CST in Product Development

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Abstract

This paper will discuss how Catholic Social Teaching, CST, can be applied seamlessly to product development process. This paper will first discuss the process created by IDEO for product design, and then incorporate values taught by CST into the process. In addition to the design process, this paper will also include segments about product distribution, consumerism, and the environment.

Introduction

Design Thought

Design thinking is a way to look at problems. It is an ideology of looking at things and trying to figure out how they could be better. It is how designers create new products and experiences; however, it is not relegated to only designers. Anyone can do it. In fact, IDEO, a world-renowned design firm, seeks out non-designers as employees because they are able to bring their own expertise and incorporate it into design thought. In this essay, I often refer to "the designer". I am not referring to someone who has a design degree; rather I am merely calling the person going through the design process "the designer".

IDEO[1] was founded by Stanford University professor Dave Kelly and is currently lead by their CEO Tim Brown. The company is known for its unique culture that cultivates creativity. Using a non-hierarchal team structure, IDEO creates an atmosphere where everyone is an active participant in the design process. They seek out employees with different backgrounds so they can look at problems from many different angles. Finally, they have created a non-judgmental environment, allowing people to speak their mind and come up with crazy ideas. In the ABC

[1] https://www.ideo.com/

Nightline Special titled "The Deep Dive: One Company's Secret Weapon for Innovation,"[2] Dave Kelly says, "Enlightened trial and error succeeds over the planning of the lone genius." By having their employees come up with as many crazy ideas as possible and not have them immediately shut down, IDEO teams are able to sift through all the possibilities to find golden ideas. Using this environment to foster creativity, IDEO has been able to make products ranging from innovative breakthroughs like a 25-foot mechanical whale from Free Willy and Apple's first mouse to common objects like a shopping cart and the standing toothpaste tube. In addition to cultivating an environment of creativity, IDEO uses a simple design process that they call the three I's, or "Inspiration, Ideation, and Implementation." This paper will further explain these 3 I's and will show how they can be related to CST.

Catholic Social Teaching

Catholic Social Teaching is a perspective that shows how the Catholic faith can be applied to current world issues. CST began when Pope Leo XIII wrote about workers' rights in *Rerum Novarum*[3]. Since then, documents such as other encyclicals and statements from Bishops' councils have been added to the CST doctrine. These documents have addressed issues such as politics, the economy, migration, the environment, and poverty. However, these documents do not cover every issue that arises, so it is up to individual Catholics to apply the concepts learned from these documents to their everyday lives. Before Pope Francis wrote *Laudato Si*[4] in 2015, very little had been written about the environment in CST documents. Even though no documents specifically mentioned the environment, Catholics have been using themes found in CST to call for climate change policies for a long time. This individual interpretation allows

[2] https://www.youtube.com/watch?v=2Dtrkrz0yoU
[3] http://w2.vatican.va/content/leo-xiii/en/encyclicals/documents/hf_l-xiii_enc_15051891_rerum-novarum.html
[4] http://w2.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html

CST to be viewed more as a lens through which we view the world instead of being a rigid set of laws.

In this document, there are some recurring themes found in CST documents to which I will often refer.

Common good- The common good revolves around the idea that humans are social beings. We form relations and communities with each other. This means every action we make not only has an effect on us but also on the people around us. Because of this, we should think about how our actions might affect the whole of society before we commit them. Under the common good principle, an action should occur if, and only if, it benefits society. This sounds very similar to Utilitarianism but it is slightly different. In Utilitarianism, it is morally right to harm the minority as long as the majority benefits. In the common good, we must considered the marginalized and work to have our actions benefit them in addition to the society as a whole.

Solidarity- Solidarity is valuing other people and respecting who they are as individuals. It is a deeper level of understanding. Fr. Franciszek Kampka writes: ‘‘solidarity relates to the attitude of mutual empathy among members of a community, becoming aware of their deep similarities and interdependence, and deepening them by experiencing the needs of others just as we experience our own needs.’’[5] In action, I believe solidarity can be described as "being with" someone. Proximity over time usually leads to a better understanding. You know more about your roommates than other students in college because you spend more time with them. In addition, "being with" implies being on the same level, same page, or having the same goals. In solidarity, you understand others' sorrow, but you also join in and feel it with them.

[5] http://www.tandfonline.com/doi/pdf/10.1179/1462317X13Z.00000000059

Subsidiarity- Subsidiarity is a way of describing who is responsible for fixing problems. Subsidiarity states that the smallest, lowest, and least centralized competent authority should handle matters. However, if this authority cannot handle or solve the problem, it is up to a remote/ higher up authority to intervene, first via aid and then by complete intervention. In essence, if a town has a pothole, it should be up to the local authority (the town/Department of Public Works) to fix the hole because they are the smallest authority responsible for the upkeep of the roads. If the town has tried everything possible and still does not have enough money or the right equipment to fix the pothole, then the state government (remote group) should intervene. As a first step, the state government could assist the town by providing the proper education and resources that would allow the town to fix the problem. Finally, if the town is still unable, the state government must step in and fix the problem using their own employees.

Option for the poor- Option for the poor means that the poor should be the priority of our attention. If we are faced with two equally good actions, one that benefits the poor and one that benefits the well-off, we are obligated to choose the option that helps the poor. The concept of the option for the poor can also be extended to all who are marginalized. Whether people are the sick, disabled, elderly, or poor, our attention should be placed on the marginalized.

Lagom- Lagom is a Swedish word that means just the right amount. In CST, the concept is used when discussing waste and excess wealth in our lives. The idea is that in every facet of life, one can define a state of being in which having one more is excess and having one fewer would make living a full life impossible.

CST with Science and Technology

In today's world, humans have created a symbiotic relationship with technology and scientific breakthroughs that are helping us better understand ourselves and the world around us.

This means that the majority of the products made today have either a scientific or technological component. The Catholic Church's history reveals various anti-science events like the excommunication of Galileo for saying that the Sun is the center of the solar system and the refusal to teach Evolution by certain schools in the "Bible Belt". Because of this, some people might argue that the Catholic Church would be against product development that includes technology. This position is disputed by *Gaudium et Spes*[6], a document written in 1965, by Pope Paul VI who addresses the issue of technology and the Church.

> When man develops the earth by the work of his hands or with the aid of technology, in order that it might bear fruit and become a dwelling worthy of the whole human family and when he consciously takes part in the life of social groups, he carries out the design of God manifested at the beginning of time, that he should subdue the earth, perfect creation and develop himself.
>
> - Pope Paul VI's *Gaudium et Spes*, 57

The document later goes into the positive values of science and technology.

> (57) Scientific study and fidelity toward truth in scientific inquiries, the necessity of working together with others in technical groups, a sense of international solidarity, a clearer awareness of the responsibility of experts to aid and even to protect men, the desire to make the conditions of life more favorable for all, especially for those who are poor in culture or who are deprived of the opportunity to exercise responsibility. All of these provide some preparation for the acceptance of the message of the Gospel a preparation which can be animated by divine charity through Him Who has come to save the world.
>
> - Pope Paul VI's *Gaudium et Spes*, 57

In other words, the Church supports technology and science if their application is meant to better humanity. Now that it is established that the Church supports technological products, we can delve into how to incorporate CST principles in the Product Development process.

PRODUCT DEVELOPMENT PROCESS

[6] http://www.vatican.va/archive/hist_councils/ii_vatican_council/documents/vat-ii_const_19651207_gaudium-et-spes_en.html

As stated earlier, IDEO uses the three I's, Inspiration, Ideation, and Implementation, to structure their design process. This is the general path used, but it is not the only path. The process is not a rigid, step-by-step manual; instead, it is iterative. One might be at the implementation phase and need to go back to Ideation because the ideas are not working. This is ok. Because this process is fairly fluid, it makes it adaptable. In the Deep Dive, David Kelly says that their process leads to focused chaos. There is just enough structure to keep one moving forward, but it also allows one to take his own path.

