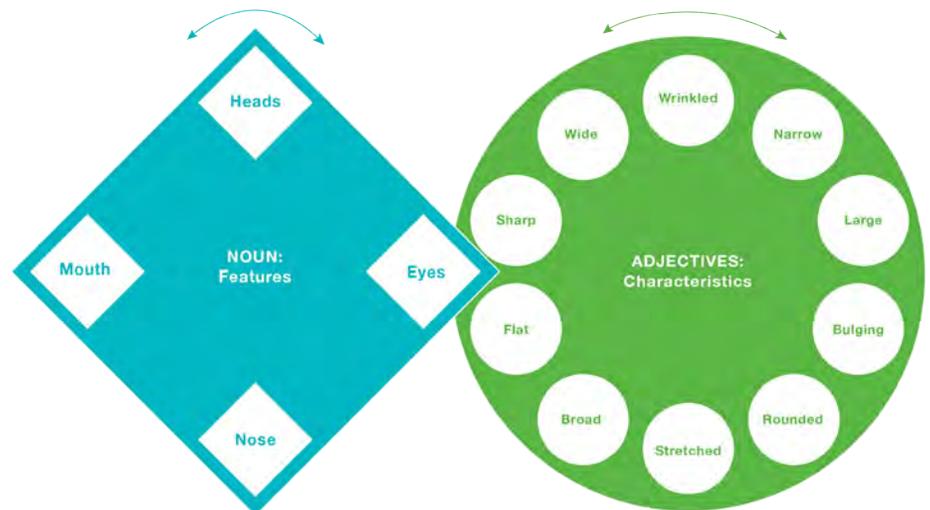


Figure 4: Nouns and Adjectives

Step 3 – Find Combinations and Variations:

The parameters that are generated are entered into the model, which helps us see the different components that we have to work with in order to begin ideation. This organizational system allows us to quickly create different combinations and variations at the spin of the dials. This system of using basic forms like a square and a circle leaves room for the user to adapt the model. For example, the left dial would be a hexagon if the number of opportunity gaps were to increase to six. And the diameter of the right dial would be directly proportional to the number of user needs observed during research.

This form of ideation keeps the channels of uninhibited idea generation open while being organized and still keeping the important insights from the research in the forefront of ideation. As we pull more insights and create more entries for the parameter dials, our chances of producing more potential design idea increase. To begin formulating combinations and variations of design solutions, while being organized, the user would have to spin the dial one at a time.

In our example with the human features, by spinning the dials, we come up with unique combinations like a human face with wrinkled eyes, a bulging nose, narrow head and a rounded mouth.

Step 4 – Evaluate for Reliability and Validity:

After the generation of ideas, it is important to evaluate the ideas for their quality. The terms reliability and validity are usually used by management researchers and generally are mutually exclusive. (Leavy, 2010) However, in order to proceed with prototyping and refinement, we need to evaluate the combinations and variations of design solutions that are a result of using this model. We need to ground our design solution in reality. Reliability of a solution is its ability to “produce consistent, predictable outcomes.” Managers usually favor the reliability aspect of the process while designers favor the validity. A valid solution would “produce outcomes that meet a desired objective.” (Leavy, 2010) These concepts are a useful addition to this process model. A solution that balances between the two ideas would be the most optimum. The goal is to design an innovative solution that fulfills the objectives as outlined in the project brief and can be produced repeatedly and consistently.

5. Future Directions

Ideally, there would be an experimental group that would use the creative ideation model and a control group who would use the traditional* method of brainstorming and idea generation. Both the groups would be given the exact same project brief. Their process would be documented in the forms of photographs, journal entries and video clips. The results would then be compared on the basis of:

- Ability of design solution to accomplish the objectives indicated by project brief (validity).
- Ability of the design solution to be reproduced consistently (reliability).
- Innovative quality of the solution benchmarked against solutions already available in the market.

Informal studies comparing the traditional* forms of ideation and the creative ideation tool have been conducted and the tool seems have an advantage due to the sheer volume of concepts and the uniqueness of each of them.

* Here, the term “traditional” would imply any method used by a designer or a design team that is consistent across multiple projects.

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UNDERSTANDING EMPATHY IN DESIGN

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1. Abstract

In recent decades, empathy has been described as an essential skill any designer must develop. Benefits of empathy, such as reaching a deeper understanding of others from a more caring perspective into the design process, can deliver more successful and meaningful products. The purpose of this paper is to present the conceptual framework of empathy in order to understand how designers are building, using, and receiving its benefits during the design process, as part of a research to evaluate opportunities of increasing empathy with training.

2. Introduction

In design, empathy is considered a key element of design thinking (D. Kelley & Kelley, 2013; Pattison, 2011; Brown, 2008), the basis for innovation (Patnaik, 2009), and an essential component in the process of designing a successful product (Dandavate, Sanders, & Stuart, 1996). It is considered essential for understanding “how to change and impact behavior” (Griebe in Xu, 2011).

Although it is difficult to prove empathy to be the main factor of a product’s success, I believe it plays a crucial role. The major challenge for design today is not only to deliver a high quality product¹ but also to provide rich, positive, and meaningful experiences beyond the functional performance. Products can offer a world-changing solution but they lose their value “if they do not resonate with the people who will use them (Thomas & McDonagh, 2013). [The] products designed without an adequate amount of empathy will be underused, misused, or abandoned”

The way designers can build and get benefits from empathy have been discussed in recent decades evidencing constraints and roadblocks in the process. Part of the problem is to define empathy for design and start building from that definition. The other part refers to relying on data more than what’s in real peoples’ stories. Data is important and provides support and credibility, but it is not enough to understand needs, desires, and expectations. We need both, quantitative and qualitative research

¹ I use the term product to refer to “physical products, services, software and integrated systems” as used by Cagan and Vogel (2012, p. 7).

Understanding Empathy in Design

in order to have meaningful results that create products that make sense to people on their daily routines. Tom and David Kelley, of IDEO, defined this approach as hybrid insights: “coupling insights based on empathy with analytic confidence within relevant target markets may be a way to take the best of both research approaches. So while we’re sure the big data trend will continue to grow, decision makers should be careful not to forget about the underlying human element” (2013). In the business world, companies such as Disney, P&G and Walmart, recognize the power of empathy on their approach when breaking into emerging markets. They learned that is very difficult to sell something without a deep understanding of what people care about and find value in, beyond the functional performance their product may offer. Once these companies realized what really matters for those markets, the doors were open for business (Pannozzo, 2013). These experiences demonstrate that leaving empathy outside the design process may lead to solutions for stereotyped profiles rather than for real people. According to Tom and David Kelley’s last interview, “in organizations with millions of customers, or in industries serving the broad public, there is a temptation to stereotype or de-personalize the customer. They become a number, a transaction, a data point on a bell curve, or part of a composite character built on market segmentation data” (2013). Although this might be the general situation, some companies are already doing their homework with successful results. Belcorp, a company leader in make-up and personal care products, have been investing on innovation and research in the last two years, training their employees in different techniques to better understand their customers beyond marketing reports. They proved the value of building empathy open new and promising paths that relate with people and their daily routines.

