Mug Design-
One Fingered Disabled People

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Abstract
Our goals for this design project were to create a mug for a one-fingered person. We first had to consider customer needs, and the feasibility of a design concept. We created a mission statement to narrow our goals. We then came up with a finite number of customer needs that were then ranked. The top needs were selected and we the used concept generation to create actual designs for our mug. The prototypes were then ranked and we chose the best to develop. This ended up being a classic cylindrical body mug made of stainless steel with a palm slot in the middle and rubber insulation covering the entirety of the body.

Key Words
one-fingered, customer needs, concept generation, prototype

Introduction
Hand and finger disabilities are not uncommon, some causes for these injuries are birth defects, illness, and military injuries. In the United States alone, the National Institute of Health (NIH) estimates that 30,673 persons/year are treated with non work-related amputations, with over 90% of these cases resulting in amputations of 1 or more fingers (1). Although a finger may seem like a minor part of the human body, it’s importance is often overlooked and it is crucial to everyday life. The removal of fingers makes even the simplest tasks difficult and can lead to a great deal of frustration. Take a coffee mug for example. Someone with all of their fingers has a variety of ways to hold the mug, and they do most of them subconsciously. However for those missing some fingers it can be a great struggle to grip the mug in any way. By coming up with a multitude of ideas, using the four different stages involved in product design, and prototyping the completed product we were able to come up with our best solution to meet our customers’ needs and design an easy-to-use one-fingered coffee mug.

Literature Review
During our external search, we looked through multiple patents to help us come up with ideas for our mug. We found many patents that were extremely user friendly, including one with special insulation coating the inside of the mug (1), one with an interesting handle that let you wrap an individual finger or fingers around it (2), one that has a tilted body to help customer’s necks (3). The third patent was the most interesting one we found because it reduces the degree of tilt necessary to drain fluid from the mug into the person’s mouth. We had not thought of this idea and it really opened the group up to more unusual and refreshing design ideas.

Design Process
The design process for a mug with a one fingered disabled person was very difficult and abstract. The market for mugs that are able to be used by one fingered disabled people is almost nonexistent as mentioned in the introduction. In order to effectively create this mug, an intricate design process was necessary. The first step was to create a thorough mission statement that addresses the specific problem.

<table>
<thead>
<tr>
<th>Mission Statement</th>
<th>To design and create a one-fingered coffee mug to provide disabled customers with the easiest and most effective way to enjoy a refreshing coffee.</th>
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<tbody>
<tr>
<td>Product Description</td>
<td>a handheld device that aids the consumption of warm beverages</td>
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<tr>
<td>Key Business Goals</td>
<td>add simplicity to the lives of the disabled</td>
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<tr>
<td>Primary Market</td>
<td>one fingered people</td>
</tr>
<tr>
<td>Secondary Market</td>
<td>open minded consumers</td>
</tr>
<tr>
<td>Assumptions</td>
<td>user friendly, convenient, flexible</td>
</tr>
<tr>
<td>Stakeholders</td>
<td>user, retailer, production</td>
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</tbody>
</table>

Group eight’s mission statement was to design and create a one fingered coffee mug to provide disabled customers with the easiest and most effective way to enjoy a refreshing cup of coffee. The next step was to determine which customer needs were most important to consider in the making of this mug. In order to determine which needs were most important, a list was made of about twenty different typical customer needs. By creating a customer needs and ranking chart, the top five customer needs were established to be lightweight, portable, easy to clean, reliable grip, and dishwasher safe, and would be considered throughout the entire design process. This is necessary to do at the beginning of this process in order to keep on track and stay focused on the most important needs besides the ability to be used by a one fingered disabled person. After this step, the actual designing process began. It was necessary to search externally, through google patents and google searches, search internally, by taking each group member’s ideas into consideration, and then explore all of these ideas together. Searching externally shows ideas that have previously worked and ideas that have previously not worked and helps to steer towards the ultimate goal. After searching internally, it was necessary to create a concept generation tree, keeping in mind the body, handle and insulation as the most important parts of the mug.
A total of thirty two designs were created and a concept combination table would put these ideas onto paper in a pictorial form. The concept combination table shows each idea side to side and allows different combinations of mugs to be created. In order to find the best design and solution to the mission, a concept selection chart is made. This is an excel chart that ranks each of the thirty two ideas and shows with numbers the best mug design for a one fingered disabled person. This concludes the design process on the computer and on paper. Now it is time to prototype the mug with clay and on solidworks. Creating prototypes makes the ideas come to life and even proves that some ideas that seem like good ones on paper are not actual feasible or the most efficient. After experimenting with solidworks, clay, and our best ideas, the mug for one fingered disabled people is perfected and ready to be sold in the market.

Design Result
After completing the design process, the mug that group eight created was almost perfected. Originally it was decided that the mug would be made with an inner slant, allowing less tipping of the mug to actually drink, an inner hole for the palm to go into and the finger to wrap around, and rubber insulation around the entirety of the mug and in the center hole. However, after modeling the mug on solidworks the group found out that the inner slant was not feasible. It left little room for coffee and actually made spilling more of an issue because it could tip over from the additional weight on one side. Group eight decided to get rid of the inner slant and keep the body cylindrical with the inner palm slot. This was versatile for a person that was missing any one of their fingers or thumb and did not matter if it was on their left or right hand. It was decided that the mug would be made out of stainless steel with rubber insulation throughout the entire body and inside of the palm slot. This would provide maximum safety and user friendliness. Even though the mug had to be a little bit taller than your average mug in order to fit eight to ten ounces of coffee, the mug would still be skinny enough to fit in cupholders in cars or theaters. The stainless steel and rubber materials allows the product to be lightweight, easy to produce, and inexpensive. These are everyday materials that every market for coffee mugs uses. The mug that group eight created it also able to be used by a person that has all of their fingers and wants a different kind of mug or is visiting a friend or family that only owns these mugs. This design result met all of the project's needs and proved to achieve the goals of the mission statement, to create a mug that a person with only one finger can use with ease. The mug also met all of our customer needs and followed each step in the intricate design process.
Conclusion
The finished mug design meets all of the necessary components in order to be released into the market. By keeping in mind the five key customer needs and all of the subcategories underneath these needs, the mug will successfully achieve the goal of this project. On top of achieving the goal, this mug can also provide a unique mug for the secondary market, individuals with all ten fingers, and will not make the primary market, one fingered people, feel different or out of place. The mug’s versatility makes the mug affordable and easy to use no matter what the situation. Also, the materials of stainless steel and rubber are easily manufactured, dishwasher and microwave safe and are easy to be produced at any factory that creates normal mugs. The only modification that could be made to this mug to make it better and more comfortable is a removable rubber inside piece that could be sold in sizes in case the person’s hand was smaller or bigger. This was an idea that was tossed around at the end of the project so it could not be modeled or prototyped. All in all, the product meets all of the objectives and criteria necessary for a one fingered person to enjoy a refreshing cup of coffee every morning.

Summary
Our goal for this design project was to create a mug for a disabled person with one finger. We first considered the feasibility of a design concept and the customer needs. We then created a mission statement to narrow our goals. After, a finite number of customer needs were created and ranked. The highest needs were selected and then a concept generation was used to create the actual designs for the mug. The prototypes were then ranked and we chose the best to develop. This ended up being a classic cylindrical body mug made of stainless steel with a palm slot in the middle and rubber insulation covering the entirety of the body. We worked with clay and SolidWorks to prototype it and 3D printed it. Our result met all the necessary components for this assignment and to be released to the market.

References