Inspiration

In the Inspiration Phase, a product designer finds the inspiration needed to create a product. This inspiration can take many forms and can occur while using many different methods. In general, the inspiration phase includes figuring out what problem needs to be solved and the initial research surrounding the problem.

Finding the Problem

The world is full of problems. Some like climate change threaten human existence, others like poverty and starvation seem too big to solve, and some are mundane, such as finding a solution to keeping headphones wires from tangling. All of these problems are being or will be tackled by product designers. Now how do people go about finding a problem? This depends on the type of project. A lot of designers work for a company, either as an employee or as a hired consultant. In this case, the company identifies a problem. Especially as a consultant, one must be careful of how the company defines the problem. Often times, companies do not completely understand their problem and ask the hired help to solve the effect instead of the cause.

For example, a company wants to accommodate more people on an online help service. Up until now, every question is dealt with by a human operator and this customer service has led

to a huge following. Because they are unable to hire new workers, the company has asked you, the designer, to come up with a system in which mundane questions are answered by a computer. A solution for this problem would allow for the company to handle more questions at a time, but the computerized solution will cause the company to lose the human centric approach and could possibly turn a lot of customers away, reducing the number of people being helped. Instead, the solution designer should find the real reason for what is limiting the amount of people served. Through some initial research the designer discovers there is a slow question and answer response time. By trying to figure out ways to speed up the response time, one will solve the cause instead of the effect of the company's issue and will create a better product in the end.

When a company identifies a problem, the solution designer has little control over the types of problems he addresses. Since the problem is framed by the company, it is hard to ensure that the problem is consistent with CST. If one finds the problem does not have CST attributes, the consultant can ask to be reassigned to another project or choose to work for a different company. However, this generally is a bit extreme. The vast majority of products come from problems without a foundation in CST, but there is nothing wrong with that. We need these products to make our lives easier and to keep our economy running. Products like spoons, toothpaste, and millions of others cannot be traced back to a CST problem, but we need them to live a normal life. If a CST inspired designer is faced with one of these products, I see no obligation to try to switch to a new assignment. If one feels the problem given by the employer is lacking in purpose because the problem and solution do not involve CST, one can always try to retroactively align it to CST by catering it to a marginalized demographic. For example, if the assignment of making a better spoon does not fit one's goal in life, a person can make it more meaningful by shifting from the general population to making a spoon for people with

Parkinson's disease. Now this realignment of purpose does not always work, and it can even go against CST if it takes advantage of its customers, but it is a good way to support and extend your project based on a fixed problem assigned to you by a company.

There are also freelance or independent product designers. This is really where we can see CST and design merge. Products and companies like LifeStraw[7] and Aravind Eye Care System[8] started out as startups and are prime examples of CST in design. Although these companies do not have a religious affiliation, I believe their creation is founded in CST principles, mainly the option for the poor. These two companies tackle two of the greatest problems facing the poor, lack of clean water and prohibitively expensive healthcare.

Whether it is lack of a clean water source, natural disasters ruining normally good sources, or people forgoing clean water because there is not enough time or energy to get and prepare purified water, the result is the same – millions of people go without clean water, the majority of which are poor. LifeStraw has created simple products that clean and purify any water source in the time it takes to drink through a straw. These products are useful for anyone, and LifeStraw has even created a line of water bottles that cater to a wealthier clientele (people who have enough leisure time to hike and camp). What separates these products from other water filters and allows them to provide an option for the poor is how LifeStraw distributes their products. In 2014, LifeStraw created the Follow the Liters program, which has some of the proceeds of all LifeStraw sales go to funding LifeStraw community filtration systems in developing countries.

In addition to water, healthcare is often a luxury and necessity that many poor populations do not have the funds to access. Cataracts is one ailment that plagues many elderly

[7] http://lifestraw.com/
[8] http://www.aravind.org/

people. Cataracts is blindness caused when the translucent lens of the eye becomes opaque and foggy over time. There is an easy treatment for cataracts, but it is not readily available and it is generally too expensive for the poor. Aravind Eye Care System, founded in 1976 by Dr. G. Venkataswamy in India, changes that. When founded, the goal was to get rid of needles blindness, which can be fixed by surgery, accounts for 80% of blindness, and the majority of cases occur in poorer areas. Over the years, Aravind Eye Care System has created more efficient, effective, and cheaper procedures. They have also created an infrastructure which allows for screenings in towns throughout India, transportation to and from sites in which the surgeries take place, and surgeon productivity that is 5 times better than other Indian surgeons and 10 to 15 times better than American surgeons. All of this benefit at an extremely cheap price, and many times it is free.

What makes these products have an option for the poor foundation is the "What" and the "How". What people benefit and what problems are being solved? How are the products being distributed to or being obtained by the consumer? For the sake of having a full discussion about these two companies, I have skipped ahead to talk about the products themselves and about how people get the product, which allows the product development to have an added option for the poor lens. Let us regroup and remind ourselves that we are still in the inspiration phase and talking about finding a problem. As I said earlier, if one is in a position of choosing a problem, looking to the marginalized and to their problems is an excellent way to follow CST principles. Trying to solve one of the many problems faced by the marginalized, whether it is for the poor, elderly, young, disabled, or sick, allows individuals to adhere to the principle of the option for the poor.

Initial Research

Once a problem has been picked, initial research needs to be conducted to properly "frame" the problem. As stated before, it is possible that the problem might be asked in a way that causes the solution designer to address the affect and not the cause. In addition, doing research allows the designer to become familiar with a topic and leads to insights that would not be apparent at the outset of the project. There are generally two stages to research, field work and synthesizing.

Fieldwork

Within field work there are three general methods that people use: ethnographic interviews, observation, and empathic research. In all methods, proximity to the projected customer or product's "habitat" is necessary.

Ethnography has its foundations in anthropology. In the early 1900's, Bronisław Malinowski[9] changed the game in anthropology. Instead of listening to stories of societies given by travelers and merchants, Malinowski decided that he must visit and live in community with the people he was studying. Malinowski's simple idea completely changed the field of anthropology and would later cause the creation of the term "ethnography." Ethnography can be defined as the "research approach that produces a detailed, in-depth observation of people's behavior, beliefs and preferences by observing and interacting with them in a natural environment."[10] By actually being with the people one is studying, individuals experience emotions, garner insights, and truly understand the community on a fundamental level. Then in the 1980's, ethnography started appearing in design work. Anthropologist use ethnography to study communities and culture, and designers create products for these communities and cultures; therefore, it makes sense for them to both use the same tools to gather information. By

[9] https://en.wikipedia.org/wiki/Bronis%C5%82aw_Malinowski
[10] Ireland, Christopher. "Qualitative Methods: From Boring to Brilliant"

having an ethnographic interview, one hears exactly what people want and sees the surrounding factors in the person's life that could affect the product.

Now how does one conduct an ethnographic interview? The most important thing to remember is that the interview is not a survey. If treated as one, the interview could just as easily have taken place on the internet or via mail, taking out the personal connection upon which ethnography relies. Never frame a question or lead the interviewee to an answer one wants to hear. If an interviewer leads, he will not find out what interviewees truly think about the subject. For example, don't ask "are you hungrier during the morning or at night?" Instead ask, "When are you the hungriest?" By asking the first question, people will most likely answer one of the two choices. When one asks the second question, answers like "in the afternoon" or "right after I work out" may arise, which would most likely never turn up following the first question format. Try to make the interview into a free flowing conversation. When it is unrestrained, people are more likely to tell stories, which provides more information regarding emotions and feelings surrounding the topic. Come prepared with questions, but be willing to follow the conversation where it leads. Often times, the best insights come from places one least expects. Finally, try to have the interview in a relevant environment. If the project about shopping carts, have the interviews take place in a grocery store. By interviewing in a relevant environment the person being interviewed might get new ideas on location, which would probably not happen if the interview occurred in a different environment. In Appendix 1, I have provided Ethnographic Interview Tips, an Ethnographic notetaking sheet, and Christopher Ireland's "Qualitative Methods: From Boring to Brilliant", which are resources created by Prof. Anne-Marie Conrado for her Design Matters course at Notre Dame.

