



Proposal for Auto Shopping Guider

January 18, 2014

Dr. Andrew Rawicz
School of Engineering Science
Simon Fraser University
Burnaby, British Columbia
V5A 1S6

Re: ENSC 305/440 Project Proposal for Auto Shopping Guider

Dear Dr. Rawicz:

The attached document, *Proposal for Auto Shopping Guider*, demonstrates the outline of our ENSC 440 capstone project. Our goal is to design, build and program a smart shopping cart which can automatically guide customers to the products that they want. This project will significantly decrease the shopping time of customers and also increase the supermarket's profit.

This proposal will describe the project overview, possible design solution, proposed design solution and sources of information. This document also provides the information about budget and funding, schedule, company structure and executive team.

Easy Way Inc. is founded by 5 creative and skillful senior engineering students: Joseph Lu, James Lin, Jacqueline Li, Tao Xiong and Enzo Guo. If you have any question about this proposal, please feel free to contact me by phone at (778) 385 - 0321 or by email at zla18@sfu.ca.

Sincerely,

A handwritten signature in black ink that reads 'Joseph Lu'. The signature is written in a cursive, flowing style.

Joseph Lu
Chief Executive Officer
Easy Way Inc.

Enclosure: Proposal for Auto Shopping Guider

PROPOSAL FOR AUTO SHOPPING GUIDER

Project Team:

Joseph Lu (CEO)

James Lin (COO)

Tao Xiong (CFO)

Enzo Guo (CTP)

Jacqueline Li (VP of marketing)

Submitted to:

Dr. Andrew Rawicz – ENSC 440

Mr. Steve Whitmore – ENSC 305

School of Engineering Science

Simon Fraser University

Issued date:

January 19, 2014

Revision 2

EXECUTIVE SUMMARY

Have you ever wondered why things are difficult to find in large supermarkets such as Costco, Superstore, Walmart, etc.? Have you ever wondered why unnecessary items appear in your shopping carts one after another while desired ones are still somewhere far away? Have you ever wondered why money goes away so much faster at check-out than what you expect before entering these supermarkets?

The answer to all the above questions is more obvious than you think. Large modern supermarkets are organized in a relatively complicated and confusing way, and as a result, it becomes unexpectedly time consuming for customers to finally reach what they actually want to purchase. Furthermore, the more time customers spend on wandering around searching for ambiguous aisle labels and their targets, the more likely they would make unplanned purchases. Such visual layout deceptions might gain some profits for supermarkets for a short period of time, and yet such organization principle would definitely cause significant loss of customers in a long run. How to retain profits and at the same time, retain the flow of customers perpetually arises.

In this project, an idea of "Auto Shopping Guider" that is an automated robotic device is proposed. The pre-programmed device along is supposed to be capable of guiding customers directly to what they desired in relatively large supermarkets in order to make up for the insufficiency of aisle labels and avoid wasting time and energy. Once customers reach their targeting items, they would be alerted by alarms installed on such a device.

Easy Way is a newly established technology organization co-founded by five passionate electronics engineering students. Each of them acquires practical mechanical and electrical hands-on experience, digital systems design capability, signal analysis skill, software programming and hardware implementation knowledge.

The entire project we propose consists of large amount of researching, circuit design, software coding and implementation which would cost approximately twelve weeks from January, 2014. Based on the current circumstance, the budget of this project would tentatively be at \$510.00, which could be obtained from various sources.

