Project Deliverable F: Prototype I and Customer Feedback

Team #7
GNG 1103C
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1. Introduction:

After establishing a project plan for the prototypes in the last deliverable, our team has started to carry out specific tasks, assigned to certain team members for developing a prototype. The task for this deliverable was to devise and explain a test plan and present the first prototype, while being respectful to the budgeting of this project. Using low cost material (e.g house scraps) our team was presented with the challenge of making an sufficient design which reflects our final concept, developed in project “Deliverable D: Conceptual Design”, and that is testable. We consider Prototype I the setting stone for the prototypes to follow and this is why it is crucial to properly analyze it and receive feedback in order to improve the design.

2. Prototype Test Plan:

The design project that our group has undertaken is to construct a device that will successfully determine whether an individual is suffering through an opioid overdose. When the user is indeed experiencing one, a notification is sent to nearby emergency personnel. This device should be discreet, durable, comfortable, and visually pleasing. The main objectives for Prototype I are to communicate and gain feedback for current ideas (with regards to discreteness, durability, comfort, and aesthetics), verify feasibility, and analyse critical subsystems to reduce the risk and uncertainty associated with constructing the opioid detection device.

2.1 Test Objectives Description:

The primary objective for Prototype I is to test the wearability of our opioid device. Considering that our device is a watch, it must be deemed wearable or else users won’t wear it which will result in failure. The method in which we are going to test the prototype is a physical test. We will be giving the watch to an individual for a day where he/she will go about their normal daily routine wearing the watch, as if they were an opioid user using it to protect their life. This elongated length of time is beneficial because the individual will encounter many activities (such as brushing teeth, dressing up, writing, etc) while wearing the device, and will be able to give detailed feedback (positive and negative) about his/her experience. The chosen person must be from outside our team, as it is necessary that they are not emotionally attached to the product or any of its features, so that they can give neutral feedback. This process will allow us to collect valuable information and data which is crucial to the design process, and obtaining this data is the objective of prototyping. Specifically, we would like to know if the watch is comfortable to wear, if it’s durable, discreet, and looks pleasing.

There are two possible types of results that may occur, specifically on a yes/no basis. The first is that the metal casing and rubber straps allow for comfort in which we will proceed to the next stage, Prototype II. The second result is that the metal casing and rubber strapping (or their shape) is not a suitable material for the opioid watch, meaning our prototype has failed to meet the user’s requirements, and must be modified. In the event that this occurs, our team will adhere to the contingency plan developed in Project Deliverable E. For this task, the casing will have to be reconstructed using plastic, provided that the metal design can not be improved. This will be done through the use of a CAD design which will be 3D-printed. Then our group will

reconstruct the device and carry out the same test plan to test again for the durability and comfort of the watch.

2.2 What is going on and how is it being done?

The first design is a focused prototype and the reason for this is to create a representation of the design produced before the final solution. It focuses on the global concept as was sketched in deliverable D. This prototype will allow us and our customers to understand the product better, as well as gain feedback about the achievement of several requirements identified in section 2.1.

The prototype was built at the Brunsfield Manufacturing Centre using basic equipment that requires only basic training or no training at all. These include a press drill, metal sheet cutter/bender, pliers, hammer, file, among other tools that may have been needed for a circumstantial reason. The design is a modified and redimensioned version of the box that was made during the MTC basic training session, with the addition of a cap to cover the open end. There were also added four tabs with holes in them to allow the attachment of the rubber straps, which were obtained from an old dollar store watch and attached to the case. The sketches which were made as the first stage of the manufacturing process (a dependency for the prototype) are present in section **6. Appendix** of this document, under **Appendix 1**. Since all the materials used were scraps, the watch did not cost any money to make, but required approximately 5 hours to manufacture by inexperienced members of the team. This prototype is not measuring any quantifiable metrics, rather it focuses on the user experience from a physical perspective. The test subject will wear the wristwatch prototype for a day and report to us his experience. His observations must then be recorded and analysed in order to answer the identified objective and identify modifications that should be made.

2.3 When is it happening?

A dependency of the prototype testing is the production of the prototype. The entire manufacturing of the prototype took place on Monday, February 24, 2020 at the Brunsfield Centre, STEM building. Team members Ali and Abdel were assigned the responsibility for this task and completed it within a time frame of approximately 5 hours (this includes the planning and dimensioning, a dependency of the manufacturing itself). The result needed from this prototype test is an understanding of the comfort, durability and aesthetics, and discreteness of the watch, so that appropriate adjustments can be made.