The second form of field work is observation. Instead of talking with people about the problem, the designer witnesses the environments in which the problem takes place. The two most common ways to make observations is to stake out a location and take notes on what one sees or to take pictures of what happens. They both have different benefits. By taking notes, one can see trends over time. At first glance, one might not notice anything special, but as the observer sits there over time, trends might become apparent. At first, take notes on everything visible, even if you think it has nothing to do with your problem. As time progresses, you might notice a trend or two. Start focusing more attention to those trends, while occasionally jotting other notes. If the trends seem to be panning out, you might want to consider spending the rest of the time focusing on them. If they fall through, start recording everything you see again until something else pops up.

If a stakeout is good for seeing stuff overtime, then taking pictures allows you to see the small details. When taking notes, you see everything in real time and are bound to miss details. By taking pictures, you are able to see the minute details that you missed earlier. You can spatially see how people interact. You are able to see emotions captured in the picture. What is also good is that you can go back to the picture a week or month later and continue to learn new things and see exactly what happened. With notes, you only seeing what you wrote. The notes might later jog a memory, but memories do not always record exactly what happened. Finally, taking pictures in different locations will allow you to see trends that crossover a variety of environments.

The final field work method is empathic research. One often does this type of research when looking to fix an experience, improve an already made product, or market one's design to a segment in which one has little knowledge. As a designer, you are often tasked with a problem

with which you have no prior experience. This is perfectly fine. As an outsider, you can look at the problem in a different way by using the lens of your expertise, allowing for new and unique solutions. That being said, if you have no understanding of the product or demographic for whom you are designing, you will most likely not be able to make a good product. If you are a male designer and are trying to design a female razor, you will not be able to design a good razor if you try to make it like the one you use. Instead, you should buy as many female razors as you can and shave your legs and armpits for a couple of weeks to understand problems surrounding the product and the experience of shaving your legs and armpits. This is the whole idea of empathic research. To get in your customer's shoes and to feel the emotions that they do surrounding the product you are designing are key ingredients for success. Just as Malinowski realized that one learns more by witnessing stories than by hearing stories, you will gain a greater understanding by experiencing the story than by just witnessing it.

How does one do empathic research? The first thing you need to do is identify the demographic you are targeting, the experience you are trying to fix, or a combination of the two. If it is an experience, the best thing to do is to go to different places and go through the experience. If you are designing a better ordering system for Starbucks, go to numerous Starbucks, cafes, fast-food restaurants, delis, and any other place you can think of that includes a similar ordering process. If you are designing a mammogram machine, you better go out and get one, especially if you are a male.

If you are designing for a particular population, try to live your life for a couple of days as if you are one of them. If you are designing for pregnant women, wear the fake pregnancy stomach for a bit. If you are designing technology for the elderly, wear gloves for the entire day to simulate dexterity issues. If designing for amputees, tie an arm behind your back. There are

many empathy products currently on the market, like the pregnancy belly, to enhance your understanding and experience. You are welcome to use these products, but often times you have things laying around the house that can simulate the different types of experiences your targeted population has. Sometimes you do not even need to physically alter your "appearance" to do empathy research. Often times it is just a mindset change. If designing for a child, try to imagine what a kid would do or what you did in similar situations and play them out. When you feel you have appropriately simulated the mindset of your targeted population, try out the different experiences for which you are designing, but also try to go through your daily routine as well. If you are designing a comb for amputees, you might find it is easy to comb your hair, but realize that it is a pain to brush your teeth. If you only focused on the comb and the act of coming your hair, you might think there is nothing to improve; however, after discovering how hard it is to brush your teeth, you might decide to make a comb that also doubles as a tooth brush stand for when you apply toothpaste. The whole point of empathy research is to record the challenges and emotions experienced. As a designer, your main goal is to address these challenges and to improve people's emotions when using the product. By doing empathy research, you need to understand the challenges and emotions surrounding the problem and then design for them.

When I talked about how to integrate CST in choosing the problem, I explained how one has to work to get them to align by making a concerted effort to choose a problem or population that will coincide with the idea of option for the poor. I believe CST and fieldwork fit together seamlessly. First let's look at subsidiarity. As mentioned before, subsidiarity states that the people closest to the problem are the ones who should solve it. If they are unsuccessful in finding a solution, an outside group must come and help the local group solve the problem. This

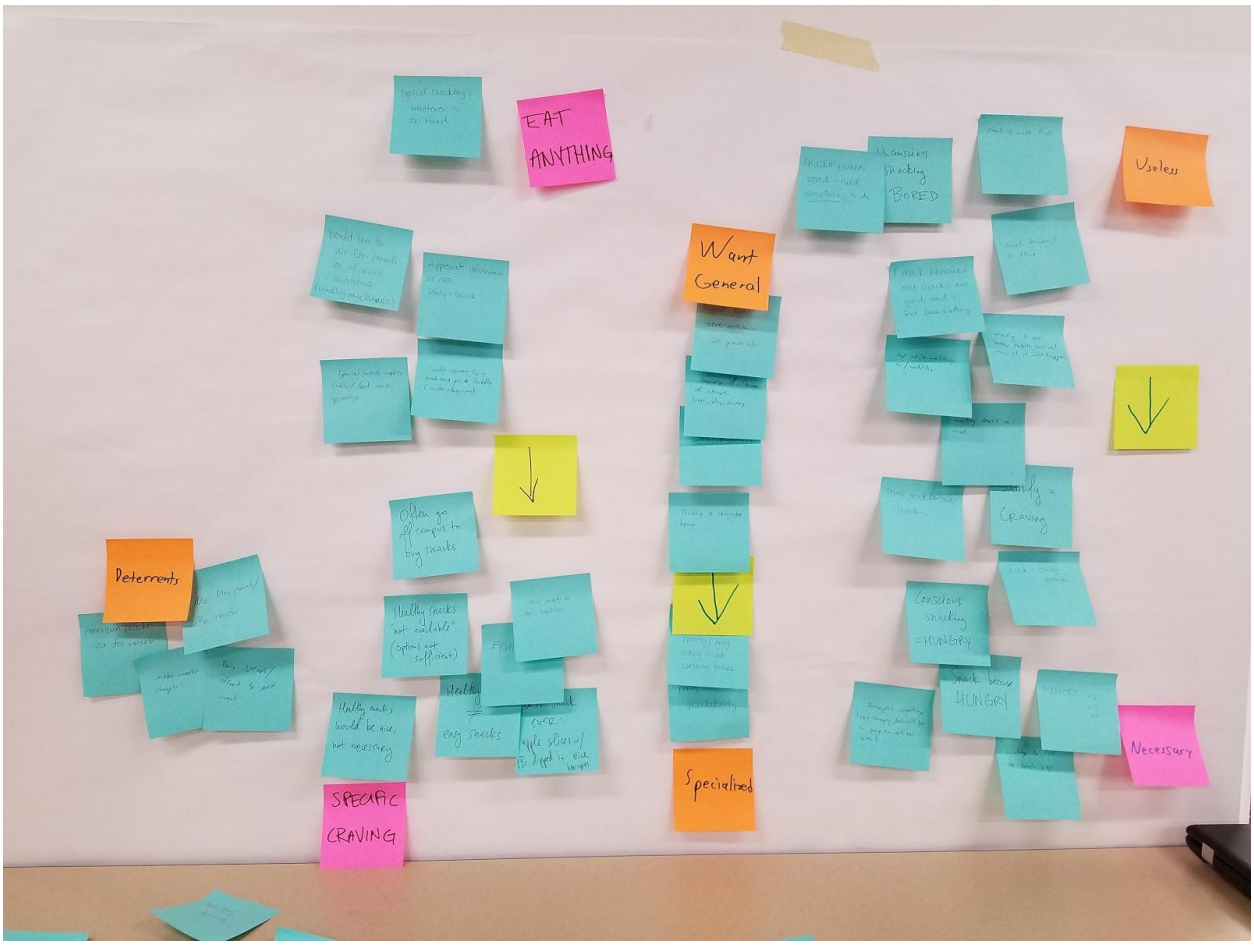
is how the three fieldwork techniques are set up. Generally you are designing something about which you are not extremely knowledgeable nor do you have much experience. In this case you would be classified as a member of the outside group. Because there is a problem to be solved, the local people are either unaware of the problem, have tried and failed to solve the problem, or do not have the resources to solve it. This generally means that the local group is unable to solve the problem, and therefore needs some outside help. When doing ethnographic research, you are including the local group in the design process. By asking questions, you bring awareness to the problem. You listen to their opinions. You use the local group as a resource that drives the design process. They might give you suggestions for how they might fix the problem. Later on, you should also include them in the brainstorming and prototype testing process as well. It is the same idea for observation, although this time it is much more speculative based on inferences you make about how the local group feels about the problem.

