September 24, 2007

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

Re: Ensc 440 Project Proposal for a Wireless Waiter Calling System

Dear Dr. Rawicz,

The attached document provides an overview of our proposed project for ENSC 440. The aim of our project is to implement a wireless waiter caller system for customers in a spread out dining establishments.

This document provides an overview of existing solutions for server request systems, and shows the distinct advantages of our wireless solution over previous methods. Also included is an outline of our design considerations and possible variations, project budget, project schedule, and a description of the company. In addition, this document also includes a section on additional features that may be implemented as time permits.

Our company, SWIS, consists of four talented individuals: Aron McKinnon, CEO; Raymond Tan, CTO; Howard Yu Hao, COO; Peter Chen, CQAO. We believe this team is capable of accomplishing the proposed task in a timely fashion.

If you have any questions or concerns, please do not hesitate to contact us at ensc440-swis@sfu.ca

Sincerely,

Aron McKinnon
Chief Executive

Short-range Wireless Innovative Solutions

PROJECT PROPOSAL

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Prepared by Management Team:

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Executive Summary

How many times have you sat at a restaurant, pub, or other sit-in service establishment and wished you had an easy and fast way to communicate to the waiter? This problem is major and plagues the service industry, resulting in aggravated patrons, under-tipped waiters and low quality establishments. Fortunately, this problem has now been solved by SWIS with its one of a kind product WCall (Waiter/Waitress Call). Overall, SWIS engineers are determined to solve the potential demand for waiter caller and other short-range wireless communication solutions.

The WCall system works by having a wireless transmitter with a call button placed at each table and the waitress having a receiver unit on her watch that quietly and conveniently conveys which tables require her attention. The paging system is a win-win design that pleases everyone! The patrons get prompt service, able to service their customers more efficiently and effectively. This results in higher tips and the restaurant owners get a cost-effective solution to a better-managed working environment that attracts more customers, thus increasing profitability.

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1.0 Introduction

1.1 Company Profile

SWIS is an acronym for **S**hort-range **W**ireless **I**nnovative **S**olutions, which coincidentally describes our company's mission and vision. The Company was formed after a problem was seen at local dining establishments, when one engineer had to wait an extended period of time for a waiter. In response to the engineer filing his grievance to the waiter, the waiter told him that he wished he knew that the patron required his attention. This sparked the idea to form the foundation of a revolutionary company, which intends to reshape communication in the service and service industry.

1.2 The Vision Statement

"To be recognized as the leading designer, manufacturer and marketer of short-range wireless innovative solutions for the Hospitality Industry"

1.3 The Mission Statement

"To develop innovative short range wireless communication products and distribute and service these products to an extensive range of customers to meet their needs"

2.0 System Overview

SWIS aims at designing short-range wireless products for numerous consumer venues. However, our initial product will target restaurants.

The product is a paging system for restaurants and pubs. The system allows restaurant/pub patrons to electronically "call" their waiter to let the waiter know that the patron is in need of assistance or ready to order. The system would consist of a button/transmitter placed discretely on every table, and a watch/receiver unit worn by the waiter. When a patron presses the button/transmitter, the waiter would be notified by his receiver unit that a particular table needs his attention. The button/transmitter unit could be decorated to display a sign or menu item. The receiver unit worn by the waiter resembles a regular watch that allows the waiter to know which tables require assistance in a simple glance.

Wcall-Waiter Call Button with Watch Receiver

A prototype of this paging system has already been designed and potential modifications and upgrades to the system can be achieved inexpensively. The system would be marketed directly to pubs and restaurants, which would allow it to be customized to the specific environment.

The main innovation of the idea is the application of various existing technologies, working together to form a new system device. Each button/transmitter unit would be individually numbered so that restaurants can keep track of which button corresponds to a specific table, and

alert the appropriate waiter. Each button/transmitter unit broadcasts a different signal and the receiver is designed so that the different transmissions do not interfere with each other. This allows for the waiter to receive patron requests simultaneously. The system uses a radio frequency protocol that would not interfere with other electronics (including cell phones and security systems), or other nearby restaurants using the same system. The button/transmitter unit is enclosed in a water-proof protective case which inhibits it from being damaged from food and drinks. The electronics used are light weight and affordable which keeps the cost of production down. The end result is an affordable and effective restaurant paging system. WCall also has potential in nursing homes, spas, large banquets, warehouses, and other environments where communication is essential.