Table of content

EXECUTIVE SUMMARY	2
Table of Content	3
1. Introduction	4
2. System Overview	5
3. Possible Design Solutions	7
3.1 Shopping Signs	7
3.2 Shopping Guide Staff	7
3.3 Supermarket's Map APP	7
4. Proposed Design Solution	8
5. Sources Of Information	9
6. Budget And Funding	10
6.1 Budget	10
6.2 Funding	10
7. Schedule	11
8. Company Structure	13
9. Company Profile	14
Conclusion	15
References	16

1. INTRODUCTION

Within the past decade, large modern supermarkets continually entered Vancouver. The first Costco urban store was opened in downtown Vancouver in 2006. Three years later, the first Walmart Supercenter opened in the city in January, 2009. The growth in amount and diversity of supermarkets has become a great force that drives the changes of people's life styles. According to the statistic report, the largest supermarket chain in Canada, Loblaw Companies Limited owns over 1600 stores and second dominator Metro has approximately 500 plus stores. Evidences point to one clear fact of drastic increase in terms of customer flow inside supermarkets.

Based on a study regarding supermarket shoppers in 2005, "Most marketers have a well-established schema for shopper travel behavior within a supermarket – the typical customer is assumed to travel up and down the aisles of the store, stopping at various category locations, deliberating about her consideration set, choosing the best (utility maximizing) option, and then continuing in a similar manner until the path is complete." (Larson, Bradlow, and Fader 2005) Layout of modern supermarkets is then scientifically designed to guide customers' impulses. Thanks to the huge labyrinth and minimized visual help, customers now spend dramatically more time on finding their targets which would lead to purchasing more items outside their original shopping lists. "About 80 percent of consumer choices are made in store and 60 percent of those are impulse purchases", said by Herbert M. Meyers, CEO of Gerstman + Meyers. It gradually becomes a reality that daily grocery shopping is impulsive and time-consuming rather than light-weight, target oriented and relaxing.

These visual deceptions of supermarket layouts certainly would help owners gain profits for a short period of time. However, with more and more customers complaining about how disturbing it is to conveniently reach what they want, noticeable loss of customers would raise as an inevitable outcome.

"Your most unhappy customers are your greatest source of learning" – This famous quote by the co-founder and chairman of Microsoft, Bill Gates, clearly states that customers' satisfaction is the key to enterprises' marketing success. "Now, economic progress depends more than ever on innovation. And the potential for technology innovation to improve lives has never been greater", also said by Bill Gates, indicates that technology has the capability to create a win—win situation for both businessmen and consumers.

This document is a proposal demonstrating a brief overview of our product including the system design, source of information, budget and funding, and project scheduling. It is aimed at providing a relatively transparent vision regarding the product to the audiences.

2. SYSTEM OVERVIEW

Figure 1 shows the basic function of our “Auto Shopping Guider”. Once the Auto Shopping Guider is started, the customer can input the information of item he or she wants and then shopping guider will start guiding the customer to where the item is in the easiest way. Then, customer can follow the guide to where he or she can find the item they need.