The key point that people forget about in design and subsidiarity is the fact that the local people generally are the most capable and the most responsible for solving the problem. As designers, we might feel that we need to enter a situation and solve it in ways that you are use to. This is not the proper way for design and subsidiarity. Listen to what the local people say and let them drive the design process. Be a moderator, an idea generator, and fill in information when it is needed. Subsidiarity also works with empathic research, but on a different level. When you experience the same things and feel the same emotions that the local group does, I believe you join the local group. It might be a part-time membership, but you join the group that is afflicted by the problem. So instead of being an outside authority coming to fix the problem, you join the local group and work with them to solve it. This fieldwork approach also aligns with the concept of Solidarity. When you conduct ethnographic research and observations, you are seeking to

understand the people that are afflicted by the problem. You learn on an individual level how the problem effects them. You are using proximity and the story-like aspects of ethnography to understand their character, emotions, and goals. You put faces and stories to the people afflicted. During empathic research, you are really applying the "being with" mentality. You understand them because you understand yourself. You know how you feel, so now you can truly understand how they feel. As mention before, the fieldwork step design process blends seamlessly with CST principles because of the human centric approach used in this type of research.

Data Analysis

Once you acquire information during the research process, you need to be able to analyze it. There are generally two tiers of analysis. The initial analysis can be done with data dumping and the AEIOU method. Data dumping takes all of the information from the ethnographic interviews, empathy research, and observations into consideration. Generally, this data dump occurs vocally or via post-it notes. If you work in a group, everyone is going to glean different information from the interviews, so a good practice is to sit down with the group and talk about what they learned and any insights they have. The post-it note method requires all to write what they have learned on post-it notes and place them on a large piece of paper. Once the initial placement is complete, people can start grouping and moving the post-it notes. People can take notes and make connections by writing correlations on paper. The grouping process can be done over and over until you feel you have made all of the connections.



The other process is the AEIOU method. This method is generally used to dissect data from the observation research, especially the photos. In this method you list the Artifacts, Environment, Interactions, Obstacles, and Users. You basically ask and answer the following questions. A: What physical objects do you see in the photo? E: Where does the photo take place? Are there any special details about the environment that you notice? I: What interactions do you see either person to person, person to object, or object to object? O: What obstacles do you see? U: Who are the users? Can you describe what values or beliefs they have? Once you have answered all of these questions you can add them to the post-it note grouping process or use them independently to create more insights.

The grunt work of the analysis is done. Now you need to take the groupings and insights and turn them into usable data. The first way to do that is to create personas. Personas are made up people for which you design. Under a business mindset, people target sectors of the market or demographics. They look at customers as part of a group instead of as an individual. "Our average customer has a family of 4.5 people" or "the average customer sleeps 5.4 hours." They use this type of data because they are trying to target the average consumer. As a designer, you should be designing for the individual instead of a group, and this is verified when you did ethnographic interviews instead handing out surveys. A persona is someone that represents a demographic, but is also an individual. A persona has a backstory and a life. They go beyond just numbers. How do I make a persona? You look at the information you found during your field work. You look for patterns, behaviors, and goals. In essence, you look for data base stereotypes. If you are working on improving studying, you might find that some people are space hoarders where all of their supplies are sprawled everywhere, others are neat-nelly's where everything on the table needs to be neat and organized, and many students are procrastinators. I just want to put a disclaimer in, the stereotypes that I am describing are trends seen through your data. You should not use the cultural stereotypes you normally perceive if you do not have the data to back it up. Often times the stereotypes are actually false. Once you come up with a stereotype, start making a person to fit it. Give the person a backstory. Include details about their family, job, goals, motivations, etc. Give this person a name and a face (include a picture). The whole reason for making personas is to put a face to the data you have researched. Instead of designing for data, you are now designing for someone. These personas help you understand who you are actually designing for. Later on when you are coming up with ideas or iterating your product, you can ask yourself, "Would my persona like this?" or "How might my persona

react in this situation?" If you are still not quite sure what a persona is, Appendix 2 shows a couple of examples.

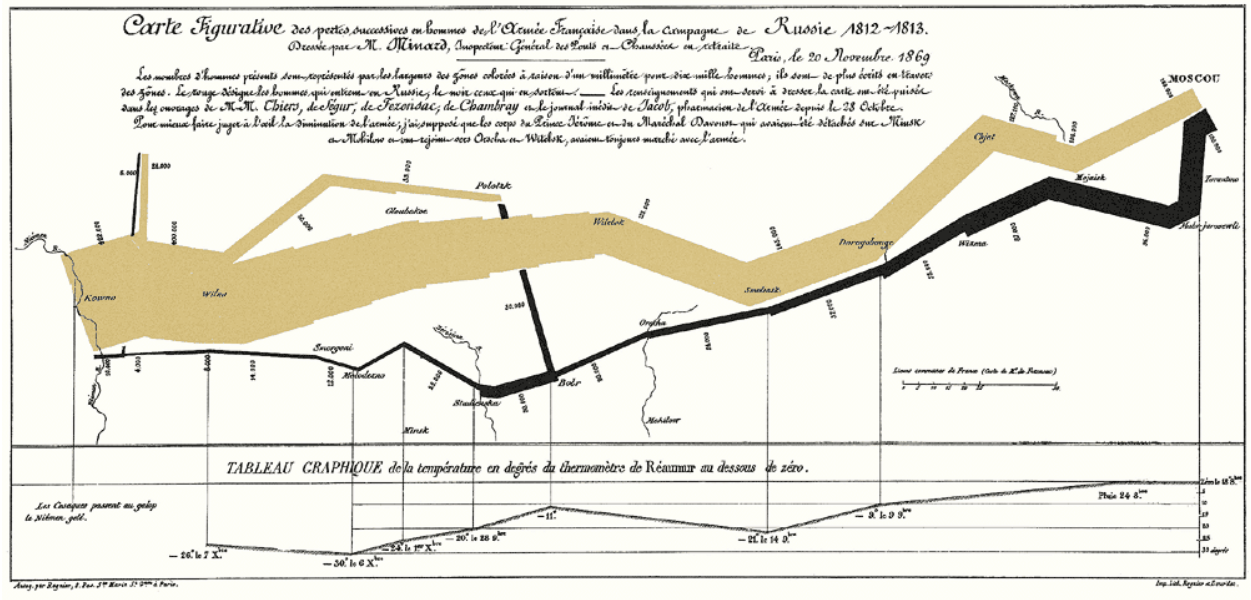
I believe personas follow the CST principle of solidarity. Solidarity is a complete understanding of someone on an individual level. A persona is an individual representation of a group. Some might argue with me that since a persona is a fake person, one is not actually understanding an individual but something that does not exist. I would agree in part to this. It is true that the persona probably does not describe someone precisely, but it allows you to understand aspects found in many of the individuals in the demographics for whom you are working. Also it allows you to divide the group into different subsets. When tackling populations like the poor, people often lump them as a single group. Creating different personas allows you to understand that there are different groups within a single demographic and that each group has different needs for solving a single problem. By subdividing into smaller groups and describing aspects of people, personas help us understand and celebrate the individuality of people, which is a major component of solidarity.