SWIS plans on marketing the WCall as a high-tech device that lifts up the image of restaurants. It is a product that will be welcomed by waiters/waitress with good etiquette. It is a cool-looking and inexpensive device that speeds up customer service with cut-down on response time thus definitely being an ideal image for a waiter/waitress.

3.0 Possible Design Solutions

3.1 Traditional Approach

Instead of letting customers wave or shout loudly to the waiter for their needs for assistance, some restaurants provide certain crafts that can serve as a kind of bell or simply a bell. It is supposed to be sounded when a customer wants service. It is easy and cheap to implement and no complex system is required. The craft used can also help the restaurant create a "style" of its own.

Drawbacks: Sometimes the sound may not be adequate to capture the attention of the waiter/waitress, especially in a busy restaurant which is filled with all sorts of noises produced by the customers. Moreover, some customers may not be comfortable with the sound produced by the "Bell", especially the bells sounded by their neighbors.

3.2 High –Tech Solutions

In some restaurants, modern electronic devices are employed to assist customers. For instance, touch screens displaying the menu are able to facilitate customers' communication with the kitchen even without the presence of a service person. More complicated systems consisting both electronic and mechanical systems are also developed to perform all services in a restaurant including serving all the dishes and drinks.

(http://www.google.ca/search?hl=en&q=automatic+serving+system&meta=) Based on these systems, an automatic serving restaurant can be built.

Drawbacks:

It is highly expensive to implement and operate such a serving system. Due to the cost of high-end electronics devices, such as the touch screen or computer systems, a large amount of

investment is required to apply such an ordering system. The power consumption of such a system can also significantly increase the total cost for the operation of a restaurant. Hence, this kind of solutions is mainly suitable for some large and highly profitable restaurants, and may not be a wise choice for regular restaurants.

The risk that the system getting damaged is very high. The expensive device installed on the tables may be damaged during several hours of operation every day. The customers may also cause damage to the devices, sometimes intentionally. The cost of maintenance or replacement for the devices will not be a small number either.

3.3 Simple Wireless Solutions

A typical wireless Service Calling System consists of one wireless calling server and one wireless calling button. The wireless calling server can be either hung on the wall or put on the table at the reception area. The button can be fixed onto the table or wall with double side tape where service is needed. After a button is pressed by a customer, the wireless calling server will display the table/room number on its large and clear screen, and the customer will be served in time. The whole system is powered by wireless technology for easy installation. Wired systems may also used when there is little constrains for installation. Pager systems can be included to facilitate the service-providing people to get an instant notice when customers requiring service. There are a number of existing products available. The following web-links are some of the typical ones.

http://www.waitercaller.com/

http://www.alfa-electronix.com/wwcs.php

http://www.freepatentsonline.com/6366196.html

http://www.spaincashregisters.com/Text/1158740589273-2904/Risto-Waiter-Call-

Nevertheless, we are trying to develop a neat and simpler system with reduced cost and enhance functions. For instance, multiply buttons are included in the table sets to help customers send more specified orders.

Details can be found on our proposed solution, which is shown on the following chapter.

4.0 Proposed Design Solution

The proposed design solution that our company came up with consists of short-range wireless communication devices used to convey real time statuses of customers' request and the kitchen's updates to the waiter. This system consists of three types of components, namely the table control panel, kitchen control panel and the waiters' wrist display, which would communicate to one another via wireless transceivers. A point to note is that although this system will be designed to cater for a restaurant, it can be altered to wireless paging systems that suits many other different environments like hospitals and old age homes.

Basically, this system allows diners to page for waiters using a table control panel which has toggle buttons, each with its own specific waiter-calling purpose, so that the waiter knows what the diners want even before proceeding to the table. This helps to speed up service because the waiters, who would already know what a particular table needs by looking at his wrist display, can save trips to the table just to ask what the diners are requesting. The kitchen too, is able to page a waiter to inform him that a particular table's order is ready and waiting.