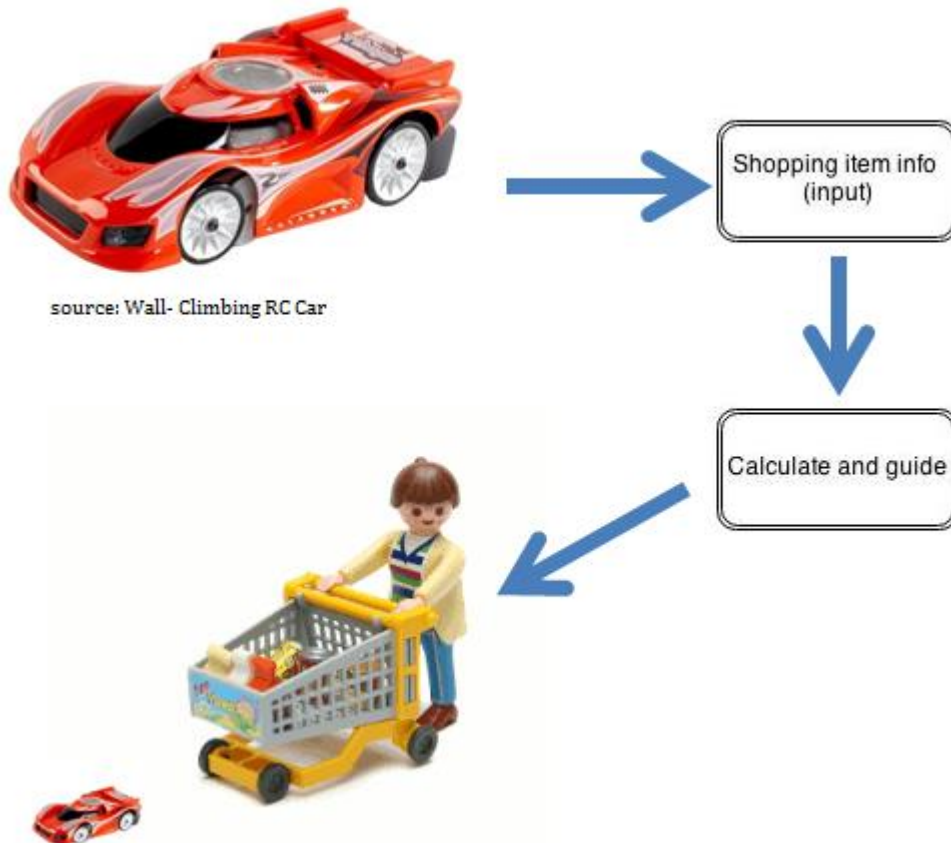


Figure 1. Conceptual diagram

A detailed programmable system block diagram is provided below (Figure 2). As the block diagram shows, once the auto shopping guide is started, the customer can input the information of item they wanted and then shopping guider will start guiding the customer to where the item is in the easiest way or the guider can be pre-programmed to go through any certain part first. On the way to where the item is, the guider can detect any barrier which could be real barrier or human. Once the guider detected the barrier, it will stop, and warn customer. The guider will continue going with the original route if the barrier is removed immediately or with the new calculated route if the barrier is still there over 7 seconds. Once the guider reaches the destination, it will stop and notify the customer that the item is found and if further service is needed.