Another helpful technique to decipher data is data visualization. It is a process in which you depict data in a visual way. The goal of data visualization is to increase the appeal, comprehension, and retention of a data set. There is an explicit guide for how to create a perfect data visualization. Many times, one is not needed in the design process; however, they can allow you to see connections between different factors that you might not have thought were related. The first data visualization is attributed to Dr. John Snow[11], who put cases of Cholera on a London map. He saw the majority of cases surrounded a few water sources, which allowed him to infer that Cholera is a water born pathogen.

[11] https://en.wikipedia.org/wiki/John_Snow

Another famous data visualization by Charles Joseph Minard[12] depicts six different factors that led to the fall of Napoleon's army march against Russia.

[12] https://en.wikipedia.org/wiki/Charles_Joseph_Minard



Data visualization is not specific to product design, nor is there a large CST component, but it can be useful in understanding correlations and trends that might not be initially apparent.

The final part of the Inspiration phase and leads into the Ideation Phase is the point of view, POV. The POV is a statement that describes how you are going to tackle the problem. Generally, you pick the persona you feel is the most appealing. Look at the persona's needs and goals and the POV naturally flows from it. The POV describes who you are targeting, what the specific problem you are solving, and why you are solving it. POV's generally follow the form "[blank] need a way to [blank] because/as [blank]" or "How might we help [blank] to [blank] because/as [blank]." All ideas and solutions that you create during the design process address the POV. If you find yourself straying from the POV, refocus your ideas towards the POV or change your POV to align closer to the ideas you are creating. As mentioned earlier, the design process is fluid, so it is ok to change you POV mid-process if you see a better avenue for solving the problem. In general POV's are tricky to get right, especially at first. You do not want it to be too specific because it will limit the types of ideas that you are conjuring. If the POV is too

vague, you end up having too many ideas and it is difficult to choose the best ones. The POV needs to be just right to foster an environment that creates "focused chaos."

Incorporating CST to the POV is very similar to how we incorporated it with what problem you chose to solve. There is nothing innately CST in the POV, but you can choose to make it follow the principles of CST. The most basic way to do this is to make who you are targeting follow the principle of option for the poor and marginalized. If you choose to address a problem afflicting a marginalized population, ensure that your POV addresses the same population. You might find that your POV has veered away from the marginalized. In this case, you can either continue with the POV you have, or go back and conduct more research, which will allow you to follow the option for the poor. You might have also just picked a problem faced by the general population.

During your research, you might find that you can address the general public, while focusing on the needs of the marginalized. This follows the idea of the common good. Something that benefits the common good, both helps the majority while also helping those marginalized by society. An example of this is Smart Design[13] and their OXO Good Grips. In a video found on the website listed in the footnote, Davin Stowell, the CEO and founder of Smart Design, explains his inspiration for redesigning a potato peeler. He got a call from a friend that said his wife was having a hard time using a peeler because her hands hurt. His friend ask him if he could redesign it to make it easier for his wife. So he designed a peeler to help his friend's wife, but the design also helped people with arthritis and it has turned into a massive OXO Good Grip product line from kitchen appliances to gardening tools. Dan Formosa, a designer from Smart Design, explains in the video that designers must "look at the extremes. The weakest or

[13] https://smartdesignworldwide.com/projects/oxo-partnership/

the person with arthritis. Or the athletes, the strongest and fastest person. Once you understand what the extremes are, the middle will take care of itself."

Ideation

The ideation stage is where you come up with all of your ideas. It is more widely known as brainstorming. There are a couple of rules for brainstorming. 1. Go for quantity and not quality. Do not put all of your effort into perfecting ideas now. That happens later with the prototyping process. The more ideas you come up with the more likely you are to fall upon the right one. As an unskilled marksmen, you have a better shot at using a machine gun and peppering the target and hoping one connects, than you do if you slowly aim through the scope of a rifle. The same idea applies to brainstorming. 2. The crazyier the idea, the better. Allow for crazy ideas because they generally occur outside the norm. Over time, we get used to the status quo and it is only through breaking through this ceiling that true innovation can occur. 3. Don't judge or self-censor. Building off of having crazy ideas, don't judge others or yourself. You can test validity later. You are hurting yourself in the numbers and craziness areas if you are only saying practical ideas. 3. Work in a group and build on other people's ideas. As Dave Kelly says, "Enlightened trial and error succeeds over the planning of the lone genius." Do not be the lone genius. Work with people. During brainstorming build on ideas and run with it until you hit a dead end, and then start with another. 4. Let out your inner kid. If you put a group of kids and a group of adults in separate rooms and ask them to solve a problem, the kids will do everything stated above while the adults might be lucky and decide to work together. As we grow up, we are so programmed to be right that we are afraid to be wrong. Because brainstorming is all about creativity or at least being willing to try to be creative, I have listed 3 activities to help you get your creative juices flowing. I will first explain the activity. I will then discuss it and how it relates to creativity and the answers or examples can be found in Appendix 3.

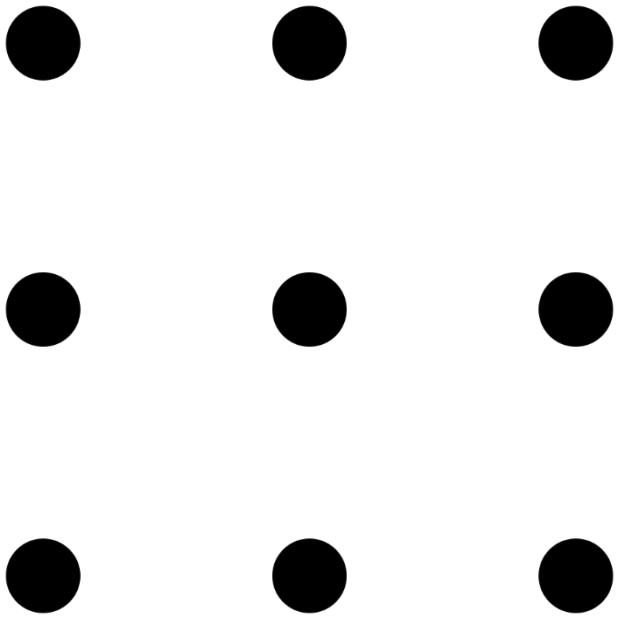
General Creativity

Drawing Your Partner

This exercise is extremely easy. First get a partner. Set an alarm for 30 seconds to a minute. On a sheet of paper draw your partner's face. For better results do this in a room with a lot of people.