This system will be designed to split a restaurant into different zones, each consisting of 10 tables (number adjustable upon customer's request), which is approximately the number of tables one waiter can effectively cater to. Consequently, each wrist display is used only in its own zone (and frequency channel) and the kitchen control panel has a set of 10 buttons for each zone.

Both the kitchen control panel and table control panel consist of toggle buttons which are first pressed (and lit up) by diners or chefs to send request updates like bill requests to a waiter's wrist watch wirelessly. Fig.1 shows a kitchen control panel where the chef just pressed and lit the button that corresponds to zone 0 table 1's order being ready while Fig. 2 shows table 4's control panel where a diner just pushed the button to request for his bill. These requests are displayed on a grid of Light Emitting Diodes (LEDs) on the waiter's wrist display, which would then tell him

which table is requesting for what. For example, Fig. 3 shows a waiter's wrist display telling him that table 4 is requesting for the bill and table 1's food is ready at the kitchen. Upon tending to the requested task at the kitchen or the requesting table, the waiter presses the lit button to reset it , which also turns off the corresponding lit LED on his wrist display.

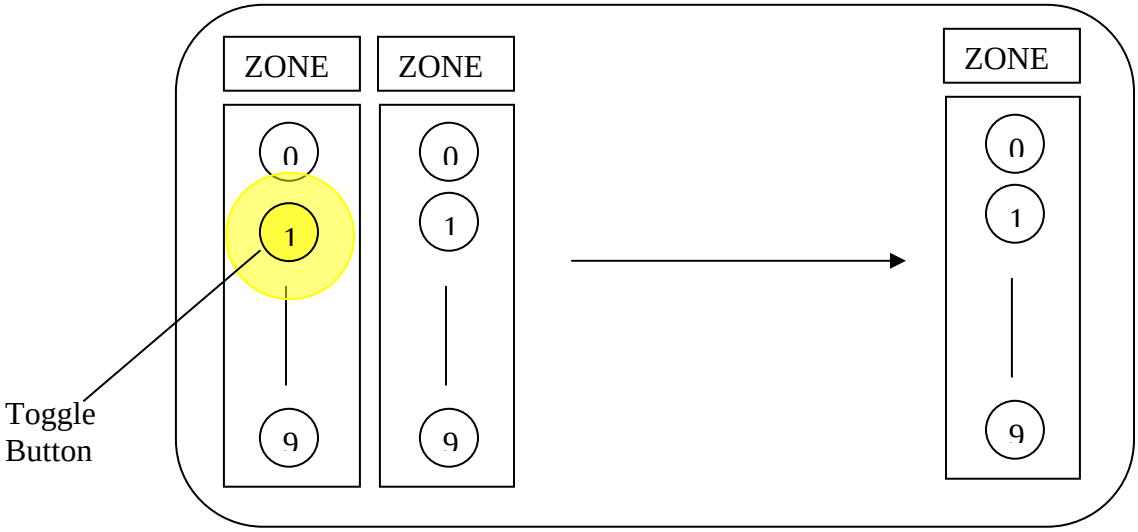


Fig. 1 Layout of kitchen control panel

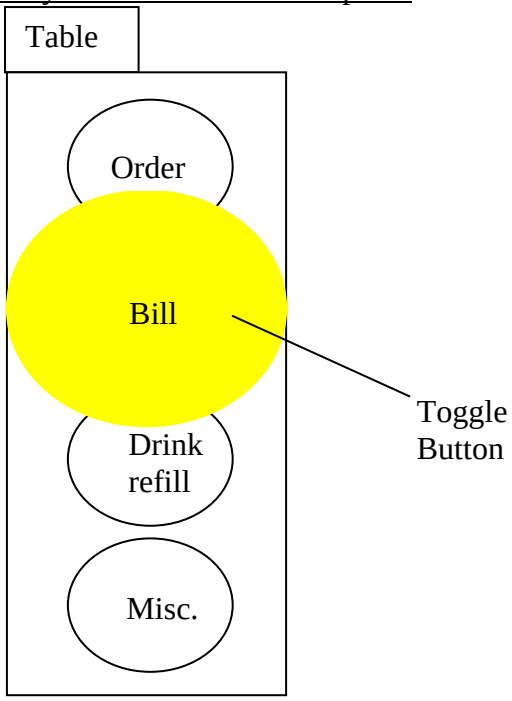


Fig. 2 Table control panel

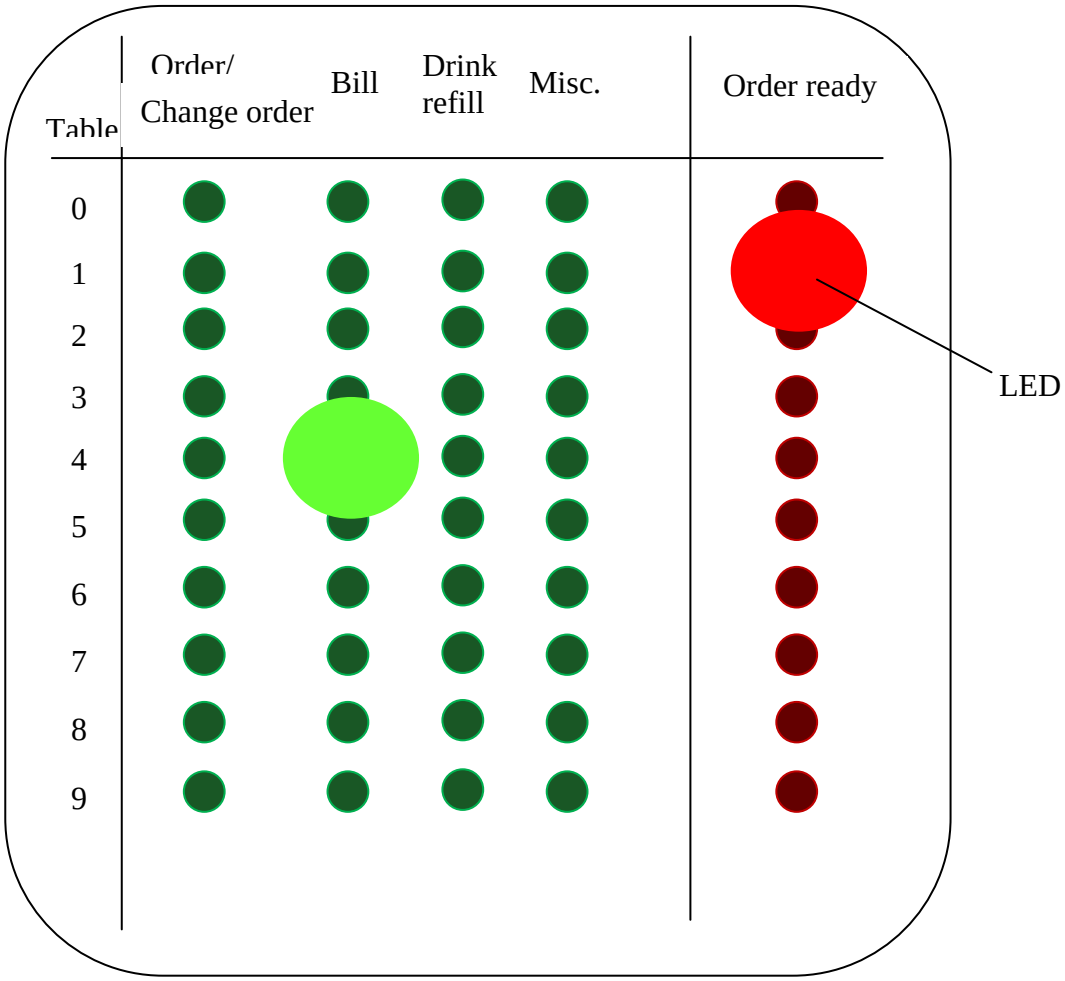


Fig 3. Layout of waiter's wrist panel display

To go about fulfilling this proposed design we intend to use short-range wireless transceivers that are capable of Frequency Hopping Spread Spectrum (FHSS) modulation where the carrier signal hops, in a pseudo-random but known order, to different frequencies within a given band in order to prevent interference from stray signals.