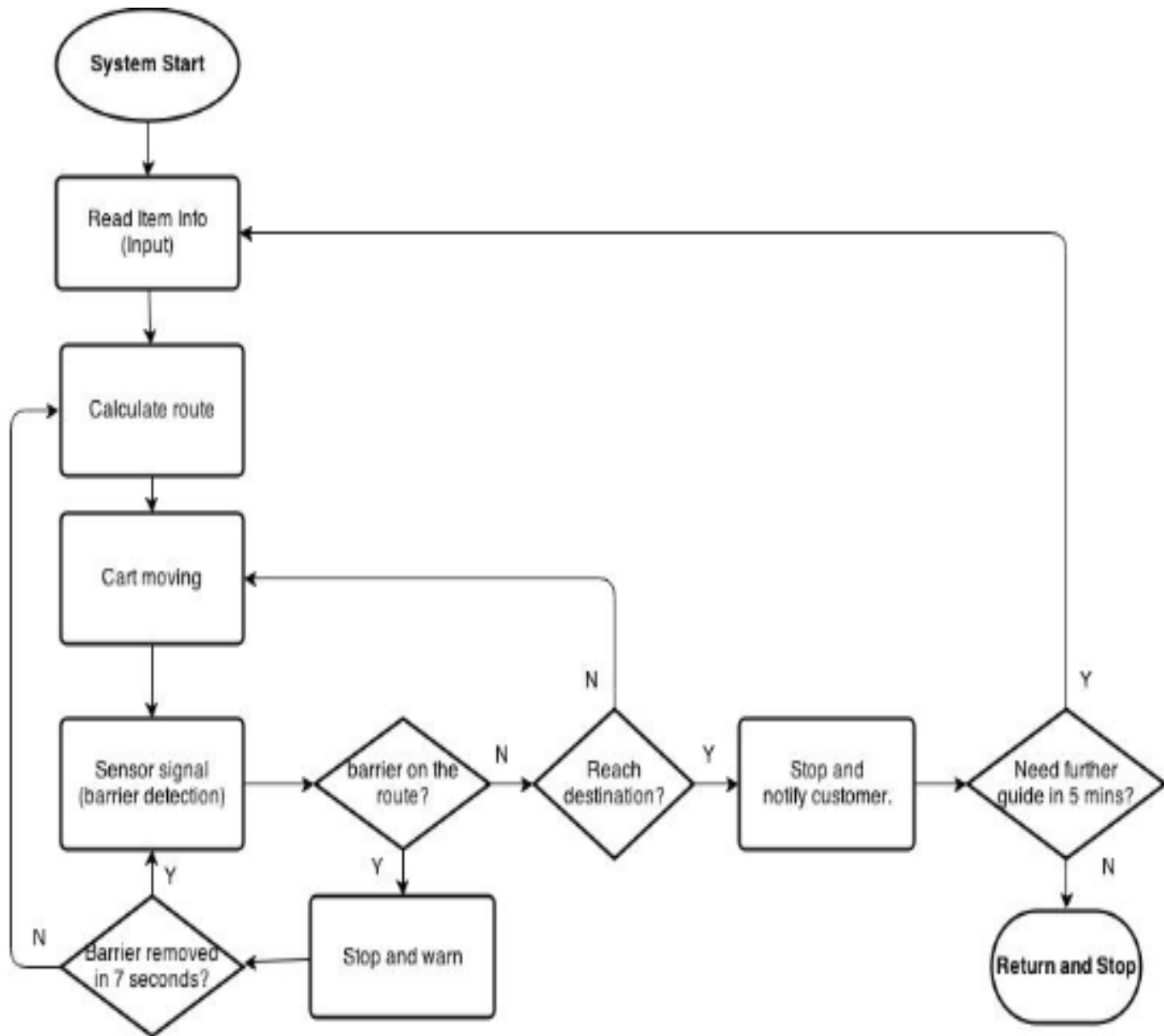


Figure 2. System block diagram

3. POSSIBLE DESIGN SOLUTIONS

Supermarkets support different product and grocery to customers such as food, frozen food, fruits, and beverage and so on. When people shop in the supermarket, they spend most of their time on finding the proper location of the product and grocery they need. In order to save the time on looking for the place of product, supermarket offers some solutions to help their customers to find the product. However, one of the biggest doubts is if the solutions are efficient, accurate and convenience.

3.1 Shopping Signs

One of the popular solutions is shopping signs. Many large supermarkets separate different areas by varieties. As the Fig 3.1 Shopping Signs shown, the shopping signs are put on the top of each area or row, so customers can find the grocery place according to the shopping signs. However, it is not the most efficient way to look for the product because the shopping signs show too much information.



source: Untitled photograph of Walmart

Fig 3.1 Shopping Signs

3.2 Shopping Guide Staff

When customers cannot find the commodities in supermarkets, they would like to ask staff for help. Because most people think they are reliable and familiar with the position of goods. But as intelligent introduced in supermarkets, less staff face and supply help to customers. In addition, another concern is if staff is able to memorize and point out all the proper locations of the grocery.

3.3 Supermarket's Map App

According to Time Tech (Turnbull, 2011), there is supermarket's map app called Tesco Groceries can help people find the quickest route for finding all the stuff on the shopping list once you arrive and activate the app. However, the biggest problem of this solution is only applied by people who have computer or smart phone.

4. PROPOSED DESING SOLUTION

Our proposed solution is to build an "Auto Shopping Guider" to lead customers find all the groceries on their shopping list. The device would offer an efficient, accurate and convenient way to look for targets' locations. Comparing with the shopping signs, customer do not need to read much information to access the locations. Also, the device is reliable because it is able to point out the exact place for people. In addition, the guider is cheaper. Even people do not have computer or smart phone, they can be benefited by our product.

The device is not a novel idea. Although supermarkets and app's developer are working on possible methods to help people to enjoy grocery shopping, these solutions are not able to satisfy these several factors which include faster, reliable and popular. However, our simple product will not only solve the major problems, but also the material is cheap and easy to be found.