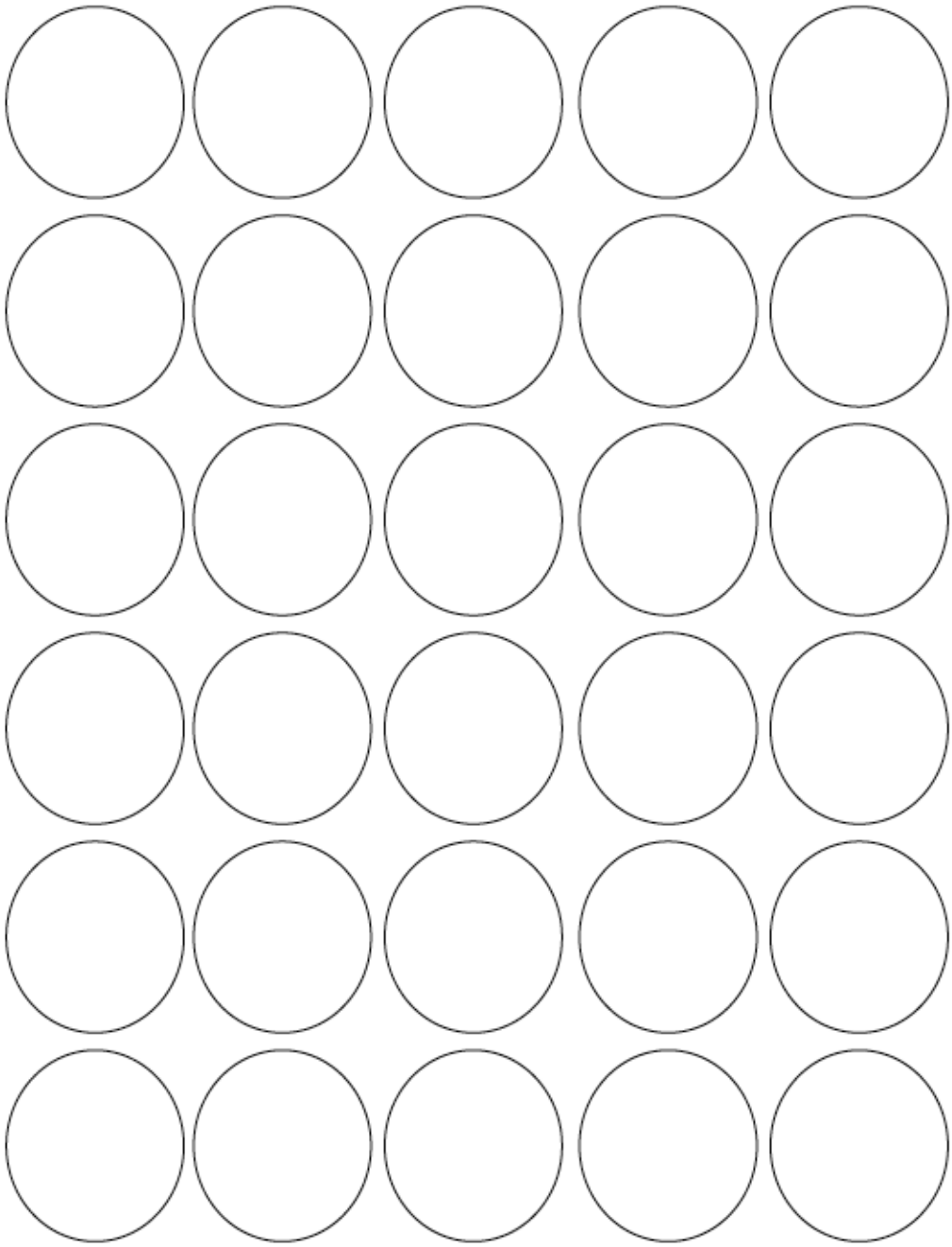
Connect the Dots

In the picture below, connect all of the dots using only four continuous lines (once you start you do not pick up your pencil).



The 30 Circle Test

Using the circles on the page, draw as many things as you can. The goal is to use as many circles as possible. You have only 60 seconds to do it.



Draw Your Partner Discussion

Especially if you did this activity in the room, you will hear an overwhelming number of "sorries" and other forms of apologizing. We preemptively try to lower other people's expectations of ourselves because we do not want to be wrong or to be judged. When kids do this, they are proud of their work. They make sure that everyone around them sees their masterpiece. This self-pride or just lack of being afraid of what other people think is what is needed when brainstorming for a design project. You are going to have awful ideas, but those ideas might trigger others. If you do not share or self-deprecate your ideas, they will never be able to be built upon to form great ideas. If you watch IDEO's "The Deep Dive," a man, knowing that he will be put on TV, voluntarily suggests that the shopping cart should have a privacy screen so that you can buy condoms without people knowing. If he was not afraid to share a crazy idea like this on TV, than you should not be afraid to share some of your crazy ideas.

Connect the Dots

One of a couple different iterations of the solution can be found in Appendix 3. The whole idea is that you need to go outside of the box to solve the problem. Since pre-school we have been taught to color in the lines. Our brains automatically form routines to reduce the amount of data we need to process. That is why people can go on autopilot and be productive. You can follow your morning routine or drive a car. It is an evolutionary trait that allows us to not get overwhelmed by external stimuli. Society works in a similar ways. We get stuck to the norm and rarely deviate. You will not creatively come up with ideas if you are stuck in the norm. You need to think outside of the box. The potato peeler had been a constant design for at least a

hundred years. It was not a great design, but people got used to it and just accepted it. If it was not for David's friend, we would still be forced to use the old scraper.

30 Circle Challenge

Just like brainstorming, this activity was all about quantity over quality. You did not need to draw the Mona Lisa. All you needed to draw was a smiley face. You might have also noticed that you followed a trend. You might have drawn a basketball and then followed it up with a soccer, tennis, and baseball. Brainstorming works the same way. Try to build off an idea. If someone mentions a technological solution to a problem, try to think of other ways in which technology could be used to solve the problem. Finally, the problem statement was purposefully left vague. It just said to use the circles. You did not need to draw within the circle. You could have used multiple circles in a single drawing. Again, it is thinking outside of the box. Here is a good example of what it could look like. If you were slow/ unable to use a lot of the circles, do not worry. It is normal. Overtime, as you do more brainstorming and similar projects, you will get better.

Brainstorming

The Stanford's Design School has posted two great instructional videos on what to do[14] and what not to do[15] when brainstorming. The whole concept of brainstorming is to have it be fast paced. Ideas should be flowing. You continually add to other people's ideas. At this stage no idea is a bad idea, so do not judge. If you feel like you are struggling to come up with ideas, Prof. Conrado has created a list of exercises that can stimulate creativity. This list can be found in Appendix 4.

[14] https://www.youtube.com/watch?v=W1h5L_0rFz8
[15] https://www.youtube.com/watch?v=ttWhK-NO4g8

Once the ideas are flowing there are multiple ways to represent or corral the ideas. The first is shown in the Stanford video. It is an unstructured brainstorming session in which a facilitator takes notes, preferably on a large piece of paper, on what is being said. As seen in the video, pictures are worth a thousand words. By incorporating pictures you are able to represent what you are thinking about to everyone. If you are looking for a more structured brainstorming method, the idea trigger method is a good option. With this method, everyone uses the Idea Trigger Sheet found in Appendix 4. For a minute and a half, everyone silently writes ideas in the first column. Then you take a break. The length of the break does not matter, you just cannot be talking or thinking about the project. You then spend another minute writing more ideas. Once that is done, you start sharing your ideas. In a circle, you share your ideas. As people share, you cross off ideas on your list that match. If an idea pops in your head while people are sharing, write it in column two. When everyone finishes sharing column one, you start sharing column two with the same crossing out practice. If you have a new idea, write it in column four. Continue this process until you run out of ideas. Once it is finished, someone should write out all of the ideas on a visible space, either a large sheet of paper or a chalk/ whiteboard. The concept of this method is that as people are sharing, ideas should be triggered and it allows you to make note of and later discuss the triggered ideas.

Idea Consolidation

Now that you have a bunch of ideas, how do you turn it into a product? The first thing you need is to consolidate your ideas. Discuss all of your ideas. Often times you end up saying the same thing a couple of different ways or you might realize that a couple of ideas might work well together if you combine them. Once this initial sifting is done, re-write and draw every idea on separate sheets of paper. Once this happens, you will have a post-it note vote. Lay out all of the

ideas, either on a table or on the wall. Each member of the group will be given a specific number of post-it notes (the amount depends on the number of ideas). You then vote for certain ideas by placing a post-it note on the idea and possibly writing a note on it. This is where you can start to think about the feasibility of the idea. Also consider your POV. Does the idea fit the POV? If it does not, you can still vote for it, but you should be able to explain why. The ideas with more post-it notes are liked more. Ideally you want to have about 3 to 5 ideas left at the end of the voting process. If you need to, you can add more voting cycles either by voting within the liked ideas if you have a lot of ideas getting votes, or you can take out the liked ideas and vote again on the rest of the ideas if you do not have enough ideas. Once you get 3-5 ideas, it is time to start prototyping.

