

Design VI – Homework 5

I pledge my honor that I have abided by Stevens Honor System

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Wireless Cell Phone/laptop Battery Charger

1: Summary of assignments of individual group members

The work of this group assignment was divided up among the four team members. Each team member performed their specific tasks for the project and they contributed equally. The work on this project is divided up as follows:

David Formoso: Worked on finding articles containing information about the project and providing summaries.

Kunjan Patel: Worked on professional and ethical responsibilities and did research in order to find references.

Smit Naik: Worked on the objective attributes of the project and helped to make the attribute tree

William Haupt: Discussed the realistic constraints of the project as well as working on the attribute tree.

2: Summaries of Information found

Article 1: “Wireless laptop charger: The future of laptop charging”

- <http://www.wirelesslaptopcharger.com/>

In this article the concept of witricity is brought up, this process involves inductive charging that allows electricity to be transferred from one place to another without the use of wires. This article also states a number of advantages to using a wireless laptop charger. Some of the more important being: The ease of use, the removal of chance of electric shock, and it will never overcharge a laptop.

Article 2: “An inside look at Dell’s wireless charging laptop”

- <http://www.pcmag.com/article2/0,2817,2353745,00.asp>

This article mentions the fact that wireless charging already exists for some technology, such as flashlights and phones. It then goes on to focus on a certain laptop that Dell is creating that will be able to be charged wirelessly. It will do this through the use of a technology called “adaptive inductive coupling”. What this technology consists of is basically all of the components of a power supply in a base station that is plugged in, and then a receiver installed in the device that needs to be charged. The base station will have a coil which would power up the laptop through a very similar coil

installed in the laptop. The article ends with a very interesting observation that wireless charging could even be done without contact, since the electromagnetic fields created here can have ranges of up to several feet in diameter.

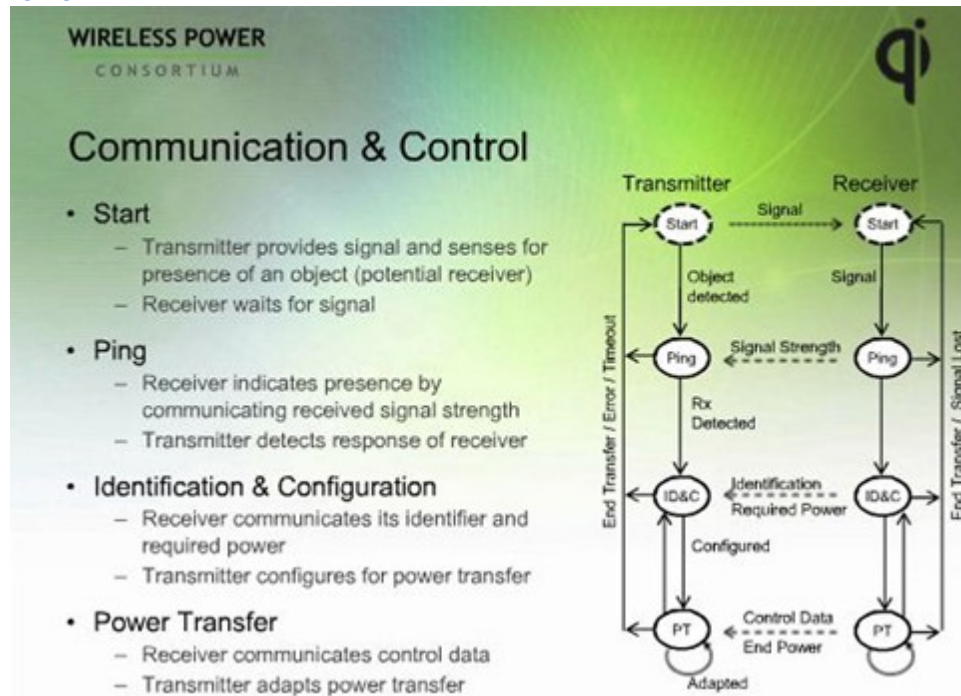
Article 3: “How does wireless laptop charging work?”

- <http://www.techedots.com/2009/09/how-does-wireless-laptop-charging-wors.html>

This article breaks down wireless charging into three basic technologies: radio, resonance, and induction. Radio charging is good for low power devices over long distance, resonance charging is good for massive power in minute distances, and inductive charging is the type of charging that we will use in our project. It uses electromagnetic waves to transfer electricity through coils. This article also states that researchers at MIT said they have come up with technology that will one day lead to devices that do not require batteries.

