

Design Team 4 Design Issues

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Introduction

Design team 4 had to take into account many issues that were above and beyond the requirements of our sponsor. Our design has been one of prototype and development. In order for us to make our product successful in the open market we need to consider other issues such as; project lifestyle management, protection of intellectual property and universal design principles.

Project Lifestyle Management

Although designing for a customer is a primary goal of this project, to make a truly successful product we must take into account the entire product life. Product lifestyle management or “PLM” encompasses every stage of the products life; from when it is first designed, to when it is being used by the customer, and then finally when the product is disposed and what happens to it post use. Product lifestyle management has five stages that include design, production, distribution, consumption/maintenance, and retirement. This section will go over each of the stages to ensure long term success of our project.

The design requirements are to create a system that allows the customer to read and control a sensor from his or her smart phone. The customer is Battelle and they wanted us to create a system that would work in a wide range on environments. Choosing the wireless protocol to use was the biggest issue in designing this product. We had to make sure that it met the requirements of Battelle but also needed to make sure it

was feasible in the time period we had to integrate it on the smart phone. We had a lot of flexibility in the design process which made it possible to choose from a variety of different transmission methods, as well as hardware setups.

Producing our product did not require a lot of resources outside of a Samsung Nexus S and a Microchip's MiWi starter kit. We were able to reduce our cost by having parts donated to us. The key to our success was managing our design schedule to ensure our product will be produced on time and is of exceptional quality.

There are two main components to this project that include the phone application and the MiWi hardware that is used to communicate between the phone and the sensor. The application can be easily delivered through the internet or even on the Android marketplace. The hardware will need to be packaged and shipped directly to the customer. Battelle will be able to use their existing infrastructure and customer base to sell this product. Ultimately it will be packaged with their existing sensor systems.

Once the customer has our product they need to be able to use it properly. By design it has a relatively simple to use interface. Team 4 will include documentation and instructions about how to use our product. We can improve the merchandising of our product by offering installation services as well as on the site training about how to use our product. In the future, upgrades to the software can be provided over the air to the customer. This way they only need to click on an update for the application, and the rest will be taken care of by our software. The future hardware should also be designed in a way that it is capable of being integrated into many different sensors without the need for major changes by the customer.

Due to the nature of electronics and cell phones in general, newer and better hardware will be coming out very often, while the connection method (micro USB) and principle of design will remain. The phone along with the software on it can easily be recycled using one of the many phone recycling programs that are already in place. The MiWi hardware can be reused for parts and also can be recycled using already existing electronic recycling programs.

Protection of Intellectual Property

Intellectual property is defined as intangible products of the mind. However, in order for these to be protected they must be represented in tangible form. Additionally, there are several different ways to protect intellectual property. The three that are most common in engineering design are copyrights, trademarks and patents. A copyright pertains to documents, software, music, etc. and are copyrighted automatically at the creation of the document. One point to make note of however, is that before a lawsuit can be filed for infringement the copyright must be registered with the government. A trademark relates to the protection of a symbol, name or slogan of a product. Lastly, patents are used for inventions, processes, machines, improvements and composition of matter. Moreover, according to a presentation written by Dr. Peggy Wade from Michigan State University, software is typically not protected under patents and instead is covered under a copyright.

Team 4's project is very software oriented. The hardware that is involved includes three Microchip dsPIC33E USB starter kits with an I/O extension board and 6 MRF49XA transceivers that are already patented by Microchip. Therefore we will not be able to patent any of the hardware since we did not design any new technology. Instead our intellectual property will lie with the software that we write and could be protected under copyright upon completion. There are four different codes that need to be integrated in order to make the project work. These include the android application, the interface from the phone to the dsPIC33E starter kit, the communication between the dsPIC33E and the MRF49XA transceivers and the sensor simulation program for the transceiver that communicates information back and forth with the personal area network (PAN) coordinator node. A foreseeable issue that the group might encounter is that some sections of the code being used have been prewritten by Microchip. A large portion of our work was the integration of the different prewritten segments. For example, there is code written to interface the android phone to the dsPIC but there is no software algorithm written that would take the information exchanged over the USB and transmit

it to the transceiver. This code along with the android application will most likely be the majority of the intellectual property that we will claim.

Universal Design Principles

At this stage of the project, the product is designed specifically for military use. This means that usability for persons with disabilities has not been taken into serious consideration. For the military does not allow a large range of disabilities within their ranks. However, the group has designed the product to be very user friendly in terms of the ease at which anyone who is already capable of using a Smart Phone, can control the sensor. The phone Application has a very simple user interface that is large, vibrant, and very forgiving of mistakes made while pushing the touch-pad buttons. This is in consideration for the use of the system by people wearing gloves or hazmat suits, for the sensor being controlled by the Smart Phone detects harmful chemicals in the air. This in mind, the user will only have to input three or four commands to achieve full program functionality. Another principal of Universality already covered by the product's design is the use of RF transceivers as the wireless communication technology. This design choice allows the user to control the sensor in environments outside of Cellular or Wi-Fi networks. This would be the case for many overseas military applications in remote regions.

To improve the product Universality, one major change would be to introduce a voice command/feedback system through some sort of wireless headset, i.e. Bluetooth. The implementation of a system such as this would mean the Smart Phone control of a sensor could be done by people with visual disabilities or people with hand or arm disabilities. Also, this feature could improve the overall user-friendliness and desirability of the product since a hands-free application will have more uses than just for the disabled. This could even improve the safety of the user by not encumbering one of his or her hands while on the battlefield.

Another change that will add to the desirability of our product would be to include a Smart Phone casing that increases the overall durability of the phone. This casing would include an anti-glare screen cover. This continues on the improvement of

environmental Universality by allowing the product to be used on the battlefield and in areas where sunlight would normally make the screen of the Smart Phone un-readable.

Conclusion

The design issues faced by Team 4 have been ones that largely deal with the creation of a prototype. Integration of the product into its final realized state, and creating a commercial available product has been a strong secondary focus in order to achieve an end system with the best functionality possible. With these two end goals in mind and undertaking of the process above, a fully integrated smart-phone sensor system can straightforwardly be created in a successfully marketable way.