The prototype design will consist of a set of two table control panels, one wrist display panel and one kitchen control panel in order to demonstrate the system's capabilities to the customers.

5.0 Sources of Information

The development of our product requires a fair understanding of the wireless networking concept, software development, and IC design. Our team members will gather our specific field of knowledge through academic textbooks, component/product specification data sheets, and the internet. We will also seek advices and information that are essential in the completion of this project.

Our main group of advisors includes Dr. Andrew Rawicz, Brad Oldham, and Lisette Paris Shaadi. Dr. Rawicz is the professor for Ensc 440 while Brad and Lisette are the teaching assistance for Ensc 440. They will provide us with the essential requirements to the project. For technical advices in wireless networking, we plan to seek advice from Dr. Jim Cavers. Dr. Cavers is the Canada Research Chair (Tier 1) in wireless communication. For IC design questions, we plan to seek advice from Lakshman One. As for advices in the important documentations, we will seek advices from both Steve Whitmore and Mike Sjoerdsma, who are experienced in the field of technical writing.

We will also need to meet industry standard for wireless communication and transmission protocols. We will be consulting with various documents that provide information in standards and protocols so that our project will not violate any existing laws.

Finally, during the development of this project, we will be seeking help from various faculty members from different faculties when needed. Also, we will seek extensive help from the library staffs and resources.

6.0 Budget, Funding, and Information Sources

6.1 Budget

The tentative budget for out prototype is summarized in Table 1. Costs have been increased by 10% to provide a conservative estimate for out budget.

Component	Cost	Quantity
Transceiver	$36	4
Antenna	$20	4
LEDs (small)	$0.071	50
LEDs (large)	$0.090	18
Control box casings	$10	3
Wrist watch casing	$20	1
Toggle buttons	$10	18
batteries	$5	4
switches	$10	4
Circuit boards	$50	4
Misc. (eg. shipping of parts)	$50	1
Total cost	**652.12**	

6.2 Funding

As our company foresees the need for funds to purchase components, the manufacturing process, and also experimentation on how to improve our prototype, we have to actively search for sponsoring bodies who would either grant us funds for innovative works or who see a potential in our product being an asset to their operations. Funding in this initial phase of our business is important as we greatly lack economies of scale and an established production line to help keep manufacturing costs low.

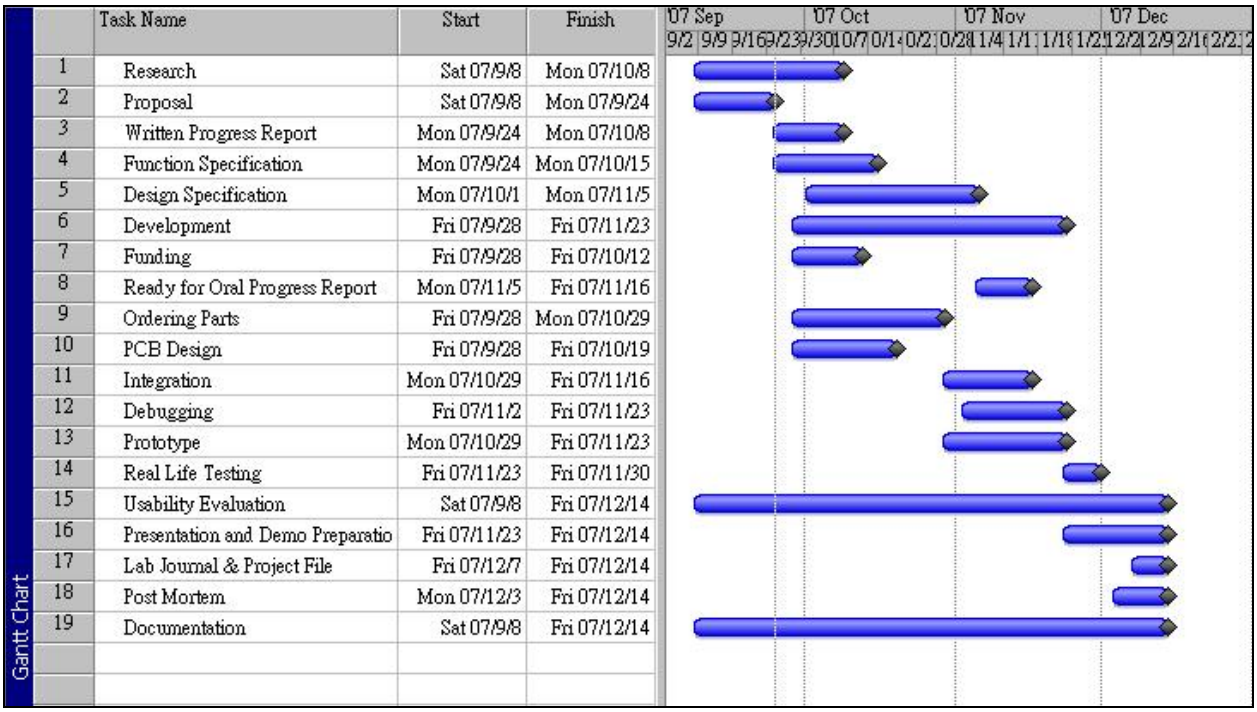
Two of our initial considerations for funding in this project are the Engineering Science Student Endowment Fund and the Wighton Development Fund as these are more readily available sources of sponsorship through our university.

