UTI Testing Assistant

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Problem:

UTIs provide an enormous risk for pregnant women, especially in developing countries such as Kenya. The problem faced with the current testing method involved sanitation and reliability issues. The social stigma surrounding UTIs is that they are often confused with STDs in these demographics due to lack of education on the subject, making the population more reluctant to get tested.

Concept Development:

We began our development of a concept by researching culture, access to healthcare, history, and economy of the country. Kenya consists of over 40 different ethnic groups who speak a variety of languages. We found that corruption of the Kenyan government has resulted in a decrease in spending on healthcare and that 34% of healthcare facilities are being operated by private companies that are reserved for families of high economic status. The average yearly income of a person in Kenya is only approximately $1,020 US dollars.

Our initial ideas for a prototype included a cheap, simple design that didn’t have to be administered by a professional and could be understood by the demographic. It also had to meet our requirements for sanitation as well as the standards set forth by Cradle to Cradle design.

Testing Report 1:

We made a materials matrix (Figure 1) to organize our tests to find out which material would be best for our product. This matrix lead us to the conclusion that polypropylene would be the best product to make our handle.

![Figure 1: Materials matrix](image-url)
We tested the prototype to observe its effectiveness of being sanitary for regular use. This test showed that through proper use, the product will remain sanitary even if the users fail to clean it. This is shown in Figure 2a/b below.

![Figure 2a: Sanitation Testing](image)

![Figure 2b: Sanitation Testing](image)

We also tested the prototype to determine if it would be reusable. This test went hand in hand with the sanitation test: after performing the sanitation test, we restarted and performed it again in the same manner. After the second test was completed, we could confidently confirm that the prototype had been reused and was therefore reusable. We measured our prototype and found that it was less than one foot long and one inch wide, which passes our initial standards for “small”.

Concept Refinement:

Throughout the testing of prototype 1, it was beneficial to consult the target demographic to ensure the accuracy of the testing. We learned through the Design Thinking Workshop that it is better to be practical than it is to be creative, however, creative ideas can sometimes promote the creation of a more practical idea. We decided to keep the main concept of prototype 1 in our next design while adding a few new improvements, including a wired clipping system and an ergonomic design for easier use of the product.
Testing Report 2:

The testing for our second prototype was roughly similar to that of our first due to only small differences in its general design. We now determined that biopolymers would be the optimal material to be used for this product because of their superior traits over polypropylene, such as biodegradability and durability, as seen in Figure 3 below.

![Updated materials matrix](image)

**Figure 3: Updated materials matrix**

We performed the same sanitation test on the prototype and received results which replicated the testing of its predecessor. The addition of the push-button-release design also helped decrease risks of unsanitary situations because it eliminates the need for the patient to put her hand anywhere near the urinary test strip.

Cost Analysis:

Biopolymer block costs approximately $300 this could make about 50 products. 50 clips will cost $8, which will make 50 products. The steel wire will cost $8, which will make 34 products. Therefore to make one product:

- Biopolymer: $6
- Clip: $0.16
- Wire: $0.24
- UTI test strip: $0.20
One product will cost approximately $6.60. Although $6.60 is a high price for this product, in the long run it will still be profitable. This is because we used biopolymers to make our product, which could be reused. If each product is reused, we then don’t have to supply as many products to a given area.

User Guide:

Figure 4: User Guide
Re-design ideas/thoughts:

At the DEM showcase we had two students come up to judge us. They had many questions but were impressed with our design. They asked how we would make our product functional, which we had ideas for but never really had to expand on, only because we were only making prototypes. If we had to improve our design in any single way it would be by actually figuring out how our push button mechanism would function within the stick. Our dream third prototype would be completely functional, thinner, and our ergonomic grip would be attached at the top.