3. Background: Recalling an Old Story in Design

The awareness of the need to understand people is not a new concept in design. More than two decades ago Elizabeth “Liz” Sanders, founder of Make Tools, declared that products fail because we’re not sure about people’s real wants or needs, thus “for products to be successful...they will need to meet consumer needs simultaneously from three perspectives: usefulness, usability, and desirability” (1992, p. 50). Later Harvard Business School Professors, Dorothy Leonard and Jeffrey Rayport, affirmed to the Business Review magazine that “empathic design pushes innovation beyond producing the same thing only better by “developing a deep understanding of user’s unarticulated needs [which] can challenge industry assumptions and lead to a shift in a corporate strategy.” (1997, p. 113). Since then, design has ‘borrowed’ methods from other areas such as anthropology; social psychology, and sociology in order to better understand people’s behaviors, expectations, desires, and needs. Parallel efforts were made motivated by the need for inclusion and integrative solutions for people with any cognitive or physical disability. A team lead by Ronald Mace at North Carolina State University proposed the principles of universal design (1997), which required designers, architects, and other areas to shift their point of view to other’s they may not be able to experience or even imagine from their desks. Later, the University of Cambridge presented the Inclusive Design Toolkit with

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practical recommendations and detailed protocols to follow in order to develop a design process based not only on disabilities but also on diversity (2005). The importance of universal and inclusive design in developing empathy grounds on pushing designers to research in the field, experiencing situations they only could describe from their imagination before. Designing from this perspective has brought benefits to all, making products easier, more convenient, and understandable. The success of these approaches indicates that the in-depth study of people's differences and particularities are worth the effort.

4. Empathic Design

When designers realized their research process required a change, they shifted from making personal assumptions, or a designer-centered design process (McDonagh, 2006), into a human centered design perspective, considering users and other stakeholders as active and essential for developing real and meaningful products. "Human-centered design can help to refocus the designer, by placing the individual and user's needs at the heart of their decision-making" (Thomas & McDonagh, 2013). Empathic design is one of the multiple techniques of Human centered design (Steen, 2008). It focuses on enhancing people's experiences through a comprehensive understanding, without the need of finding the ultimate truth about their activities and environment (Kouprie & Visser, 2009; Kurvinen, 2007; Postma, Lauche, & Stappers, 2012). Empathic design bases on observation and participatory techniques that get envisioning designers more involved in field-research activities, and places stakeholders in a very active role.

5. What Is Empathy?

According to the Oxford American Desk Dictionary and Thesaurus empathy is "the ability to understand and share the feelings of another" (2010). The word comes from the greek *em* (in) *pathos* (feeling) and was translated to the german word *Einfühlung* (feeling into) in 1858 by Hermann Lotze and Robert Vischer. The philosopher Theodore Lipps used the term to describe when people have direct access to another's emotional states by internally imitating their facial expressions (de Vignemont & Singer, 2006, p, 437). At the beginning of the twentieth century the psychologist Edward B. Titchner translated the word into English as the word we know today. The original meaning (in feeling) has been extended, re-phrased, and re-interpreted in many different ways.

Every discipline defines empathy from its own perspective and interests. Some areas define empathy as an emotional response and other as the conscious response after understanding what other people are experiencing. As in other areas, design is not the exception. The main and bigger problem is the lack of agreement in what empathy means in design. It is not clear if designers understand empathy as a personality trait, an emotion, or as a skill. Despite of this disagreement, everyone agrees on its perceived benefits on products. From this perspective, the tools or increasing empathy may be based on vague definitions and unclear expectations. Because these techniques grow in popularity and number, it is fundamental not only to

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understand what empathy is for design, but also to review what we want to understand from the stakeholders and how we are accomplishing that goal within the design process.

After a deep research across areas including design, I defined empathy as the ability to step in and out of another's viewpoint by recognizing, understanding, and sharing their feelings, without losing one's own perspective, and responding with the appropriate behavior, that in case of designers, translates to the appropriate [design] product (Leyva, 2013). This conceptualization considers empathy as a multidimensional system, regulated by a flexible boundary or horizon between designers and people that grows by learning about other's realities and experiences (McDonagh, 2006a), and a response.

6. Understanding Empathy in Five Principles

1. It is bigger than sympathy and compassion, and does not imply agreement

Empathy is interchanged and occasionally confused with words such as sympathy and compassion. The Oxford American desk dictionary and thesaurus defines sympathy as "feeling sorrow, distress and anguish for another's misfortune;" and defines compassion as "the act of being concerned about others' suffering (2010)." Although both, sympathy and compassion relate to "the other", these concepts are limited to negative situations whereas empathy extends the ability of sharing and understanding others in any condition, including, but not restricted to, the negative ones. From this perspective, sympathy and compassion are modes of empathy, but empathy expands beyond feeling sorrow, concern, and distress. Likewise, empathy requires understanding and sharing emotions of another without judging. It means to be able to understand and even share emotional situations, and yet disagree with the other reaction. (Feldman & Mulle, 2007; Furey, 2012).

2. It has limits; too low apathy too much is pathological altruism

According to Simon Baron-Cohen, a psychologist expert in studying empathy in people with autism, empathy does not work like a switch you can turn on and off, but more like a dimmer, along what he calls the "empathy bell curve" (Baron-Cohen, 2011b). Empathy is the "sweet spot" in between *apathy*, or not caring, and *pathological altruism*, or caring too much. The later has been defined in anthropology as "going native," or getting too involved in the observed situation. Crossing this imperceptible line often makes people "lose the emotional detachment needed to be both observer and participant" (Cline, 2012). This phenomenon can also lead to focusing on our own emotional states and start judging from our own perspective. In that moment we are no longer able to distinguish between another's and our situations, basically because we became part of it. (Oakley, 2012). For designers, being able to stop is critical in order to consider all possible perspectives concerning the problem. As long as empathy is a process that benefits others by receiving different perspectives, detachment or separating from the situation is essential for shaping those perspectives. This detachment helps when considering different stakeholders' viewpoints, even if they have opposite requirements.

3. Empathy is a social skill that evolves in the childhood and relates to the ability to recognize that others differ from us

As a social skill, empathy evolves in the childhood and relates to the ability to recognize that others differ from us (Rifkin, 2010). It starts around “the second year, as soon as symbolic representation and mental imagery set in that enable children to represent the self, to recognize their mirror image, and to identify with another person” (Bischof-Kohler, 2012). Although the primary connections of empathy are motivated without awareness by sharing representations, empathy is a voluntary process (Decety & Jackson, 2004) that requires motivation and willingness (Kouprie & Visser, 2009). Once we recognize we are unique and different from others, we also recognize the differences in needs, desires, and preferences. Empathy develops and refines along a person life-span, and is supported on other social abilities such being good listener, not-judging, and respect others’ point of view in situations where we may share feelings and other situations where we may not.

4. All humans are able to develop empathy

Developing empathy is a complex process that evolves and is refined with time. Its development depends on a combination of biological settings, socio-cultural conditions, and professional motivations.

From the biological point of view, almost all humans are hard-wired with a neurological circuit that provides the possibility for developing empathy, excepting those suffering disorders such as Alexithymia or Asperger’s syndrome, that prevent people from understanding non-verbal communication cues (Baron-Cohen, 2011b). Within this neurological circuit, the mirror neurons and the limbic system play a key role. “Mirror neuron system is a group of specialized neurons that ‘mirrors’ the actions and behavior of others” (Rajmohan & Mohandas, 2007). This mechanism of mimicking other people is the base of our learning processes, and presumably responsible for contagious reactions such as yawning when someone yawns, or babies crying when another cries (Meltzoff & Decety, 2003). The limbic system, on the other hand, is involved in the emotional processing (Jackson, Rainville, & Decety, 2006), helping us making sense of people’s actions and building emotional connections with them (Patnaik, 2009).