Article 4: “Engadget primed: how wireless and inductive charging works”

- <http://www.engadget.com/2011/06/24/engadget-primed-how-wireless-and-inductive-charging-works/>



This article was the most informative article our group found. The picture shown above was found in this article and provides a very good description of how the technology works. The article then states that the reason this technology has been taking so long to surface was because there was no standard set, and every company was working on a not very well known technology. That is until WPC came up with

guidelines for inductive charging that are called Qi. It is important that companies follow these guidelines in order to insure not only compatibility but also in order to comply with safety rules.

3: Constraints and Responsibilities

A. Realistic Constraints

i. Economic Constraints

The product must be produced with minimal cost. This should be done by using off-the-shelf parts so that costs can be minimized. There should be some money devoted to marketing the product, because mass appeal for this product will cause a great customer base, and thus a large quantity of the product will be sold. The product should be manufactured off-shores so as to minimize the labor costs at factories. The costs of shipping the product should be minimized by making the product as small and as light as possible. The product should be marketed as upscale so there can be a larger price, and thus higher profit margin.

ii. Environmental Constraints

This product needs to be made in a manner that is environmentally friendly. First, the product itself needs to be made in a way so that it is power-efficient. This will be of a larger appeal to the customer, as well as more environmentally friendly. The manufacturing process for the product should not use any harsh chemicals. Use of harsh chemical can cause health related issues for factory workers, as well, it can cause great and irreversible environmental damage.

iii. Health and Safety Constraints.

As mentioned above, the usage of harsh chemicals should be avoided in the manufacturing process as it can be harmful to factory workers, and if such chemicals were to seep into the water supply, it would be harmful to the surrounding communities. The product should be made so that there is no risk of electrical shock. This means that there should be some sort of insulative chassis, and that there should be a connection to ground. There is also a possibility that the product might heat up and cause a fire. In this case, there should be some sort of fail-safe that prevents such an occurrence. There should be fuses in the power-unit as to prevent excessive power-surges. At the same time, in the development stage, the product should go through rigorous testing to ensure its safety.

iv. Manufacturability

As mentioned previously, the product should be manufactured in a cheaper labor market. The product should also use off-the-shelf parts so that it can be easily manufactured, and so that all the discrete components do not need to be manufactured too. This will mean that there will be

minimal need to train factory workers extensively. Also, using off-the-shelf parts will ensure the reliability of the product, which will make it more profitable.

v. Sustainability

This product should be made in a sustainable way. The factories should be energy-efficient, making use of high-tech machinery that have minimal power-usage. Shipping of the products should be with biodegradable packing materials (i.e. avoiding usage of styrofoam). The product should be made from material that can be recycled later.