CST in Brainstorming

Incorporating CST into brainstorming is very similar to how it is implemented with the problem defining and POV creation. Because you want as many ideas as possible in the idea generation stage, you do not think about CST. As stated earlier, there are no bad ideas. If you want to propose drowning puppies as a solution, go for it. It is unlikely, but it is possible that it triggers another idea and leads to something useful. It is not until the idea consolidation that CST can play a role. When voting on ideas, think about how the idea is promoting the principle of the common good and the option for the poor. Does this product solve the problem by benefiting society/ community as a whole? Does this idea have its focus on helping the poor, elderly, disabled etc.? You can also incorporate subsidiarity if you not only do interviews and collect data with the people that are affected by the problem but also include them in the idea generation and consolidation processes. Again, by doing this you are letting the "local group" drive the design, letting them take on the responsibility of solving their own problems

Implementation

The implementation stage is where ideas become a product. I believe it starts from the prototyping stage and ends when the product lands in a junk yard or is recycled into something else. As stated earlier, the design process is a suggested path and not an instruction manual. Some people might disagree that prototyping should actually be in the Ideation stage or think that Implementation finishes when the product ends up on the shelf; however, I believe this classification works well, and you are always able to move backwards and forwards in the design process.

Prototyping

The goal of prototyping is to express your idea in a way that allows people to visualize it and then be able to get feedback on it. There are different stages of prototyping from the crap-up to a finished product in early market testing. In the beginning, a common issue that people have is that they try too hard to make it perfect. Similar to how details are a bad thing when it comes to brainstorming, loading up early stage prototypes with details is a bad thing. For starters, it usually takes longer to make prototypes with more details. By the time it takes for you to make one detailed prototype, you could have made three or four crap-ups and gotten feedback on them. Also, in the early stages you are trying to get feedback on big picture ideas. If you add details, people are more likely going to give feedback on them. If you are designing a website and you add visual details like a border or the shape and color of the buttons, people are going to talk more about those details than they are about the layout of the website or whether they think the idea surrounding the website is a good idea. So to make a good early stage prototype, you should strip the idea to the bone. What is needed to convey my idea and nothing more? When you do this you are creating a crap-up. A common example of an early stage is pictured below. It was made to ask a surgeon if this is what he wanted in a new tool. As you can imagine,

surgeon tools are extremely detailed and precise, and yet the designer was able to convey his idea and get feedback from it by only using a marker, film canister, clothespin, and tape.

In a world in which everything is becoming more digital people are moving away from crap-ups and starting to jump straight into the code. I feel that this is the wrong approach. Even though, the final product will be digital, there are many ways to fully explain the product in an analog way. A great example of this is IDEO's prototype for an Elmo IPhone app[16]. Once prototypes are made for all of your ideas that carry over from the Ideation stage, you need to go out and see what people think. Like ethnographic interviews, you need to show these prototypes to the people affected by the problem. Ask them what they think and what could be improved. Listen to their opinions and take note of them. Initially do this questioning in a comparative way. Of all of the prototypes, which one are you the most likely to use? This is another method of consolidation until you fall upon a final product. After these interviews you can remake the prototypes incorporating the responses and ask more people about what they think about the new prototypes. Get rid of the ones that people did not like and start to focus on the few that were

[16] https://www.youtube.com/watch?v=-SOeMA3DUEs

good. You may need to start over the Ideation process or even come up with a new POV if no one liked your prototypes. Once you focus on an idea, you can start to add more details and eventually end up with a complete working model. This is the time when you should be starting to use Computer Aided Design, 3D printing, a coding language to create websites or apps, etc. Along the way keep getting input from the local group. As I mentioned a couple times already, if you keep the local group in the loop and let them drive the design, you are practicing the principle of subsidiarity and will also end up with a better product.

Production

After you have iteratively prototyped and picked a final design, it is time to put the product into production. Generally to do this, you will need use workers and possibly factories. CST was founded when Pope Leo XIII wrote about the poor conditions of workers in factories.

> There is general agreement, that some opportune remedy must be found quickly for the misery and wretchedness pressing so unjustly on the majority of the working class: for the ancient workingmen's guilds were abolished in the last century, and no other protective organization took their place. Public institutions and the laws set aside the ancient religion. Hence, by degrees it has come to pass that working men have been surrendered, isolated and helpless, to the hardheartedness of employers and the greed of unchecked competition.
>
> - Leo XIII, *Rerum Novarum*, 3

If you want to follow CST principles throughout the design process, then you must make sure that you respect the dignity of the worker and allow them worker rights.

The Workers' Rights Consortium (WRC)[17], although not Catholic, is an independent labor rights organization that has created a code of conduct for worker's treatment that aligns very well with CST. Their rules for the proper treatment of workers can be found as followed[18]:

1) Wages and benefits

[17] http://www.workersrights.org/

[18] Taking from a presentation given by Prof. Todd Whitmore in his Rich, Poor, and War class at Notre Dame

- Calls on companies to "establish a dignified living wage for workers and families."
- "[T]here is a dictate of nature imperious and more ancient than any bargain between man and man, that the remuneration must be enough to support a wage-earner in reasonable and frugal comfort."

- Leo XIII, *Rerum Novarum*, 34

2) No Forced labor:
   - Prison labor, indentured labor, bonded labor, etc.

3) No Child Labor:
   - Under 15, 14, or in school

4) No Harassment or Abuse:
   - Physical, sexual, psychological or verbal harassment or abuse
   - And any form of corporal punishment

4) No Discrimination:
   - Includes sexual orientation and political opinion

6) Health and Safety:
   - Names U.S. Federal Occupational Safety and Health administration (OSHA) and International Labor Organization (ILO) guidelines

7) Freedom or association/Collective bargaining:
   - No harassment, intimidation, retaliation
   - No cooperation with government in prevention
   - Free access of organizers to employees
   - Recognition of union of workers' choice

8) Hours of work:
   - 48 hrs/wk + 12 hrs. OT
   - One day off each week
   - And holidays and vacations.

9) Overtime:
   - 1½ pay of living wage
   - Must be voluntary

10) Women's rights

- Necessary specification of nondiscrimination clause because legal rights does not mean rights recognized in practice

If you are able to say that your company or factories follow this code of conduct, then you are following CST practices of how to treat worker.

Making the Product Available

When I talked about the LifeStraw and the Aravind Eye Care System, I said that they follow the principle of the option for the poor because they not only tackle a problem faced by the poor, but also by how they make the product available to them. How a product becomes available to the poor can happen in many ways.

Lean Startup

One way it can happen is with lean startup. Lean Startup is a fairly new business model that allows startups to be successful and profitable. The mantra is to fail fast and to fail cheap. They do this by having a constant information feedback system with the customers. This is not a new concept for design thinkers, but it is now just reaching business people. Up until recently, companies and startups were making products and inserting them into the market without asking the customers for feedback. Many times the product would fail and the company would be out all of the money they spent to design, manufacture, and sell the product. Instead, lean startup uses customer feedback throughout the process to create better products. The concept of fail quicker and fail cheaper, revolves around the lean startup's minimum viable product (MVP). The MVP is like our crap-up. It is the simplest and cheapest way to show customers the idea for a product in order to get their feedback. By using MVP's, lean startups can see if their product will be successful without spending a lot of money. If the product is going to flop, you only

spent money on what is equivalently a crap up instead a final product and the inventory to last you until next Christmas. Businesses are generally attracted to lean startups because they allow you to increase your profit margins as a company. In an Integrated Business class I took at Notre Dame, I learned that for 7 new product ideas, 4 go into development, 1.5 go to production, and 1 is a success. In the normal business model, all four of the ideas would usually go to production and be sold. Of the four, only one would be successful, so the company has spent money all the way to production for three products that were not successful. In lean startup, you would cheaply make MVP's for the four ideas in development, learn that 2.5 of them would not work, and only pay for 1.5 of the ideas to go through production. Even if only one is successful, you have only wasted 0.5 full production cost and the cost of 4 MVP's instead of 3 wasted full production costs. Because you are saving money as a company on the design and production cost, a company can make a larger profit if the prices remain the same for the two models. Instead of making more profits, the company can decide to follow CST and choose to lower the cost of the product and keep the same profit margin as the old business model. By doing so, you are helping the poor acquire the products needed to solve their problems without putting them in a fiscal burden. A company does not need to lower its prices to a point in which they are no longer making a profit.