From the social point of view, developing empathy depends also on the environment and conditions we grow in. Economic and social theorist, Jeremy Rifkin, affirmed that as humans “we are *softwired* for sociability, attachment, affection companionship, not for aggression, violence, self-interest, and utilitarianism” (2010). This connection with others gets stronger as we feel part of something, developing a sense of community and belonging (Leary, 2010). People exposed to challenging public situations and social rejection are able to develop more empathy for others in comparison to those who have been the center of attention, experienced social privileges, and enjoyed unrestricted access to different situations (Pickett, Gardner, & Knowles, 2004). These last conditions have been called the problem of the ‘egocentric child’ who may have to spend longer periods learning about others’ perspectives (Gilbert, 1998).

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As a professional skill, areas such as healthcare, nursing, and psychology identify and recognize empathy as a key element in the healing process (Small, 2011), and crucial to build a therapeutic environment (Rogers, 1957). Areas such performing arts also uses other aspects of empathy to be able to accurately represent a character from inside out (Goldstein, Wu, & Winner, 2009; Goldstein & Winner, 2012). In design, empathy is considered the main and most important component of design thinking (Brown, 2008; T. Kelley & Kelley, 2013). However, is empathy trainable? Can we learn how to be more empathic or how to build it? Much has been debated about the possibility of training empathy. From the neurocognitive perspective, Decety & Jackson (2004) consider empathy as voluntary and “flexible human capacity (...) susceptible to social cognitive intervention, such as through training or enhancement programs for targeting various goals (e.g., reeducation of antisocial personalities, training of psychotherapists)” (p.94). From this perspective, empathy training for designers should focus on refining the social ability that seem simple and even natural to better understand others’ thoughts, feelings, underlying motivations, and values.

5. It allows us to understand and predict others behavior by understanding why they do what they do

The neurological system allows us to recognize other’s actions, intentions and motivations by identifying patterns in their behavior, coding them, and anticipating other’s future behavior, thus coordinating ours across different social situations (Eisenberg, 2000; Baron-Cohen & Wheelwright, 2004; Decety & Jackson, 2004; Iacoboni, 2005; de Vignemont & Singer, 2006; Epley, Nicholas, & Waytz, Adam, 2010). This codification is the base for human relationships. For designers this categorization and pattern analysis all humans, may become powerful resources to predict how others would react under specific conditions.

7. Promoting Empathy in Design: Tools and Techniques

Since empathy is a social skill we could use as a professional advantage, this means “designers need conceptual tools that enable them to think about the social without having to become social scientists themselves” (Postma et al., 2012). Once we agree, as design community, on the definition of empathy, the challenge is to review what we want to understand from the stakeholders and how we are currently accomplishing that goal within the design process. The problem is that if twenty years ago design lacked tools for understanding others; today, the extensive offer makes the selection of the appropriate technique very confusing. Designers struggle deciding not only when in the process to select one or another tool but also how to implement it properly in an actual iterative process.

According to Liz Sanders, the best scenario to achieve empathy with people is by direct interaction. Process such as co-design and participatory design methods provide the appropriate conditions for such enhancement (Personal communication, Dec 14, 2013). Direct contact either by observations or by participatory processes gives designers the possibility to relate emotionally with the stakeholders at different levels. For instance, an observation of

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other people struggling trying to accomplish perceived simple tasks, allow designers connecting with the person behind the problem, instead of only with the problem itself isolated from the human, as may happen when reading from descriptions or other sources (D. Murray, Personal communication, March 26, 2013). Researchers from different disciplines also concur that the main way to get into identification and recognition of other's behavior is by observation (Reik, 1949; Gilbert, 1998; Sanders, 2000; Suri, 2003; Dreyfuss, 2003; Goldstein et al., 2009; Macrae & Quadflieg, 2010; van Rijn, Visser, Stappers, & Özakar, 2011; Montgomery & Judelle Brake, 2012), combined with memory, knowledge, and reasoning (Ickes, 1997) to be able to make accurate inferences. Certainly direct observation is a powerful source of information and represents the foundation of many other techniques. David & Tom Kelley, IDEO founders, affirm observation is the best way to inspire and spark new insights; it is the way to understand others' concerns through their reactions (2013). Observation facilitates emotional resonance with other's situation allowing us to recognize a piece of ourselves in different realities. For empathy, it is the first step to connect from our experiences with the observed situation. For this reason, and because observing can be much more complex than it seems, this activity itself requires additional tools not only for organizing and documenting the information, but also for making sense of these observations when making decisions within the design process. This is why companies such as INSITUM, a leading innovation consultancy, uses structured observation protocols for their research processes; therefore researchers do not miss any important detail or get distracted with less important information (Personal communication, Alvaro Diaz, Partner & Manager INSITUM Colombia, October 15, 2013). Having the goal of observation clear and following simple rules, this ethnographic technique becomes a powerful source of information.

However, having access to people is not always feasible, and when it is, it does not guarantee we are able to understand completely their experiences only by observation and direct interaction. In many scenarios, the lack of time and/or resources constrain designers to learn about their stakeholders from different sources of information, under the risk of making decisions based on false assumptions. A good option for complementing observation, and for avoiding stereotyping people is to replicate as much as possible stakeholders' conditions through techniques such as simulation and mimicking, engaging perspective taking from both, cognitive and emotional perspective. In any case, all situations and products require different levels of empathy. In some cases, the demand could be more towards the emotional connection and less about a rational learning. On the contrary, others may require less emotional resonance and much more rational learning and understanding from a fictitious scenario.

8. Benefits of Empathy In Design

Based on a literature review across disciplines, I believe that improving empathy in designers might help several purposes during the design process. It may give access to stakeholders' needs and desires that are often difficult to verbalize. It may become a tool for facilitating the inferential process and

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understanding future reactions, emotions and habits contemplating overall impact solutions in contrast to isolated impact results. It may help building hybrid insights along with data, providing a solid and realistic base for the decision-making processes from an emotional and cognitive reasoning. Empathy may help designers to navigate through different stages of the design process by changing the questions and opening new possibilities for sharing and understanding. Lastly, it may give designers the understanding that a product should offer a meaningful experience beyond the technological and functional package, modifying the behaviors and habits it shapes and ultimately impacting the lifestyle it will be part of.

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BOOK RECEIVED

December 2013 Vol. 8 Num. 12

Managing Emotion in Design Innovation

Author/Affiliation
Amitoj Singh

This book presents an emotion centered research framework titled "emooha" for design innovation. It defines emooha and underlines the importance of the developed framework in culturalization of technology and thereby design innovation. The book explains the detailed research on product styling which leads to the creation of "Emooha" and how to use it in product design.

Key Features

- Outlines the 'emotion centered segmentation' of product ownership experiences
- Provides a research framework for methodical assessment of product styling
- Demonstrates the cultural impact on design in connection with emotional factors of the user
- Bridges the divide between design practice and design theory
- Addresses design innovation in a huge market of motorbikes in India

Selected Contents
Introduction. Literature-Oriented Research Framework. Evolution of Research Methodology. The Sociocultural Segmentation of Biking. Emotive Quality of Biking Segments. Emotion-Centered Research Framework for Design Innovation.