The obstacle of completing this project is limited timeline and funding. We have to design, program and test the product in thirteen weeks. Furthermore, we have limit budget to purchase material and parts. As a result, we would like to try our best to build a simple product that can execute in a model supermarket.

With more time and money, we would like to improve the product in several aspects. For example, the product can be embedded with current shopping cart. Secondly, we can install monitor with better user interface. Customers can monitor which groceries have been taken. Moreover, customers can perform the check-out by themselves with scanner which embedded in our product. As a result, they can save time on lining up to checkout.

5. SOURCES OF INFORMATION

We will research a variety of information regarding the fundamental background knowledge of our project. These sources include life experience, course textbooks, Kinematics and dynamics of mechanical systems, various internet resource, soldering technique, information transmission.

ASURO is a tiny mobile robot developed for educational purposes by DLR, the German aerospace center. It could provide us with professional soldering and programmable hardware. We will combine the component parts of ASURO Hardware with our ideas to build our auto shopping guider in our mind.

Additionally, we will research and discuss the situation can be influenced by a multiplicity of different factors. For example, a barrier is in front of the "Auto Shopping Guider". We will also establish ichnography of scaled-down version of supermarket to simulate shopping in in reality.

Finally, the most important creative information is the knowledge of team members to design, program, simulate, and revise our "Auto Shopping Guider" to accomplish tasks that we expect. We will apply the C programming language to program.

6. BUDGET AND FUNDING

6.1 Budget

We estimate the cost based on the information online and construct Table-1. Table-1 shows our expected costs and the different category of component for our product "Auto Shopping Guider". The most components have been overestimated by at least 15% to provide for contingencies.

Table-1: Tentative Budget

Equipment	Estimated Cost
Tweezers and Soldering Accessories	\$40.00
USB IR Transceiver	\$40.00
Parts and Components (such as wheels)	\$80.00
ULT- Board	\$40.00
Snake-Board	\$90.00
Maker	\$20.00
hardboard	\$25.00
Cable	\$15.00
LCD Panel Board	\$80.00
Motors	\$50.00
Power supply	\$30.00
Total Cost	\$510.00