Other sources that we consider approaching to request for funds include the Highland Pub operated by the Simon Fraser University student union society, Canadian Restaurant and Foodservices Association, Prime Restaurants of Canada Inc., Restaurant Equipment Distributors of Canada Limited and the Industrial Research Assistance Program by National Research Council Canada.

To ensure accountability of fund usage in our manufacturing, our company will keep a track record and receipts on all expenses incurred in the production process. This would also facilitate the distribution of expenses amongst the various organizations funding our project. In the event that insufficient sponsorship is available for this project, our group is willing to share the company's expenses equitably.

7.0 Schedule

Figure 7.1 shows the Gantt chart for our project. This chart outlines the timeline of our project development. It also marks the important deadlines that must be made. We will be using this chart to ensure our project is delivered on time and completed professionally.



	Task Name	Start	Finish
1	Research	Sat 07/9/8	Mon 07/10/8
2	Proposal	Sat 07/9/8	Mon 07/9/24
3	Written Progress Report	Mon 07/9/24	Mon 07/10/8
4	Function Specification	Mon 07/9/24	Mon 07/10/15
5	Design Specification	Mon 07/10/1	Mon 07/11/5
6	Development	Fri 07/9/28	Fri 07/11/23
7	Funding	Fri 07/9/28	Fri 07/10/12
8	Ready for Oral Progress Report	Mon 07/11/5	Fri 07/11/16
9	Ordering Parts	Fri 07/9/28	Mon 07/10/29
10	PCB Design	Fri 07/9/28	Fri 07/10/19
11	Integration	Mon 07/10/29	Fri 07/11/16
12	Debugging	Fri 07/11/2	Fri 07/11/23
13	Prototype	Mon 07/10/29	Fri 07/11/23
14	Real Life Testing	Fri 07/11/23	Fri 07/11/30
15	Usability Evaluation	Sat 07/9/8	Fri 07/12/14
16	Presentation and Demo Preparatio	Fri 07/11/23	Fri 07/12/14
17	Lab Journal & Project File	Fri 07/12/7	Fri 07/12/14
18	Post Mortem	Mon 07/12/3	Fri 07/12/14
19	Documentation	Sat 07/9/8	Fri 07/12/14

Figure 7.1: Gantt Chart

8.0 Team Organization

A dedicated and interwoven executive team consisting of Aron McKinnon(CEO), Raymond Tan (CTO), Peter Chen (CQAO) and Howard Yu (COO) provides the central pillar to foster the goal of developing competitive, exciting and novel products. A multidisciplinary knowledge base from this team with diverse technical and organizational experiences will contribute to the success of the WCall project. Each of us is responsible for a specific area of the company, but we all work together and align our interests to the company's goals.