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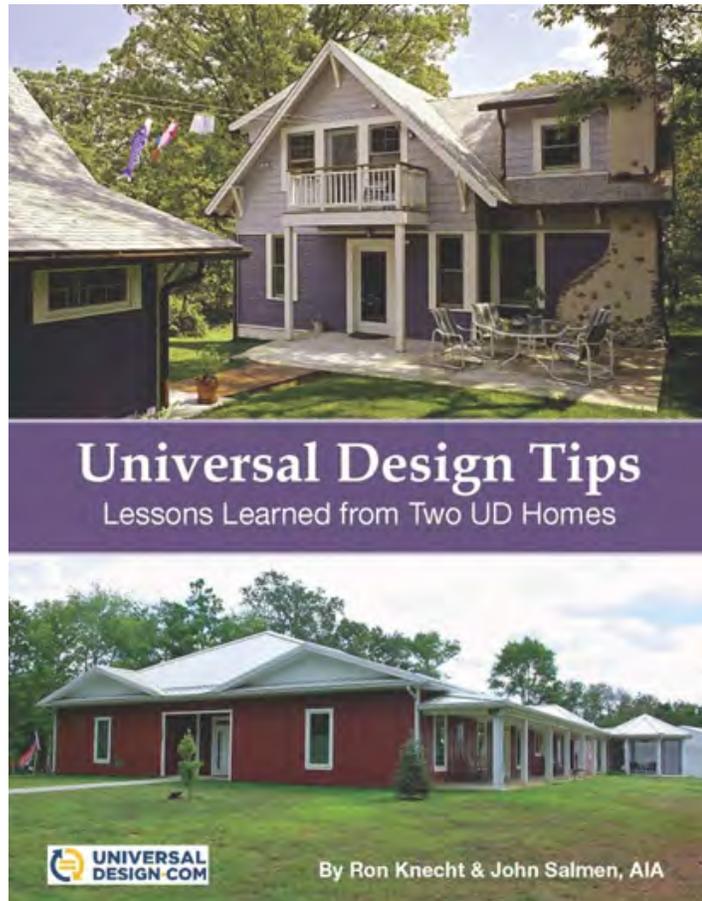
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A New eBook from UniversalDesign.com
Universal Design Tips: Lessons Learned from Two UD Homes



This new electronic book from UniversalDesign.com is filled with tips and ideas that will help guide anyone through the process of designing and constructing their own Universally Designed home. The book was co-authored by John Salmen, AIA, the publisher of Universal Design News and founder of UniversalDesign.com, and Ron Knecht, whose durable, energy efficient Universally Designed house was featured in the January 2012 issue of Universal Design News.

The first section of the book deals with the planning process, providing insight on how to choose a location for the house, consider activities of daily living during planning, best use various types of design professionals, finalize a floor plan and develop a building schedule.

The rest of the book is organized according to different areas or elements of the home (i.e. exterior doors, bathing, and kitchen counters, just to name a few.) Whether designing a whole house or simply remodeling one area, Universal Design Tips makes it easy to quickly refer to the relevant section and find valuable tips that ensure success. Each of these sections includes design tips, photos and important lessons that the two authors learned through their personal projects.

Book Recieved

John Salmen has been working in the field of accessible architecture and Universal Design for over 30 years, and he put this expertise to good use when remodeling a historic property to create the Universally Designed house he and his wife hope to live in for many years. Salmen's "Home for the Next 50 Years" has been featured in various media outlets: including The Washington Post, Fine Homebuilding, AARP's television show Inside E Street and the book *The Accessible Home: Designing for All Ages and Abilities*. Now, readers will be able to explore Salmen's home in even greater detail and apply his experience to their own Universally Designed home projects.

Ron Knecht's experience with Universal Design started after his wife of 46 years became ill with cancer. As her health worsened, Knecht learned first-hand the importance of accessibility for maintaining independence, safety and one's quality of life. Before Knecht's wife passed away, she extracted a promise from him that he would move to a Universally Designed house located closer to their daughter. Knecht was underwhelmed by both the houses that he saw on the market and the UD house plans that he found online; he realized that he would have to plan and build a custom house in order to fulfill his promise.

Knecht and Salmen were mutually impressed with the thoughtful Universal Design details present in each other's homes, and eventually they decided to co-author a book that would draw from their experiences to provide guidance for anyone planning to build or remodel their home for enhanced safety, comfort, independence, convenience and aging in place.

The eBook is available from UniversalDesign.com as a downloadable PDF, for \$20. A short excerpt of the book is also available for preview prior to purchase. To buy the eBook or view the preview visit UniversalDesign.com.

NEWS

December 2013 Vol. 8 Num. 12

1. Meeting to promote disability-inclusive development agenda

UNESCO will be hosting the 8th meeting of the UN Inter-Agency Support Group for the implementation of the UN Convention on the Rights of Persons with Disabilities (IASG) at its Headquarters in Paris from 25 to 26 November 2013. IASG, which has two chairs – the United Nations Department of Economic and Social Affairs (UNDESA) and the Office of the United Nations High Commissioner for Human Rights (UN OHCHR) – and one yearly co-rotating chair, has also previously been ensured by UNICEF, ILO, the World Bank and other Agencies.

IASG, composed of all UN Agencies, was created to facilitate and coordinate the implementation of the United Nations Convention on the Rights of Persons with Disabilities, and covers a diverse range of activities and initiatives related to disability issues. The IASG meeting is, therefore, intended to sustain a dialogue between different UN bodies working in this area in order to ensure a coordinated and comprehensive strategy to protect the rights of persons with disabilities.

Among the items to be discussed in Paris will be a debate on the implementation of the Outcome Document of the High Level Meeting of the General Assembly on the Realization of the Millennium Development Goals for Persons with Disabilities, which took place during the UN General Assembly meeting on 23 September 2013. The IASG meeting will thus be instrumental to carving out the vital role that disability-inclusive development will play in the post-2015 development agenda.

The first day of debates will consist of a closed internal meeting only to enable technical discussion between UN Agencies. The second day will be an open discussion that will involve non-governmental organizations and disabled people organizations working on issues related to disability. The second day will also include a thematic workshop in the areas of inclusive education; access to information and knowledge; ICT accessibility and disaster preparedness and response; as well as social inclusion and internal disability policies and practices.

UNESCO promotes the rights of persons with disabilities to access information and knowledge using ICTs as their inclusion stands at the heart of UNESCO's work. The brochure, *New Avenues for Empowerment: Access to Information and Knowledge for Persons with Disabilities*, provides more information about UNESCO's work in this area.

2. The travel and hospitality industry should apply the principles of universal design to their products and services.

by Jackie Ng

IT'S that time of the year again when most of us plan our holidays, trips, breaks and getaways. Whatever you call it, the main purpose of these outings is to unwind and relax, and get away from crazy stuff which stresses us out. After a year of hard work, what better way to reward ourselves than to take a holiday and chill out.

I used to join the year-end holiday-makers before I was diagnosed with brain tumour 15 years ago.

Following two operations and a turn of events which affected my mobility, I have not had too many chances to travel.

As a brain tumour survivor, there are a lot of issues which I need to take into consideration when travelling. Accessibility is a key concern.

A few years ago, I had the opportunity to travel to the East Coast with a group of people with various disabilities.

We took the national carrier and was pleased with the way the airport staff handled passengers with disabilities. The transfers to and from the aircraft went smoothly.

However, we were not so lucky with our hotel rooms.

As the hotel did not have any disabled-friendly rooms, we had to make do with whatever we were provided with.

All of us had problems with the toilets.

The shower was inaccessible because it was inside the bathtub, so the staff provided us with plastic chairs and scoops.

The sink was also out of reach for wheelchair users.

If we wanted to take a bath, we had to use the hose next to the toilet bowl. Just imagine taking a bath with freezing cold water early in the morning.

Some of us had a really tough time manoeuvring our wheelchairs inside the restroom. It was not built to accommodate wheelchairs and the poor design and positioning of fittings added to our misery.