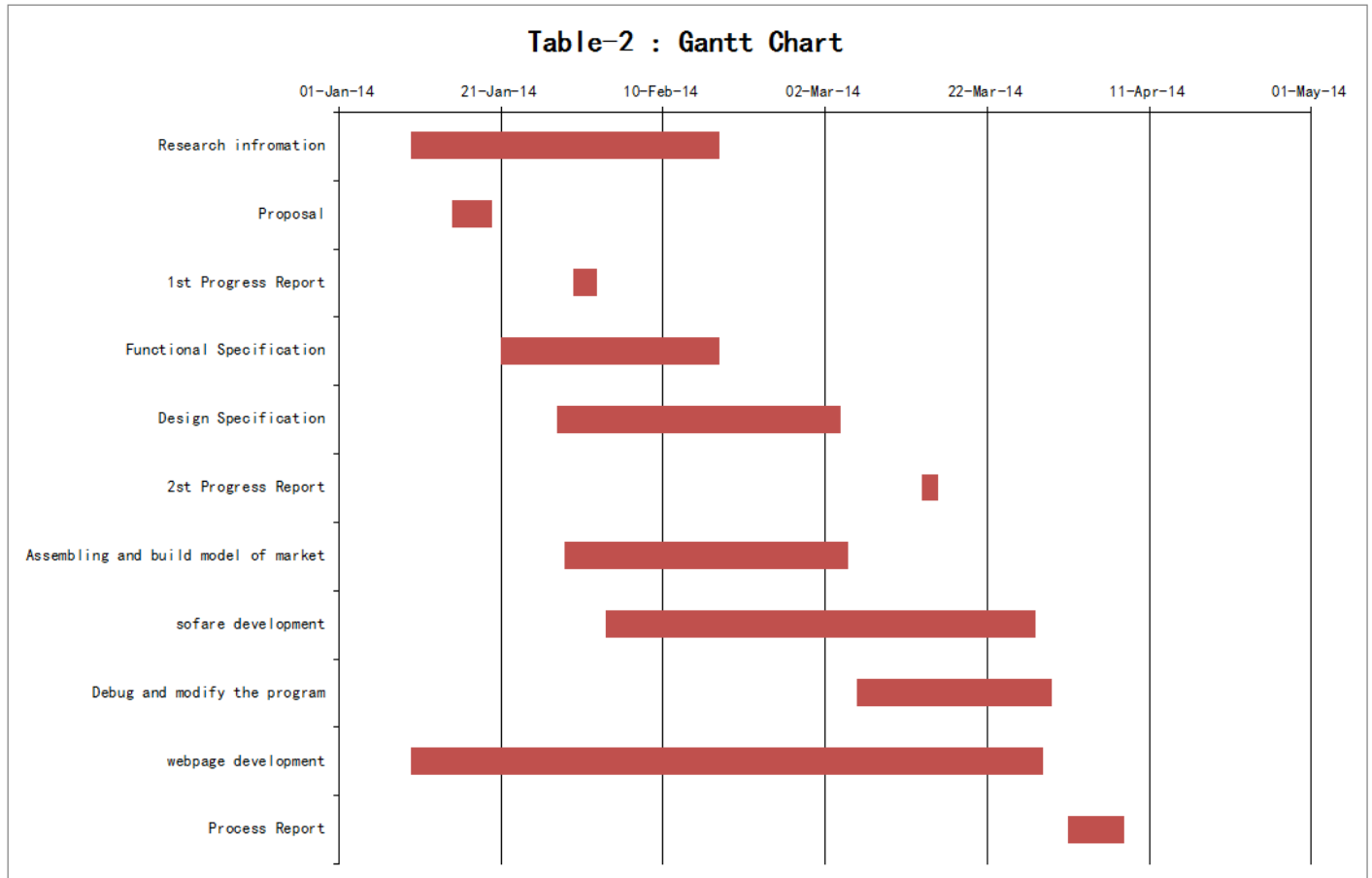
6.2 Funding

Due to the high cost of budget for our project, various sources are being considered. Our team is planning to apply for the Engineering Science Endowment Fund.

Our teammate discussed the circumstance and as a result, we will share the remaining financial costs of our project equally if the Engineering Science Endowment Fund is not enough to pay for the entire project.

7. SCHEDULE

Table-2 shows the projected time of different various tasks for our product “Auto Shopping Guider”. Figure-3 display the specific time that task refers to Gantt chart will be accomplished.



