

Element H: Prototype testing and data collection plan

Element H: Prototype testing and data collection plan

To test our Visual Basic Program, we evaluated all of our design specifications to see which we could test and prove our product viable.

Design Specifications: (Explained in Element C)

(Order is from most important to least important)

1. Universal: Solution must use the On-board diagnostic System (OBDII) that is used on all cars 1996 and newer.
 - a. *This design specification is testable and can be answered simply with yes/no. Our product did comply with the OBDII system by using a Bluetooth OBDII reader to communicate with the Torque APP. We did use the OBDII Bluetooth reader that communicates with the onboard computer that evaluates system faults within the vehicle. We acknowledged that our design was universal when we were able to retrieve the diagnostic code from the Bluetooth reader that specifically uses the OBDII system found in car 1996 and newer.*
2. Safety: Solution must not be a hazardous distraction to the driver either (Driver distractions include three categories: visual distractions, manual distractions, and cognitive distractions^[1])
 - a. Such distractions may include: eating, talking with passengers, reading maps or newspapers, writing, using a cell phone, using computer and navigation devices
 - i. Thus, we want to avoid or prevent any distraction.
 - b. *This was the most important design specification to thoroughly test. Safety was a huge requirement to ensure the viability of our product. We wanted to ensure that our product was not a major distraction to the driver. Thus, we designed a safety test procedure. To test this design specification, we wanted to simulate a driving atmosphere. To test how safe our product is we wanted to see if our product would be considered a hazardous distraction. Therefore, we made a test procedure to measure how long a participant's eyes would be off the road to read what our product had to tell them. We developed this test after considering the possible distractions while driving. The most prominent distraction noticed was visual stimulations. Visual distractions include a wide variety of elements such as cell phones, bright lights, and outside events. Any if these distractions may cause an accident which could be fatal. Thus, we wanted to evaluate the possible visual distraction that our prototype may provoke. Upon research, we found out that a prevalent visual distraction is texting and driving. This distraction is extremely dangerous, and has a wide range of research correlating with texting and driving. We found out that 4.6s is the average amount of time that it takes to send or receive a text. Over the span of 4.6s^[2], a driver traveling at 55mph goes an entire football field without looking at the road. This is highly dangerous. Thus, our goal for our prototype was to ensure that it takes less than 4.6s to read the information given by our prototype.*
3. Accessible Materials and Technology (Should be able to access materials online or in stores, and use technology that already exists)
 - a. *This design specification was completed through the building process of our product. Thus, this design specification was proved through the actual product because we were able to access the materials/technology to complete this task.*
4. Updatable (Easy to update by manufacturers and without unreasonable expenses)
 - a. *This design specification could not be tested. This design specification was a yes or no answer regarding the type of technology used. An example would be if our product was a stationary product without the ability to connect to Wi-Fi or a computer device, this would not be easily updated (no). In contrast, an APP or an adaptable device can be updated through Wi-Fi or software updates (yes). In our case, our dream product is an APP which should sufficiently fulfill this design specification. However, since we made a prototype that was not an APP, we could not test this design specification.*
5. Inexpensive: \$25-\$50 (Amount taken from Previous Survey)
 - a. *This design specification can be answered through the evaluation of the price of our product. Our final price was a \$5-10 APP and an optional fee for full diagnostic at \$5. This was determined in contrast to the price of the Torque Application. The Torque Application cost around \$5 for the full APP. We based our price off of our prototype being a similar in price. As our prototype would only add basic information of critical and noncritical displays. Additionally, the extra \$5 fee would be to send the diagnostic code to mechanics and repair shops. This would compensate for the labor to check the code and evaluate it by the mechanics. Overall, the total price was underneath the benchmark of inexpensive which fulfilled this design specification.*

Based on our analysis of the design specifications, we had to thoroughly test one of our design specifications: Safety. Visual safety is a crucial aspect to the safety of our product. We wrote a detailed test procedure:

Visual Safety Test

Names: *[student names redacted]*

Incremental Testing Summary: None

Testing Date: April 11, 2013, April 12, 2013

Testing Location: *[school name redacted]*

Purpose

- The purpose of this test is to determine the safety of our prototype and observe any possible distractions which could create a safety hazard when driving an automobile.

Pass/Fail Criteria

- Pass: This test is successful if the volunteer can fully read the message given by the prototype under 4.6 seconds and return their attention back to the road.

Materials

- Computer with Program (Prototype)
- PowerPoint Video that has a slide show of various pictures.
- Notebook
- Pen/Pencil
- Steering Wheel Simulation
- Timer

Initial Conditions

- Smart Board is connected to Computer with Slideshow Presentation
- Separate Computer is in front of participant with program.
- Participant is holding a steering wheel to simulate driving.

Safety Concerns

Hazards	Controls	Completed
N/A	N/A	N/A

Test Termination

- Terminate this procedure if the volunteer becomes distracted by anything other than the Program (Prototype) or the slide show presentation.

Data:

- By using a timer, determine the amount of time the volunteer was distracted. Measured in ____ seconds.

Stepwise Procedure

1. All materials are on hand.
2. All initial conditions have been verified.
3. All participants are familiar with safety concerns.
4. Start the PowerPoint Video, and ask the participant to say the correct color of the word shown on the screen.
5. At a random time during the test, set off a diagnostic code on Program.
6. Alarm participant of code.
7. Once the participant takes their eyes off the slide show, start the timer.
8. Stop the timer once the participant reads the next color on the slide show.
9. Record this time in notebook.
10. End the slideshow.
11. Ask participant if the code they read was critical or noncritical.
12. Record their answer in notebook.
13. Repeat steps 1 to 12 with other participants.

This test procedure was approved by our [information redacted] Teacher: [redacted instructor name] . Additionally, this test procedure was reviewed by our expert (Mr. Thomas Kennedy Sr.) who agreed with its conditions and requirements.

To decide the Pass/Fail Criteria, we researched what is considered to be a fatal distraction while driving. A result of this research was voluminous information given about texting while driving. Texting while driving is considered a hazardous distraction to a driver. The research, shows the average time to send or receive a text is 4.6 seconds[3]. At freeway speeds (55mph), 4.6 seconds is equivalent to driving the length of a football field without looking at the road (360 ft.). At city street speeds (30mph), this time is about one block without looking. At both speeds, this time is extremely dangerous to be distracted. This lack of attention to the road increases the likelihood of an accident, which is potentially fatal to the driver and their passengers, pedestrians, and other drivers.

[1] "AAA Exchange." Distracted Driving. AAA Exchange, 2011. Web. 13 Dec. 2012. <<http://exchange.aaa.com/safety/distracted-driving/>> (<http://exchange.aaa.com/safety/distracted-driving/>)

[2] "FindLaw KnowledgeBase." Distracted Driving: It's More than Just Your Eyes. N.p., n.d. Web. 22 Mar. 2013. <<http://knowledgebase.findlaw.com/kb/2013/Feb/983858.html>> (<http://knowledgebase.findlaw.com/kb/2013/Feb/983858.html>)

[3] "FindLaw KnowledgeBase." Distracted Driving: It's More than Just Your Eyes. N.p., n.d. Web. 22 Mar. 2013. <<http://knowledgebase.findlaw.com/kb/2013/Feb/983858.html>> (<http://knowledgebase.findlaw.com/kb/2013/Feb/983858.html>)