Jackie Ng, brain tumour survivor.

Jackie Ng, brain tumour survivor.

A disabled-friendly hotel room should feature standard adaptations with beds, switches and panic alarms placed at suitable heights.

Restrooms should be big enough to accommodate wheelchairs, and all fixtures and fittings, including handrails, must be within easy reach.

Another major concern is whether restaurants and other food and drink joints like bars are accessible.

Imagine you are hungry and you head to a restaurant only to discover that you can't access it due to a lack of facilities. How would you feel?

When on holiday, we worry if restrooms in restaurants and public places are disabled-friendly and whether we can access the malls.

How I wish the coming Visit Malaysia Year 2014 would be more inclusive, and the travel and hospitality industry would apply principles of universal design to all their products and services.

Universal design involves designing buildings, products and spaces that address the needs of people with disabilities.

Universal design also recognises that there is a wide spectrum of human abilities, and that everyone passes through periods of temporary illness, injury and old age.

By designing for this human diversity, we can create things that are more functional and user-friendly for everyone.

There are seven principles of universal design:

1. Equitable use

The design should be useful and marketable to people with diverse abilities.

2. Flexibility in use

The design accommodates a wide range of individual preferences and abilities.

3. Simple and intuitive use

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

4. Perceptible information

The design communicates necessary information effectively to the user, regardless of the user's sensory abilities.

5. Tolerance for error

The design minimises hazards and adverse consequences of accidental or unintended actions.

6. Low physical effort

The design can be used efficiently and comfortably with minimum fatigue.

7. Size and space for approach and use

Appropriate size and space is provided for approach, reach, manipulation and use, regardless of user's body size, posture or mobility.

Here are some examples where principles of universal design are applied:

Smooth, ground level entrance without stairs;

Surface textures that require low force to traverse on;

Surface that are stable, firm and slip-resistant;

Wide interior doors (92cm), hallways and alcoves with 152cm x 152cm turning space at doors and dead-ends

Lever handles for opening doors rather than twisting knobs;

Light switches with large flat panels rather than small toggle switches;

Buttons and other controls that can be distinguished by touch;

Use of meaningful icons with text labels;

Ramp access to swimming pool;

Labels on equipment control buttons in large print.

I am aware that Kuala Lumpur is not a very disabled-friendly city as far as accessibility is concerned, with limited accessible hotel rooms available, but I believe “if there is a wheel, there is a way”.

Certain things can still be arranged. Will the industry players be prepared if tourists visit our country with the whole family in tow, including elderly parents, toddlers, and babies in strollers?

And don't expect people to leave their disabled family members at home.

How wonderful it would be if our travel agents are willing to go the extra mile to arrange accessible transport for our disabled tourists.

It would be better still if the agents could work together with hotels and restaurants to provide accessible accommodation and services to their guests.

It would be very helpful if the travel agents could provide disabled tourists with information on disabled-friendly facilities. For example, where is the nearest disabled-friendly restroom, or the nearest lift.

In the service industry, whoever provides better services wins.

3. Embracing Variability with Universal Design for Learning *Principles for creating learning experiences that are accessible by all children*

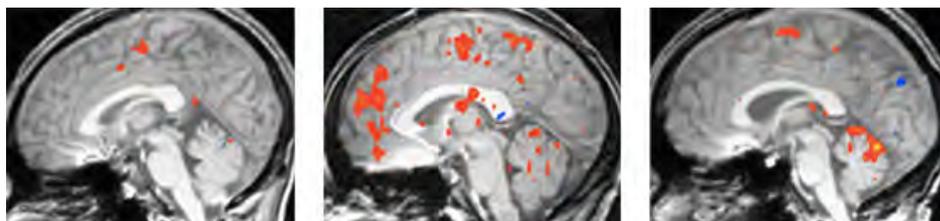
by Chelsea Miller



I always thought the term “special education” was a little misleading. Traditionally, special education services involve a team of family and professionals finding ways to modify the curriculum to make each child fit into prescribed grade level expectations. After becoming a teacher, I believed all people learned a little differently, and everyone would benefit from a team that drafted a specialized education plan for them. Why can’t we design schools and curriculum in a way that is more inclusive of learning differences so that 13% of American children aren’t labeled for supposedly being “disabled”?

After attending CAST’s Universal Design for Learning Institute, I was thrilled to learn that there are educators and neuroscientists researching this very idea. Their belief is that all children are exceptional because there is predictable variability in our neurology, meaning that all people learn and think in truly unique ways.

To demonstrate this, a group of neurologists at the Institute asked three people to tap their index finger and thumb together repeatedly. Below are the MRIs of three people completing the exact same task:



As seen above, the three participants used their brains in observably different ways to complete seemingly identical task. As educators, we observe a similar phenomenon in the classroom: all of our students are exceptional learners because each of our brains process information differently. These differences are only amplified when the task becomes more difficult and complex, such as learning to read or solving calculus problems.

With this understanding, CAST suggests we rethink instructional design using the three Universal Design for Learning (UDL) Principles:

1. Provide Multiple Means of Representation

Learning is impossible if information is imperceptible to the learner, and difficult when information is presented in formats that require extraordinary effort or assistance. To reduce barriers to learning, it is important to ensure that key information is equally perceptible to all learners.

2. Provide Multiple Means of Action and Expression

It is important to provide materials that all learners can interact with. Properly designed curricular materials provide a seamless interface with common assistive technologies through which individuals with movement impairments can navigate and express what they know. This can be done by technologies like a single switch, voice activated switches, and expanded keyboards.

3. Provide Multiple Means of Engagement

Affect represents a crucial element to learning, and learners differ markedly in the ways in which they can be engaged or motivated to learn. There are a variety of sources that can influence individual variation in affect including neurology, culture, personal relevance, subjectivity, and background knowledge, along with a variety of other factors.

In short, we should redesign instruction to be accessible to all learners rather than looking for accommodations and making modifications. Lessons should set clear goals with high expectations for all students, yet provide flexible means to accomplishing them.

The first two UDL principles can be applied to a Rubik's Cube. With the Rubik's Cube, the goal is to have alike squares on the same side of the cube. Traditionally this is done by covering the individual squares with colored stickers, and the player must align the alike colors on the same side of the cube. But what if a player were blind? The original solution was to produce special Rubik's Cubes with Braille letters instead of colors on the sides. But rather than creating two sets of cubes, why not provide Rubik's Cubes with both Braille letters and colors, thus changing the representation of the cube (Principle 1) and the action by which players can interact with it (Principle 2)? With this design, all players could use the same, universally accessible tool, accomplishing the same goals while interacting with it in different ways.

Affect (Principle 3) is equally, if not more important. In order to learn new information, we have to feel emotionally safe and motivated in our learning environment. All stimuli in a classroom first filters through our nerves and spinal column, then through our emotion centers, thus coloring the information that our frontal cortex then uses to process learning. All information carries a physical and emotional context which can aid or hinder our integration of knowledge. Thus, culturally relevant pedagogy and using technology to personalize the learning experience is paramount.

Candace Walkington from Southern Methodist University illustrates the importance of affect in her research on using technology to personalize instruction in an algebra classes. In this study, the group of ninth graders who used technology that integrated students' personal interests (e.g. sports, music) into the math problems solved the questions faster and with more accuracy. The students were able to apply the abstract concepts learned while using this technology in novel ways after the initial intervention.