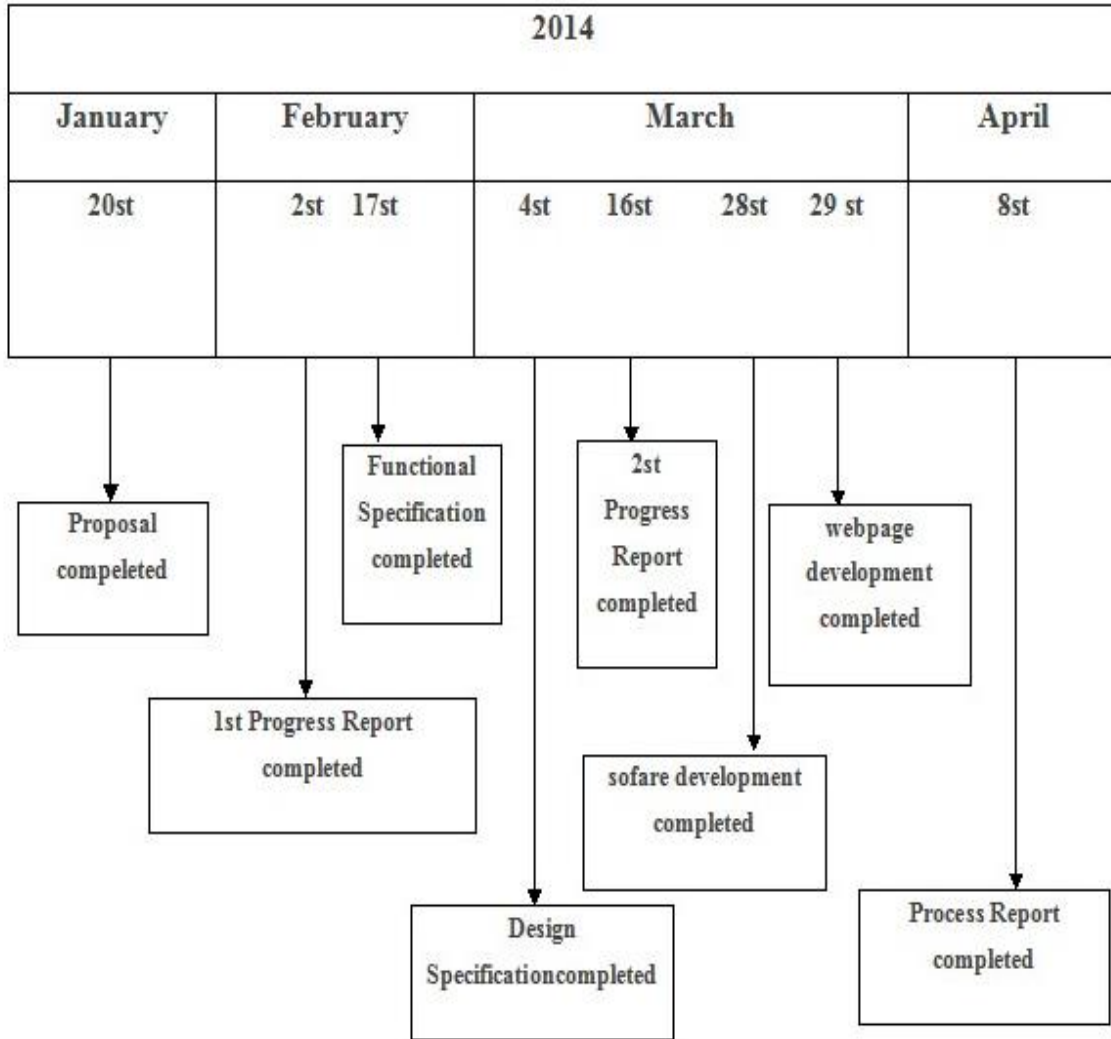


Figure 3. Milestone Chart

8. COMPANY STRUCTURE

Easy Way Inc. was established in January 2014. It consists of 5 creative and skillful senior engineering students: Joseph Lu, James Lin, Jacqueline Li, Tao Xiong and Enzo Guo. All members are fourth year electronics engineering students with different Co-op placements. The diversity in co-op position gives us the ability to solve both software and hardware problems and each member can apply his/her skills to achieve our common goal. The detailed information of each member will be highlighted in next section.

Joseph Lu, the Chief Executive Officer (CEO), is also the director of our project. He is in charge of the design process and makes sure this project can be completed on time. Enzo Guo, the Chief Technology Officer (CTO), designs and programs advanced features for our project. James Lin, the Chief Operating Officer (COO), is in charge of implementing the designed features and tests the functionality of the project. Tao Xiong, the Chief Financial Officer (CFO), manages the budget and funding. Jacqueline Li, the Vice President of Marketing (VP), helps scheduling team meeting and recording meeting minutes.

The tests are assigned to each member based on their skills during the team meeting every week. In order to make sure our design process is running smoothly, we have more than 2 team meetings per week. We believe that communication is the best way to solve problems.