B. Professional and Ethical Responsibilities

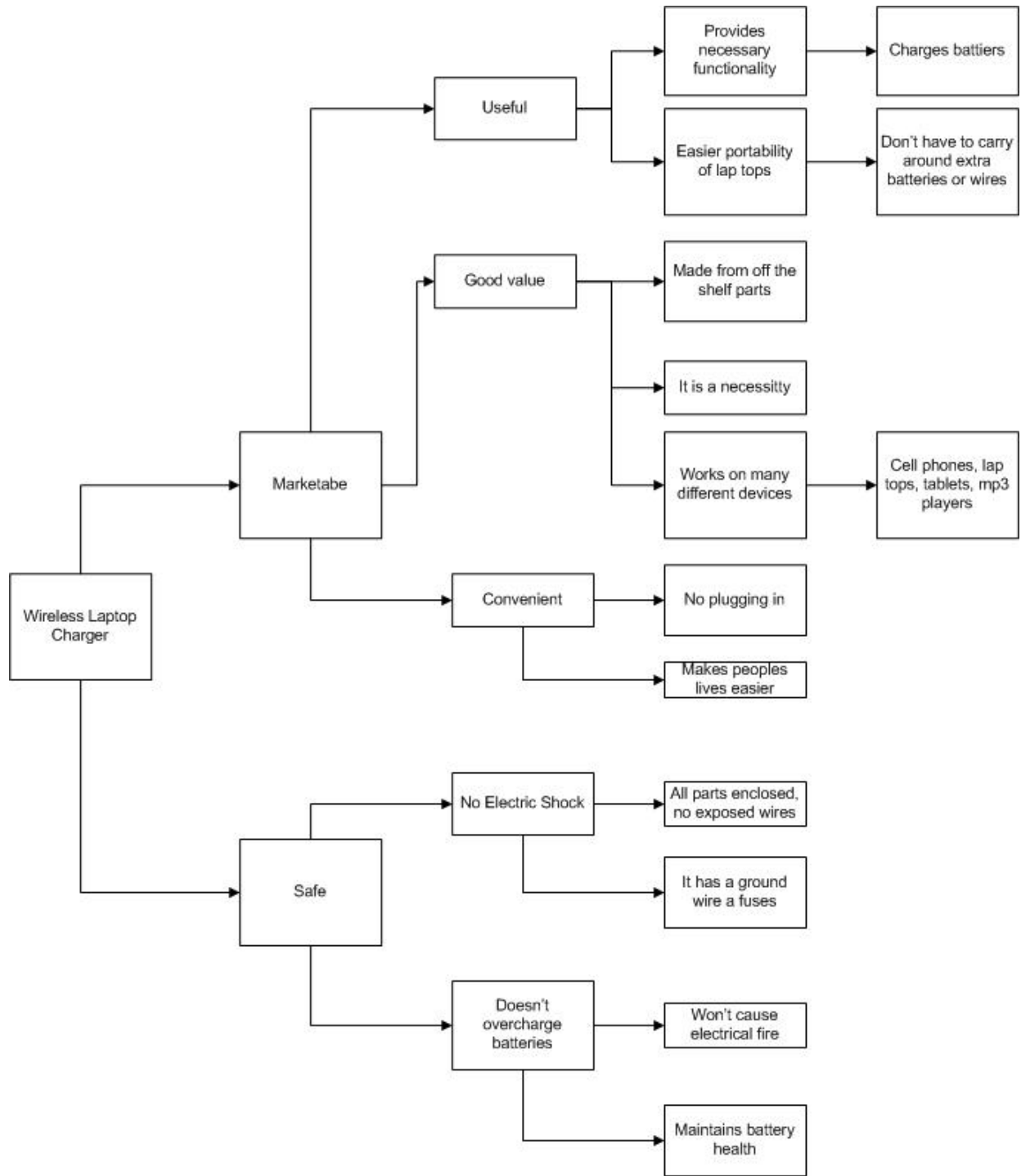
The making of this product comes with certain ethical and professional responsibilities. Using low-price labor means that there is a potential that workers might be abused. It needs to be ensured that workers will be given certain rights and that these rights will be respected. It is also expected that the workers will be given benefits, such as compensation for injuries, sick and vacation days, and basic medical benefits. The workers should not be overworked -- they should be given reasonable hours, and should be properly compensated for working overtime. Other ethical responsibilities of the product include honoring product warranties as well as respecting the wants of the customer base. Any raw materials used in the manufacture of the product should be purchased from countries that are respectful of their citizens.

4: Objective Attributes

- Safety: the project must deliver power in a safe manner, and have fuses to prevent overheating, and ground connection to prevent electrical shock
- Perceived: as safe: This will have an appeal to all customers.
- Low production costs: Allows the product to be mass produced and allows for a larger market with large profitability.
- Marketing flexibility: Will promote sales of the product en masse to large customers (companies) therefore to attract more end-users
- Environmentally Safe: must use safe materials so that it will pass governmental regulations, and so that factory workers are safe.
- Easy to use: Must be easy for customers to understand and use the product.
- Durability: must be able to last for a long time and take abuse from public usage.

- Reliability: the product must so that the customers are happy with their purchase.
- Easy to distribute: Allows for customers to get the product with ease.
- Promote sales: must attract end users to the product.
- Availability: customers must be able to buy an adapter to use the wireless power technology.
- Manufacturing Cost: must be made from off the shelf parts so that it is easy to manufacture and produce, and to keep costs down.
- Customer Appeal: People must find the product to be useful so that they are more likely to use it and hence the product will gain mass appeal, attracting more customers.

Attribute Tree:



5. References List

'Tesla Wireless Energy Transfer at CCC' by Davor Jadrijevic, December 10,2009

http://electronics.howstuffworks.com/wireless_power.htm

Wireless Energy Transmission, Max Seidman,

http://fc.bbns.org/cataldo_ctr_science_website/2007_2008/2008%20Symposium%20Presentations/Wireless%20Energy%20Transfer.MS.ppt.pdf

http://web.mit.edu/newsoffice/2007/wireless_0607.html

http://ecoupled.com/pdf/Wireless_Power_Overview.pdf

6. Recommended Reading

"Efficient Wireless Non Radiative Mid Range Energy Transfer", by A. Karalis, J.

Joannopoulous and M. Soljagic

"Scalar Waves: Advanced Concepts for Wireless Energy Transfer", by Dr.

Konstatin Meyl