With this understanding, we know that context and relationships within a school setting are paramount. Understanding Universal Design for Learning creates a mindset for us to design learning experiences for all individuals to gain knowledge, skills, and enthusiasm for learning. My hope is that as educators we can set the stage for a new generation who embraces variability over disability, especially in education and the workplace.

About the Author



Chelsea Miller

Chelsea Miller is a former teacher who works at Goalbook. She is also a professor at the University of San Francisco and the Director of Curriculum at Open Mind School.

4. UN Inaugurates Accessibility Centre for Persons with Disabilities

NEW YORK: Hailing a new facility that enables greater participation of persons with disabilities in intergovernmental processes at Headquarters as “a model of the digital United Nations we are trying to create,” Secretary-General Ban Ki-moon said on December 4 the initiative showed the Organization is making strides towards creating a disability-inclusive world.

“Yesterday was the International Day of Persons with Disabilities. Today we prove that we care about this issue all year ‘round,” Mr. Ban told a special event launching the Accessibility Centre, which will provide cutting edge tools for persons with vision, mobility and hearing disabilities, enabling them to access documents and fully participate in meetings.

“We are moving forward with 21st century solutions that make the most of technological innovation,” he said, explaining that people can stop by, borrow state-of-the-art equipment, and then leave to join their colleagues at different UN meetings.

Developed by the UN Department for General Assembly and Conference Management, the Centre was made possible by the generous support of the Republic of Korea, which the UN chief thanked for “its generous contribution that turned our vision for the Centre into a reality.”

Also at the event was John Ashe, President of the UN General Assembly, Jenny Nilsson, President of the Youth Section of the World Federation of the Deaf, and Kang Seong Ju, Director-General of the Convergence Policy Bureau of the Ministry of Science, ICT and Future Planning of Korea. Peter Launsky-Tieffenthal, Under-Secretary-General for Communications and Public Information moderated the proceedings.

Highlighting some of the features of the Centre, the Secretary-General said the overall approach is not centralized. Some may wish to recharge their wheelchairs at the Centre, “or type with a Palm On Keyboard, or take advantage of different services. But the result for all users is to integrate with the whole UN community,” said Mr. Ban.

In fact, equipment from the Center is not all located at the Centre. Palm On keyboards can be found at other IT kiosks around the building. There will also be a Satellite Accessibility Center in the North Lawn Building. Other available services include: braille and other assistive keyboards, hearing aids, bone conduction headsets and screen readers.

“We are privileged to share this equipment to all who need it free of charge. All we ask in return is your involvement, your ideas and your initiative,” the UN chief said, adding that persons with disabilities make enormous contributions to the Organization’s global work – on human rights and much more, including peacefully settling disputes, advancing sustainable development and establishing the rule of law.

“You can count on us to do everything possible to support your valuable work. And we count on you to keep pressing for progress on issues across the international agenda,” he said, expressing hope that the human rights of all will be brought front and center as the Organization sees increased engagement and participation of persons with disabilities at UN meetings. In his remarks to the event, UN General Assembly President Ashe said global efforts to make the world more accessible to persons with disabilities must begin – and, as the Accessibility Centre demonstrates, are beginning – “right here in our own hallways.”

Both the General Assembly and the UN Human Rights Council have asked the Secretary-General to implement standards and guidelines for the accessibility of facilities and services throughout the UN system, Mr. Ashe said. “For if we are to build a more inclusive world, it is essential that persons with disabilities are able to fully participate in and contribute to our deliberations,” he stressed.

To do so, they not only need to be able to access our meeting rooms, they also need to access information through documents and websites that are designed to be accessible to all, Mr. Ashe continued. Furthermore, they need assistive technologies such as screen readers, pointing devices or hearing aids. “By providing these tools and services, the Accessibility Centre will be instrumental in building an inclusive United Nations,” he declared.

“As President of the General Assembly, I am committed to supporting the full participation of persons with disabilities in our intergovernmental processes,” he said, explaining in that regard that he has begun to explore with the Department of General Assembly and Conference Management (DGACM) the possibility of producing the body’s verbatim records in a digital format accessible to the visually impaired.

“This will allow us to share the fruits of our deliberations with all, including those who cannot attend meetings,” pledging his commitment to ensuring that, as the international community begins the task of crafting the post-2015 development agenda, the voices of people with disabilities will be heard everywhere, in countries as well as within the UN conference rooms.

PROGRAM & EVENTS

December 2013 Vol. 8 Num. 12

01



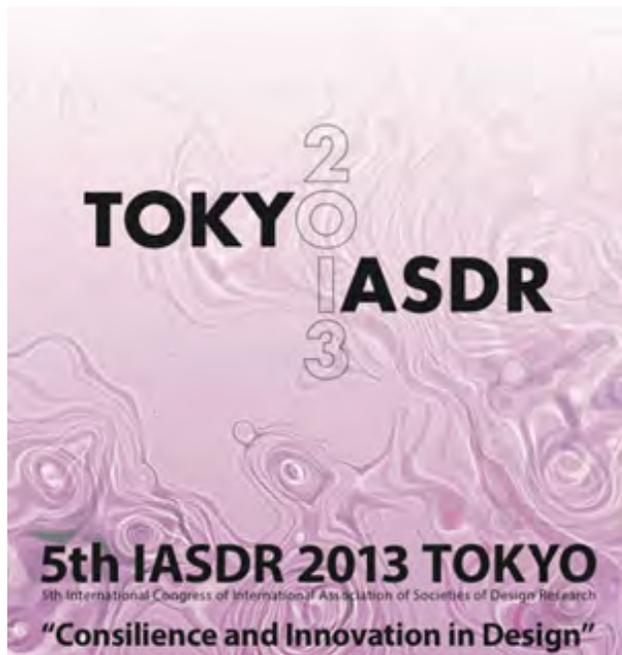
'Typography and Culture'
<http://www.typoday.in/>

Typography Day will be organized for the seventh time on 28th Feb, 1st, 2nd March 2014 at the Symbiosis Institute of Design, Pune in collaboration with the Industrial Design Centre (IDC), Indian Institute of Technology Bombay (IIT Bombay) with support from India Design Association (InDeAs) and Aksharaya.

The theme for this year's event is 'Typography and Culture'.

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02



03



products, news, business
2013 IDEA open for entries

26 November 2012 by Kate Jones
The 2013 International Design Excellence Awards is open for entries.

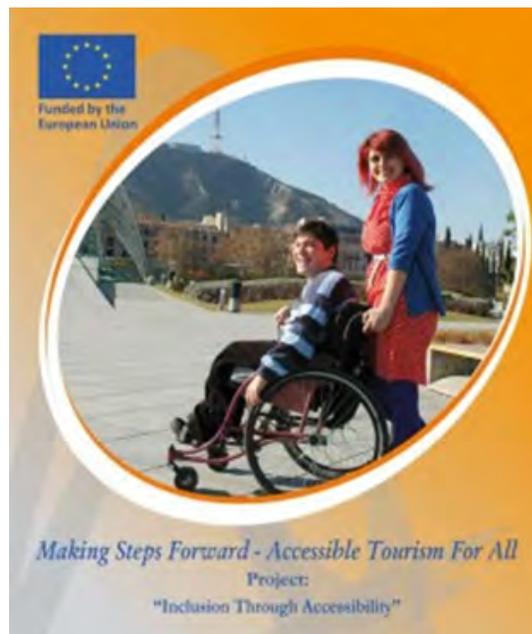
home / 2012 / november / 2013 IDEA open for entries

The Industrial Designers Society of America (IDSA) are calling for entries for their annual International Design Excellence Awards® (IDEA) competition for 2013.