Since the testers will wear the prototype for a full day, the iteration time is 24 hours. We have decided as a group that one cycle is enough testing for this prototype, and we will stop after that. The reason being that in 24 hours, a person should have had enough experience wearing the device to know the conceptual faults present that can be problematic

3. Results

The following three figures (**Figure 1, Figure 2, Figure 3**) display the orthographic views of Prototype I:

Figure 1: Top view of Prototype I

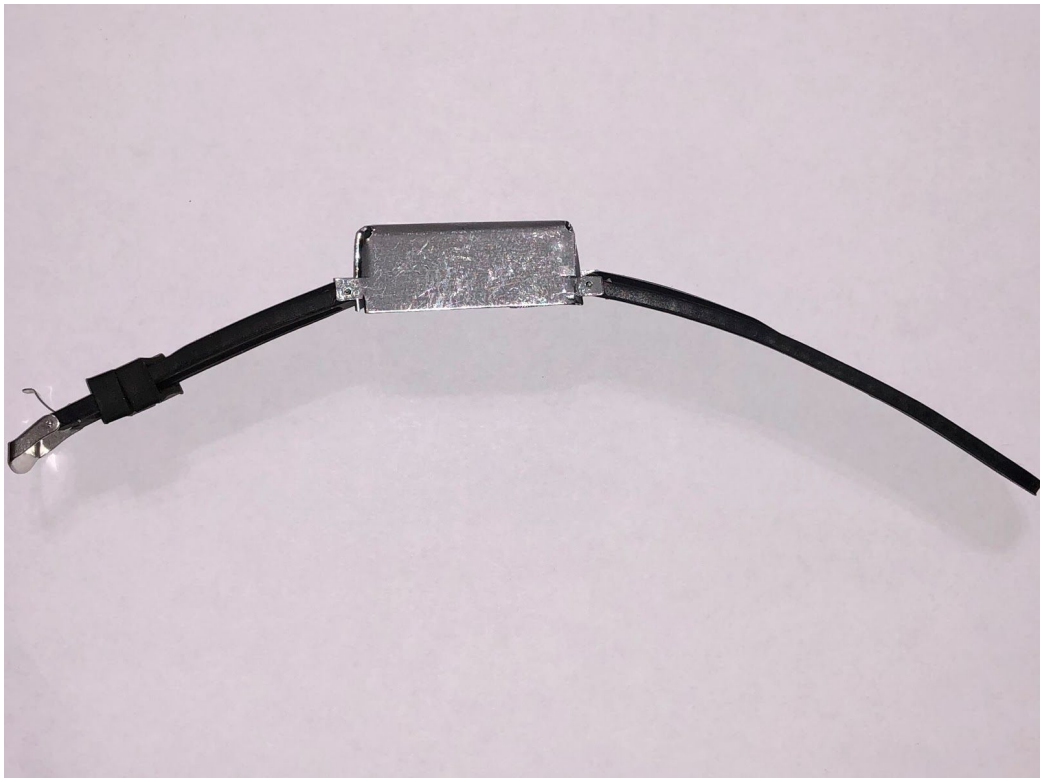

Figure 2: Front view of Prototype I

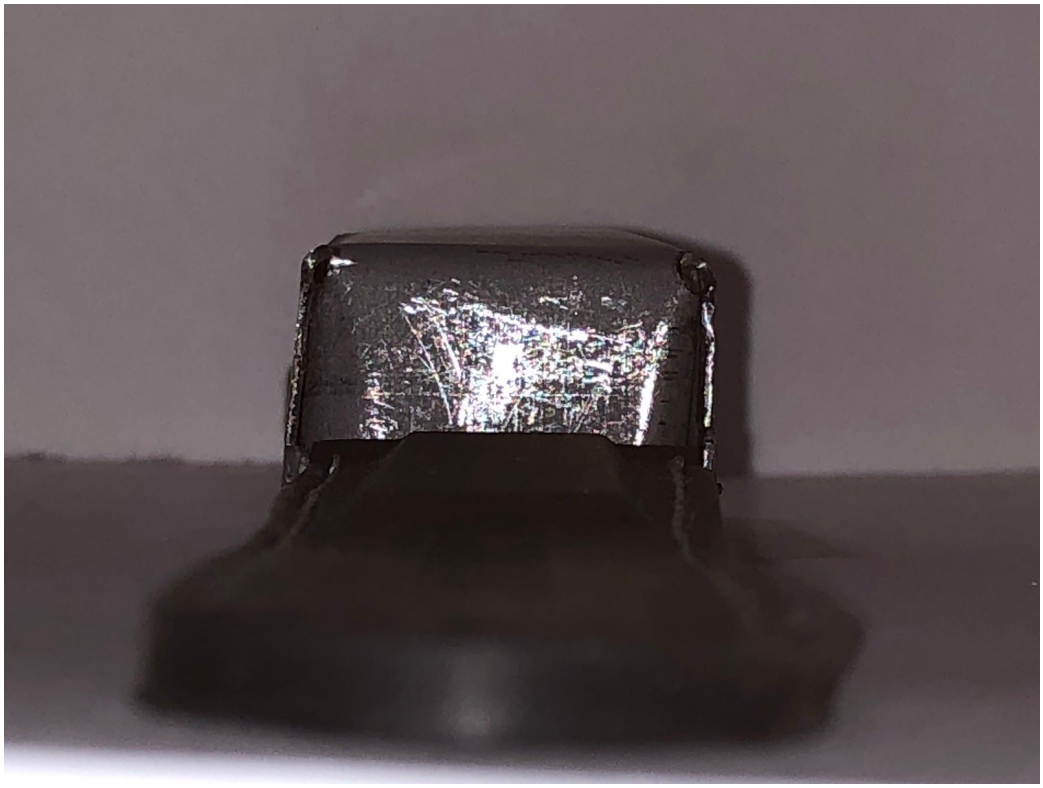

Figure 3: Right side view of Prototype I

Our tester revealed many valuable sources of information and data. They include:

- The watch is very bulky and restricts movement of the wrist, which is irritating
- The metal case is simplistic and feels classy, but also futuristic.
- The bottom of the case has exposed metal sheet edges which can be irritating to the skin
- The rubber straps look and feel very durable, but the metal buckle rubs against the skin and is irritating
- Due to the size of the wristwatch, wearing and taking off clothes is doable but very challenging and one grows tired of this
- The corners of the metal case are rough and sometimes get caught on clothing, such as on a winter jacket. This can potentially cause damage.
- The metal case is lightweight and feels very sturdy. One does not fear it will chip or break.
- The size of the case is large enough that it is not discrete and attracts privy eyes. Almost everyone asks “What are you wearing?”. One may grow tired of these questions or become more cautious or paranoid of the judgement of those around him.

4. **Analysis:**

The prototypes essentially consist of a metal box and rubber straps. Our team believes that the fidelity of this prototype is medium. It takes the exact form and materials that the final prototype is expected to take, so at first one may think that the degree of fidelity is high. Some important differences, however, include the fact that there are no cutouts in the box for buttons and displays, which may affect the user experience as well as the aesthetics, durability, and discreteness. The contents of the case are also non-present, which means that the prototype will be significantly lighter than in reality, which may have an effect on the comfort. This could have perhaps been solved by stuffing the case with weights, but it is hard to tell at this stage exactly how much the final prototype will weigh. The dimensions used were also estimates of the final ones and, and the team has discovered after the manufacturing of the prototype that the final one will be larger, due to the internal parts. In summary, the assumptions made that we have identified are aesthetics, weight, and dimensions, and we know that these assumptions will not reflect reality. With this in mind we have decided that this prototype has a medium degree of fidelity.

There are also assumptions made with the testing method that must be acknowledged. Although we believe that the tester's experiences will be enough for them to understand the product enough to give feedback, the reality is that they are only representing a single category of people, and other categories of people (eg. different professions) may have different experiences with the product. We believe that this method of testing will however be sufficient, especially as resources to not permit us to do more comprehensive testing.

The team was very happy to find that at the end of the testing method, we achieved the objective data we were looking for. We gained key pieces of information about the wearability of the prototype, including aesthetics, comfort, discreetness, and durability, as well as other interesting pieces of information we were not specifically looking for. This taught us that when testing prototypes, you can obtain crucial information that was not part of the objective and that you were not even looking for in the first place.

The fact that some features of the watch cause irritation is certainly alarming and must be addressed. Luckily, they can be fixed by altering the way that the metal sheet is folded into the case so that there are no exposed edges facing the wearer's skin. In addition to this, the manufacturing process of the case can be changed to reduce the sharpness of the corners, removing the possibility of damaging the wearer's clothes.

Unfortunately, certain other problems found in the feedback are very hard to adress, namely the bulkiness of the wrist watch which restricted wrist movement and greatly reduced discreteness, to the point where everyone asks about the device. Once potential users discover these, they will certainly decide to not use the device. Unfortunately the final prototype will only be bigger and more bulky, as we are restricted by the size of the internal parts, and it's not possible to get smaller parts with our budget and capabilities. We will simply have to optimise the positioning of the components to make it as small as possible, while acknowledging this restriction.

The team was delighted to hear certain positive pieces of information, such as the fact that the case and straps are very durable and are classy and futuristic looking, since durability

and aesthetics were specific needs identified early on in “project deliverable B: Needs Identification and Problem statement”.

5. Conclusion:

With the completion of our team's first prototype, we have successfully reached the first milestone which was planned for in Project Deliverable E. Using our first prototype, we executed a full test plan and conducted a thorough analysis on the comfort, durability, and aesthetics of the device. The feedback the team received from the test plan was extremely valuable and has led us to make changes to the manufacturing process of the final prototype. More importantly, the objective of the test plan, which was to know if the device is comfortable to wear, durable, and if it looks pleasing (aesthetically), was successful as we recorded valuable data that is recorded in this document, using the test plan also explained in this document. This information will be used to improve the design of prototype III, and even in prototype II, since the outer design is restricted by the internal components, many of which will be represented in that prototype. More specifically, we know that during prototype II, it's not only important to get the subsystem running, but to make it using the least material possible and the most efficient arrangement. Prototype I has given us information on how our idea meets some needs identified deliverables B and mentioned numerous times in this document, but there are many other needs which remain to be tested, and those will be the objectives of the second prototype, who’s deliverable is due on March 8, 2020.

6. Appendix:

Appendix 1 - Sketches created before manufacturing of Prototype I as a general plan (following page)