The overall development of the SWIS waiter caller is shared equally amongst the executive team, while each member is responsible in the management of specific technical or organizational sectors. As the CEO, Aron McKinnon oversees the project as a whole and manages organizational issues. Our COO, Howard Yu, ensures prompt communication and leads daily operation. Hardware development and integration will be the focus of our Chief Technology Officer, Raymond Tan, and Chief Quality Assistance Officer, Peter Chen.

Unique to our team design is a shared interdependence structure that promotes efficient coordination and minimal integration bottleneck. Each team member will have opportunities to obtain technical proficiency and understanding in different segments of the project. Such segments include developing the button console, antenna array and the wireless intercommunication module. These tasks will be assigned to members by not only their strengths, but also their interest in the project. Using this strategy will produce a successful project, while allowing team members to work on something they like.

The use of the Simon Fraser University Caucus encourages further communication amongst members for faster decision-making and centralization of resources for effective collaboration.

9.0 Team Profile

	**Aron M[c]Kinnon**, the Chief Executive Officer (CEO) of SWIS (amckinno@sfu.ca) Aron M[c]Kinnon, sixth year undergraduate student of Simon Fraser University engineering physics. As the CEO of SWIS, Aron will overlook all operations to ensure that all of the chief officers are communicating in an efficient manner. He will make all the final decisions regarding SWIS's operation. His extensive background in managing teams of researchers to develop cutting edge electronic products will prove useful to the demanding task of leading this inspiring young company to success.
	**Raymond Tan**, the Chief Technology Officer (CTO) of SWIS (rpt3@sfu.ca) -3rd year exchange student from National University of Singpore Work experience: Civil Aviation Authority of Singapore – baggage handling and sorting system for Terminal 3 Bomb Squad of Singapore armed forces – study on electronic circuitry Relevent Skills: Programming / Software: C, C++, PSPICE, MATLAB, VHDL, Xilinx, Assembly language Communication systems, A/D conversion Microelectronics, microchips 8086 microprocessor system Basic semiconductor theory Electromagnetic theory Basics on antenna design Systems and control, feedback and stability
	**Peter Chen**, the Chief Quality Assurance Officer (CQAO) of SWIS (cchenc@sfu.ca) Peter Chen, fifth year undergraduate student of Simon Fraser University engineering systems option. As CFO of SWIS, Peter will oversee all financial needs of the company. He will make final decisions on all of the Hardware design.
	**Yu Hao**, the Chief Operations Officer (COO) of SWIS (diwaker@swis.co.ca) Third year Electrical Engineering student at the National University of Singapore. Have work experience in the A*star Data Storage Institute, Singapore Familiar with C/C++ programming Circuit design experiences from past courses Have business related experience through taking business courses and part-time working experiences.

10.0 Conclusion

Restaurants, particularly ones with bars and patios are seen as lucrative and potential markets for WCall. Other potential markets for WCall include large banquet halls and formal gatherings with spread out settings. With modification to WCall in the future, SWIS also plans on introducing WCall to the health industry, spas, old age homes, and offices. In all these afore mentioned settings, WCall will serve to make communication among workers and customers more effective. For instance, health industry personals will be able to operate more efficiently with a portable WCall since they will not have to worry about missing the needs of one patient while tending to another, thus planning their time more effectively and efficiently. SWIS sees the market opportunity for WCall originating in the hospitality field and then spreading to other areas where effective communication is valuable in large workplace settings.

In preparation for undertaking this project as shown in the proposed schedule of milestones, the Gantt chart indicates that SWIS strives to stay organized and dedicated to the tasks at hand. The dedication by SWIS in finding cost effective means to obtain parts and funding is an indication of our priorities in completing the project on time and on budget.

Through the whole timeline of this project, we hope to apply all our accumulated knowledge gained from previous co-ops into it. Keeping in mind that we all have different backgrounds in engineering (software/hardware), we hope that through this project, all members of the group can gain further skills in the other area where they wish to learn more about. We hope to produce a product which can be marketable to the restaurant as an alternative to current calling solutions. We also hope to learn how to work together in a group environment with times of success and failure, while simulating a real-world company.