9. COMPANY PROFILE

Joseph Lu - CEO

I am a fourth year electronics engineering student from Simon Fraser University with one previous Co—op placement in BlackBerry as a test system developer. I have considerable proficiency in both software programming and hardware assembly. I acquire professional documentation skills, VB.NET embedded software debugging skills, XML scripting, PLC knowledge, mechanical and electrical hands-on skills. I am also very familiar with communication networks, ICs, electrical circuits design, FPGA configuration, object—oriented programming with C++ and HTML/CSS web development. In addition to my academic and technical abilities, I do acquire exceptional interpersonal and communication skills, organization and prioritization skills, as well as efficient collaboration in any teams.

James Lin - COO

I am a 4th year electronic Engineering student at Simon Fraser University with previous co-op term experience at BlackBerry as a embedded software developer. I have programming experiences in C++, QNX and Assembly language. I am familiar with 2nd and 3rd layer of mobile communication technology. I am able to design, implement and configure integrated circuits, FPGA as well as various other electronics equipments. Other than the technical skills listed above, I have good communication skills and I am a good team player.

Enzo Guo - CTO

I am a fourth year Electronics Engineering student at Simon Fraser University. I have worked for Sierra Wireless Inc. for 8 month as a Hardware Designer Co-op. During this co-op, I have developed strong knowledge about hardware design, RF circuits and PCB layout. Moreover, I acquired advanced soldering skills and I am very familiar with hardware testing equipment such as oscilloscope, function generator and DMM.

Tao Xiong - CFO

I am currently a fourth year undergraduate student in the Electrical Engineering Program at Simon Fraser University. I have gained experience related to solving problems and troubleshooting. I have the abilities of applying the AutoCAD in design and PLC Programming. I also have advanced upstanding of communication networks, electrical circuits design and debugging, digital systems design and debugging, Window and Linux operating systems. Software programming with C++, MATLAB. In addition, I am a hardworking and responsible person always looking to improve myself and work in a precise manner. I have also improved my written and oral communication skills as well as team collaboration skills.

Jacqueline Li - VP of Marketing

I am a 4th year Electronic Engineering student at Simon Fraser University (SFU). I acquire C++, Assembly language, JavaScript, PHP, HTML and CSS programming experiences. I am able to design and configure integrated circuits. Also I had co-op experience at BlackBerry as a software tester for 16 months. Currently, I am on a part-time job as a sale associated.

10. CONCLUSION

The product design proposed in this document would radically help in satisfying not only the consumers' shopping needs but also supermarkets' profit requirements. It is a cost efficient and human oriented design. The product is capable of effectively minimizing customers' complaints in terms of confusing store layouts.

Easy Way believes technologies drive innovations and innovations cause economic progress. Our objective is to originate the win—win situation that was mentioned in the introduction by making customers' lives easier along with lowest costs and profitable investment in terms of store owners.

We believe that for the upcoming twelve weeks, our dedication and strong technology background would ensure that the design will be completed on time. More information regarding this project could be obtained from the above contents in this document.

11. REFERENCE

1. Jeffery S. Larson, Eric T. Bradlow, Peter S. Fader. (2005) *An Exploratory Look at Supermarket Shopping Paths*. Retrieved from http://www.andeenutson.com/studies/Shoppers%20and%20Products/11_AnExploratoryLookAtSupermarketShoppingPaths_2005.pdf
2. Wall-Climbing RC Car. (August 3, 2010). *The Best Remote Control Cars*. Retrieved from <http://www.bit-tech.net/bits/2010/08/03/fun-with-remote-control-vehicles/3>
3. ASURO parts pricing in formation, by REXX Engineering. http://www.arexx.com/arexx.php?cmd=goto&cparam=p_asuro
4. [Untitled photograph of Walmart]. (n.d.). Retrieved from <http://www.lippincott.com/en/work/walmart>
5. Turnbull, G. (2012, May 27). Supermarket's Map App Shows Quickest Routes to Things on Your List. *Time Tech*. Retrieved from <http://techland.time.com/2011/05/27/supermarkets-map-app-shows-quickest-routes-to-things-on-your-list/>