> In determining the amount of the wage, the condition of a business and of the one carrying it on must also be taken into account; for it would be unjust to demand excessive wages which a business cannot stand without its ruin and consequent calamity to the workers. … But if the business in question is not making enough money to pay the workers an equitable wage because it is being crushed by unjust burdens or forced to sell its product at less than a just price, those who are thus the cause of the injury are guilty of grave wrong, for they deprive workers of their just wage and force them under the pinch of necessity to accept a wage less than fair.
>
> - Pope Pius X1's *Quadragesimo Anno*[19], 72

[19] http://w2.vatican.va/content/pius-xi/en/encyclicals/documents/hf_p-xi_enc_19310515_quadragesimo-anno.html

The company should be able to stay afloat, but since lean startup is more efficient than normal business practices, you should be able to lower the prices to help the poor without hurting the company.

Other Methods

Other ways that you can allow the poor to be able to obtain the product are by creating local capacity and through charity. You can create local capacity by using the population you are trying to serve in the process of creating the product. By creating workforces, especially using the Co-op system, you are able to ensure that you have enough inventory to successfully combat the problem and if you pay a living or a just wage, you can allow these people to have enough money to buy the inventory. The Co-op system, is a style of business in which everyone runs the company. Generally workers buy into, are educated about, and run the company with everyone receiving a single vote on matters involving the company. What allows this system to work well, is that you are able to split the company into local branches and still run efficiently. Instead of using big factories, you can have places do artisanal manufacturing without needing to displace them from their home. Finally, the Co-op system puts a large percentage of their profit into improving the community. How this occurs is through voting by the local people running the Co-op, subsidiarity. Not only are the workers receiving more money and are now able to buy the products meant to help them, the company is also putting out resources to help different problems within their communities.

The other method is charity. Many of the companies of LifeStraw are following the model of buy one, give one away or some similar model. They follow the ideologies that they can be less profitable or those who are well off can pay a little extra to help those in need.

Whether it is shoes, water, clothing, etc., companies are saying that they will match a certain percentage of their sold product and donate to people in need. This helps introduce the products into populations that need them and cannot afford them, but generally this does not help the impoverished populations in the future. It is like the saying goes, "don't give a man a fish, teach him how to fish." By doing so, you are setting them up for success in the future. I would say that LifeStraw is a special case because clean drinking water is so important to our health and survival. What seems like a gift, ends up creating an infrastructure of health, which leads to more able body workers who can then contribute to and improve the community.

Consumerism

The whole reason you are creating a product is the expectation that you have a consumer. However, if you choose profits over consumer needs, you end up failing CST. We have talked briefly already about how increasing prices in a way that does not allow people in need to acquire the products is a non-CST principle. Another way to increase profit is to force products onto people that do not need them. This is happening in the U.S. where there is a long history of consumerism. Paul Elkins says "A consumer society is one in which the possession and use of an increasing number and variety of goods and services is the principal cultural aspiration and the surest perceived route to personal happiness." This leads to a viscous cycle in which people are buying things which they do not need in order to increase their societal standing. In a consumer society, there is a consolidation in wealth. Instead of using excess money, the money left over after your needs are met, to help the local community, people are keeping it the surplus money so they can buy more things. This practice goes against CST.

Instead, CST chooses to follow Lagom instead of consumerism. Lagom means having the right amount of things in order to fully participate in life. It varies for whatever society you

live in, what product you are considering, and what needs you have. In America, smartphones are becoming more of a necessity to participate in life. Under the principle of Lagom, you would ask yourself, what is the right amount of cellphone I need so that if I go lower, I cannot fully participate in society and if I go higher, I will be in excess. A tech savvy business women, a couple years out from graduation, might feel that she needs a smartphone so she can have quick and easy access to her email and to the internet; however, she realizes that having the newest iPhone or Samsung would be superfluous. She can do everything that she need with an iPhone 4. Buying the iPhone 4 would be following the principle of Lagom. Now a middle schooler has a different need when it comes to cellphones. She needs it to be able to communicate with her friends so she does not feel left out. Having a smartphone with an app store is fun, but not necessary. It might be just enough to get a keyboard phone so she can text. As mentioned earlier, if people start to live out the principle of Lagom, designers would be able to spend more time on real problems instead of trying to trick consumers into buying something new, even though the old one works perfectly well. Lagom could help spread out more evenly the wealth of society.

Obsolescence

In addition to companies pushing products onto customers to aid in consumerism, they also create products to become obsolete in a few years to cause the customer to buy a new one. There are two types of obsolescence. The first being the natural progression of technology. Our technology is growing at a rapid rate. What is state-of-the-art now, might be out-of-date in a couple years. Best Buy has a great commercial[20] depicting this. As mentioned in the paragraph discussing technology and the Church, the progression of technology, if done correctly, is a good

[20] https://www.youtube.com/watch?v=EdRMVhlNP5I

thing. Designers should continue to push forward at the cost of what is out there today, as long as the infrastructure is still there for people to use the old products and to be able to participate in society fully.

This natural form of obsolescence is okay because the customer still has a choice to keep his old product. Students at Notre Dame, although a dying population, still use flip (dinosaur) phones and people can still listen to records despite the cd and then iPod revolution in the music industry. What cannot happen is to allow this natural obsolescence to exclude people from society. The advent of the internet was wonderful. It connected people and gave an incredible wealth of knowledge at a click of the button. However, things are starting to be run through internet. College and job application are often times only available online. This excludes a portion of society who cannot get to a computer. This cannot happen. Infrastructure needs to be set up to allow for hand written applications until computers and the internet become a completely universal thing.

The second form of obsolescence is planned obsolescence, when a company purposefully creates a product to fail in order to ensure that the customer will need to buy the same product again. There are people whose job it is to create functions and to conduct studies to see what is the minimal amount of time for a product to last to make the customer think it is a good product and therefore will buy its replacement from the same company. This practice of forced obsolescence is forcing people to consumerism. It does not allow them to choose whether they should buy the new product or keep their old one. This causes a vicious cycle, forcing people to buy things, which the poor cannot do. In addition, the broken products usually end up in landfills producing massive amounts of waste and hurting the environment.

The Environment

In this paper we have so far only talked about the personal and societal interactions that can be affected by CST principles and the product development method; however, there is also an environmental factor as well. The most recent encyclical, *Laudato Si*, written in 2015 by Pope Francis, focuses entirely on the environment. As designers who want to follow CST practices, we need to also try to solve the environmental issues, but also consider it throughout the rest of the design process. We must also realize that environmental issues and the problems facing the poor are not separate fields.

> (25) Climate change is a global problem with grave implications: environmental, social, economic, political and for the distribution of goods. It represents one of the principal challenges facing humanity in our day. Its worst impact will probably be felt by developing countries in coming decades. Many of the poor live in areas particularly affected by phenomena related to warming, and their means of subsistence are largely dependent on natural reserves and ecosystemic services such as agriculture, fishing and forestry.

We need to think about the environment throughout the Implementation stage. We need to consider how much pollution will be created when we manufacture the product. Can we make production more environmentally friendly? We need to think about what materials we are using to make the products. Are they recyclable or biodegradable? Is it easy to understand what should be done with the product once it breaks? Also, is it possible for the product to be reused. When I initially discussed the Implementation stage, I defined it as prototype to grave. Instead of having the American concept of a product's lifespan be cradle to grave, can we turn it into cradle to cradle?

Conclusion

This paper is intended for use as a guide to teach people how to do the product design method, but also to illustrate that Catholic Social Teaching principles can be seamlessly integrated into the process. I chose only a handful of CST principles to integrate, but there are

plenty more to incorporate into the design process. When writing this paper, I was mainly thinking about product design. As an engineer, that is typically what I would do, but there is also experiential and social design. There is also a new trend in the design world called Transformational Design. Transformational design is a human-centered, interdisciplinary process that seeks to create desirable and sustainable changes in human behavior. I have recently learned about this topic, so I was not able to incorporate it into the paper, but I can only imagine the connections it could have with CST. This is a topic, which to my knowledge, has not been explored. I have tried to lay a solid foundation for experimental design reflected through Catholic Social Teaching, but I feel like I have only presented the tip of the iceberg.