04



05



06

CALL FOR ENTRIES: POSTER DESIGN COMPETITION

You are invited to design poster for ICSID interdesign 2014 workshop Contest Theme:

Humanizing the Metropolis

Background

Under the theme Humanizing the Metropolis, the Interdesign workshop aims to design solutions to address critical service issues in the metropolis. The goal is to enable the city to become self-reliant on its resources, as well as increase its citizen's sense of pride.

"In the context of emerging economies, Mumbai presents numerous opportunities for a dialogue about infrastructure, housing, sanitation, mobility, education and health care to name but a few. It demonstrated the challenges of this densely populated city and a desire to work towards the betterment of its communities through an inclusive process. In selecting their proposal, we hope to help the city bring forward a substantial level of affordable solutions to address some of these critical issues."

The competition calls for poster that expresses the interdependence of city's services, its resources and the people.

Awards

First winner Rs. 100,000. (One lakh) with citation)

Second winner Rs.50,000. (Fifty Thousand with citation)

Grand Jury

The member of the Grand Jury panel comprise of leading designer, thinkers and communication experts. People who love Mumbai.

Participation Eligibility

Entry to the contest is open to all Professional designers, design students living in India

Participation is open to teams and individual submissions.

Submitted designs must be original and not currently in publications.

Submit the design with a brief write-up of around 150 words.

Specifications

Dimension of the final poster: 420mm X 600mm only in portrait format

Resolution: 300dpi

File type: JPEG or PDF

Colour mode; CMYK

Your Contact Information

Name, Postal Address, E-mail, Telephone no. Cell No

Program & Events

Last date of Submission of your entries

Friday June 21, 2013, 4pm.

If you have any queries, pl. do not hesitate to contact us:

Sudhakar Nadkarni
nadkarni36@yahoo.com
or Anand James Dev
anand.dev@welingkar.org

Send Entries to:

ICSID Interdesign 2014
Business design
weschool, Matunga,
Mumbai-400 019

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07



IFA 12th Global Conference on Ageing
"Health, Security, and Community"

10-13 June, 2014 Hyderabad, India

Keynote Speaker



Prof. Muhammad Yunus,
Founder, Grameen Bank
Recipient, Nobel Peace
Prize 2006

Calling For Abstracts!

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<http://ifa2014.in/>

Conference Subthemes:

- Health
- Non-Communicable Disease
- Telemedicine

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08



09

12th Global Conference on Ageing
10-13 June, 2014
Hyderabad, India
"Health, Security, and Community"



 <http://ifa2014.in/>

 IFA
INTERNATIONAL FEDERATION OF AGEING
INDIA COUNCIL FOR

**Calling For Abstracts, Papers, Workshops,
and Symposiums!**

10



HCI International 2014
22 - 27 June 2014, Creta Maris, Heraklion, Crete, Greece

11



Transportation connects us all.

Whether it's simply getting from home to work or using products shipped over distances near and far, in every region of the world transportation impacts our daily lives.

At first glance, transportation may simply appear to be about the movement of people and goods. But looking deeper, it's also closely linked to equality, access to healthy food and good schools, and wildlife impacts, for example.

As the mobility demands of people and freight have grown, so too has the need for products, systems, and services that will make the transportation sector more life-friendly, for both people and the planet.

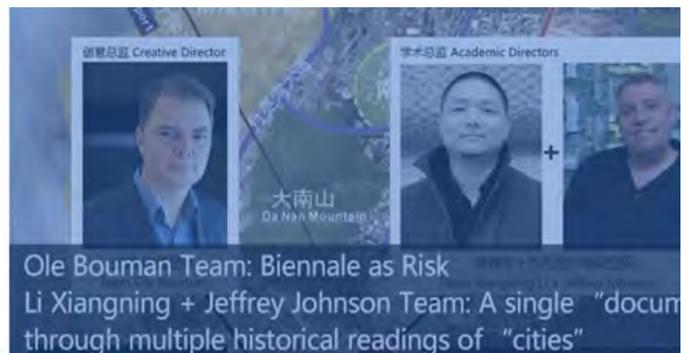
Registration is now open

Learn biomimicry and how to apply it while competing for cash prizes with students from around the world.

Register your team for immediate access to the biomimicry design resources and start developing your design solution today!



12



13 International Design for All Foundation Awards 2014



The 5th edition of the International Design for All Foundation Awards recognise achievements in the field of design for all, great and small, by governments, businesses, not-for-profit organisations and professionals from all over the world. In so doing, they aim to demonstrate that the implementation of design for all/universal design in any form contributes towards improving quality of life for everyone.

At the Design for All Foundation we believe that our awards should not be a competition, but that we should recognise all examples of good practice which arise from identifying a need or problem and satisfying user requirements and expectations. Hence from this edition onwards we will honour all “Good Practices” which meet the criteria for excellence.

However, each year an international jury will select the 5 “Best Practices” out of all the Good Practices submitted to be presented with the International Design for All Foundation Award. These will be the examples which stand out in terms of their impact and which indicate the way ahead for better implementation of design for all/universal design.

1. 30 September 2013: Opening of call for entries.
2. 2 January 2014: Deadline for submission of entries.
3. 12 February 2014: Award ceremony, which will take place as part of Urbaccess: the European accessibility and universal design exhibition in Paris.

14



UXPA2014 is 21-24 July, 2014. Be part of it.

15

'INCLUSIVE DESIGN FOR CULTURAL INTERFACE IN PILGRIMAGE SITES'



EQUITY BY DESIGN

Introduction:
In Indian society, traditions are deeply rooted despite modern lifestyle. Children learn these traditions from their parents and pass them on to their future generations. One such traditional practice is pilgrimage that almost all religions follow, in one form or the other. A pilgrimage is a journey of spiritual quest and faith, and is practiced all over the world. Generally, it is a visit to a holy place of significance to a person's beliefs and faith. It is strongly believed that one must visit such sites at least once in their life time. In India, there are several associated religious rituals, beliefs and stories with these sites, and a number of people visit to pray for good health and well being. This includes a lot of people with disabilities, elderly, children and women. This also includes rural people (poor and illiterate). The School of Planning and Architecture, Bhopal, an autonomous institution of MHRD, Government of India, is premier institute of National Importance. With a commitment to support social, cultural and environmental sustenance in the community, the school organizes a 'National Student Design Competition' or 'Design for All/Universal Design' every year. This year 2013-14, the school plans to launch this design competition with an aim to promote universal usability in pilgrimage sites in India.

Objectives of the competition:
Many universal design questions will make up the studio investigation: What facilities exist for the pilgrims in the site and how they support equal access and usability to include elderly, women, children, and people with disabilities? How places offer a unique context about 'diversity' and 'assistance' to older, disabled and poor people, and how that perspective frames universal design of facilities in these sites? While universal design's 'independence for all' focus is well grounded in western lifestyle of people living independently, what role does universal design play in India's inter-dependent society where most people live with others? There are good international examples of universal design; how universal design can be implemented in existing culturally rich pilgrimage site? The students are expected to develop inclusive, human centered, innovative, and contextual designs for any one pilgrimage sites in India. The site should be largely visited by pilgrims and can be located anywhere in the country. It may be government or private owned, or may/may not be from any particular religion.

Important Dates:
Launch of the Competition: 19th October 2013
Last date for the Registration of Teams: 31st December 2013
Last date for the Final Submission: 31st January 2014
Competition Judgement, Universal Design Workshop and Exhibition: 1st-2nd March 2014

Eligibility for participation:
Teams consisting of a maximum four students enrolled in degree/diploma-granting colleges in India are invited to participate. Proposals may include consideration of more than one discipline and may include architecture, engineering, industrial design, interior design, interior architecture, landscape architecture, architectural conservation, urban planning, environmental planning, urban design or any environmental design discipline. Multi-disciplinary teams are strongly encouraged. The student/teams need to register prior to the competition.

Award:
1st Prize - ₹ 50,000
2nd Prize - ₹ 30,000
3rd Prize - ₹ 20,000

Contact information:
NEDC Team
School of Planning and Architecture
(An Autonomous Institution of MHRD, Government of India)
Sports Complex, NISARG Campus, Bhopal, Madhya Pradesh (M.P.), INDIA-462051
E-mail: india@spackindia.ac.in
Web Site: <http://www.spackindia.ac.in/NEDC.aspx>
Phone : 2670010, 2670046, 2670108

NATIONAL STUDENT DESIGN COMPETITION - 2013-14

16



Designing for the New China
The world's largest consumer market

Designing for the New China Online Workshop

The Design Community College
Sunday, January 19, 2014 from 9:00 AM to 12:00 PM (PST)

17



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JOB OPENINGS

December 2013 Vol. 8 Num. 12

1. Here's announcing openings in Tata Elxsi, for designers (with 1-4 years work exp) in our Experience/Service Design Domain.

The designers are expected to work in the following areas: Service design, Design Research, Interiors, Space design, Retail design, Store and fixture design, Exhibit design, Signage Design.

Architecture graduates will be given priority.

Please send in your CV and portfolio to

richa@tataelxsi.co.in and ghate@tataelxsi.co.in

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2. Pronto software solutions, Bangalore is looking for fresh talent to blend in with their development team.

visit us at www.pronto-ss.com and contact pronto.

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3. Onio Design Pvt. Ltd.

Onio Design Pvt. Ltd. is a leading design led innovation consulting company. Onio works with visionary start-ups, SMEs and Fortune 500 companies, through their innovation journey from ethnographic research, future scenarios, brand strategy, product innovation to innovation capability building.

Onio's approach to innovation is more holistic and renaissance like, with engineering to business and aesthetics to philosophy being discussed in a day's work. Our team consists of people from diverse backgrounds and universities. We are looking for self-motivated and talented people to join our team at our Pune office.

This position is for our Pune office.

Design Business Manager (DBMO-1301)- One Position

Candidate is a graduate/post-graduate in any of the humanities streams like sociology, cultural anthropology, psychology, literature OR a person with MBA in mass-communication/marketing from a reputed institution OR a designer, who likes the marketing side of design business and has already done some work in that position OR someone with client-liaisoning work experience in service oriented industry.

Job Openings

This role does not require 'design' skills. It does require ability to quickly understand the business dynamics on the client side and decipher it for the team, manage different aspects of projects like team management, time management, communication management, delivery quality management and invoicing. This position requires extensive travel.

Must have: A minimum 2 years of experience as a marketing/client-liaison/analyst position in any service oriented industry; immaculate command on written and verbal communication in English. Good to have: Prior experience in a design company/ad-agency.

Send your résumés with half a page cover note about yourself to manoj at oniodesign dot com.

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4. Graphic Designer needed for a US-based startup operating out of Gurgaon.

Experience no bar, brilliance is. Check out the JD here!

<http://www.vmock.com/pages/careers.php>

Email your applications at careers@vmock.com.

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5. Senior Product/ UX Designer

Citrix SaaS is growing and we're looking for a Senior Product Designer to join our Customer Experience team in Bangalore. We're passionate about our "simpler is better" design philosophy, so we're looking for someone with a talent for creating clean, intuitive, and usable interfaces to join our team of highly collaborative designers.

Responsibilities

As a Senior Product Designer, you will work in a team of talented and highly collaborative UX designers and drive the design of a wide range of projects for our SaaS business.

Working on software design projects requires an excellent understanding of user-centered design, great communication skills, and the ability to see both the forest and the trees. You will work closely with our product managers, architects, designers, researchers, editors and customers to understand and communicate user needs and business requirements; create design deliverables such as sketches, wireframes, storyboards, flows and mockups to communicate design solutions to multiple audiences; and work with developers within an agile development process to ensure a polished and easy-to-use end product. You will also work with user experience researchers to translate user research and usability study findings into design improvements.

In-depth Product/Domain Knowledge

Job Openings

Must demonstrate significant experience and deep understanding of a product, its users and the design process.

A minimum of 5 years experience in product/ domain space with M.Des. / PGDPD or 7 years experience with B.Des. / GDPD or equivalent (preferably with specialization in Interaction Design/ HCI).

Collaborates closely with user researchers and contributes to research strategy

Advocates the role of design in the development process

Understands business goals in regards to the product area

Works to broaden product and domain expertise

Collaboration and Leveraging the Knowledge of Others

Shows the ability to work well with others.

Takes ownership of the design and works closely and effectively with the broader Product Design team, Product Management and Engineering leaders

Receives, weighs, and integrates diverse feedback from a multi-disciplinary team

Able to work effectively in a fast-moving environment, juggle multiple projects, and prioritize work

Strong Presentation and Communication Skills

Must present and communicate their design work to both PD members and outside audiences.

Presents designs in a clear, confident, professional, and cogent manner to diverse audiences

Able to explain rationale for design decisions within a larger context

Regularly communicates project status and shares design iterations

Understands the mission and goals of UX and is able to communicate this to product teams

How to Apply

Apply online at careers.citrix.com to Req. #19908. Please include a link to work samples or an online portfolio in your CV. This is a full-time on-site position with benefits in Bangalore, India.

.....

6. Studio ABD

Studio abd is looking for freelance architect for retail project, in bangalore. experience of 2-3 years with couple of projects in retail would be great.

expected role - adaptation of design to architectural drawings as per standard requirements, monitoring execution , adaptation of design to various store formats, material list, cost verifications.

Job Openings

if interested, kindly write to us at work@studioabd.in with samples of your work.

.....

7. Graphic and Animation Design

We are looking for Graphic and Animation Designers to be located at our Bangalore office.

Inviting applications from candidates with 0-2 years of experience; Please send in your portfolio and resume to hr@unikwan.com

8. GD Goenka School of Fashion & Design

GD Goenka School of Fashion & Design is now half way through its first year of operation, and is now looking for recruiting full-time faculty for the next year for its communication, interior and product design programmes at Bachelor, Masters and Doctoral level. The teaching and laboratory facilities at the school as also the details of courses can be accessed at the following links:

<http://www.gdgoenkauniversity.com/schoolofdesign/>

<https://www.facebook.com/pages/GD-Goenka-School-of-Fashion-Design/436852256360642?fref=ts>

<https://www.facebook.com/gd.goenka.9?fref=ts>

Applications are being received now and the interviews will be scheduled between Mar-May. Selected faculty will be expected to join between June-July.

Please help us spread the word.

Applications/Letters of interest may be sent to deanoffice.design@gdgoenka.ac.in

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9. VGC

VGC, a holistic branding and communications agency is looking for a copywriter for its Bengaluru office; someone who knows the art of creative writing, and feels passionate about the craft- be it for an ad, a poster, a tv, a website, a brochure, a strategy, a blog, a what have you. You can look up vgc.in to get an idea of the span of our work.

If indeed you know someone who revels in writing the long as well as the short of it, and craves for a place which will appreciate their work then they can write to creative@vgc.in with their cv and a smattering of their best in a pdf format.

CONTACT INFORMATION

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