



January 15, 2010

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

Re: ENSC 440 Capstone Project Proposal—DispensAlert™, a Medicine Dispensing Alert System,
by Xypnios Innovations Inc.

Dear Dr. Rawicz:

Please find attached the Capstone Project Proposal for the product DispensAlert™ by Xypnios Innovations Inc. Xypnios Innovations Inc. is a well-balanced company comprised of six multi-talented, innovative, and motivated individuals: Mohammad Abu-Laila, Gary Chiang, Steven Horita, Ryan Laing, Joseph Liu, and Trevor McCauley.

Xypnios Innovations Inc. is excited to develop and release an innovative solution to remind individuals who take multiple medications on a regular basis. The goal of the device is to increase the probability of maintaining a healthy lifestyle by having a memory aid to inform the user to take their medication on a timely manner.

The proposal will provide a brief system overview of the product, estimated budget requirement, preliminary project scheduling, company profile, and team organization. All supporting sections of this document will help justify the demand and viability for this product.

I will be more than happy to discuss any additional questions you may have regarding the proposal. Please do not hesitate to contact me via email at rdl2@sfu.ca or by phone at 604-613-1611.

Sincerely,

A handwritten signature in black ink that reads "Ryan Laing".

Ryan Laing
President and CEO
Xypnios Innovations Inc.

Enclosure: *Proposal for DispensAlert™—Medicine Dispensing Alert System*



Xyphnios
INNOVATIONS

DISPENSALERT

**Project
Proposal**

Project Team: Mohammad Abu-Laila

Gary Chiang

Steven Horita

Ryan Laing

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Executive Summary

At Xypnios Innovations Incorporated, we understand the frequent problem with regards to taking medication. People often forget to take their medication due to distraction throughout the course of the day. By forgetting to take their medication, the patient can suffer setbacks to their health problems and may eventually lead to fatality. With our electromechanical device, DispensAlert™, anyone can be reminded to take their medication on a timely manner. This is beneficial for elderly individuals who may forget to take their medicine by increasing their independence which can lead to a sense of personal satisfaction. In addition to preventing under-medication, the device can also prevent over-medication as well. The idea is to have a base medication dispensing station that will be coupled with a wristband device that will alert the user when the consumption of medicine is needed. There will be an audible and force feedback alert on the peripheral device. Our device increases the probability of maintaining a healthy life style by having a memory aid to inform the user to take their medication at the proper time.

While the biomedical engineering field has blossomed in the last decade, research has mainly been focused on state of the art technology. Our product combines a simple idea with simple mechanisms to solve an everyday problem for people, especially the elderly. We believe this product will excel in the market due to the abundance of senior citizens who forgets to take their medication in a timely manner.

Xypnios Innovations Incorporated, named after the Greek word for alert, consist of six undergraduate Simon Fraser University Engineering students. Throughout the Spring of 2010, this team of experts will successfully assemble and market the device to the best of their abilities. The approximate cost of the prototype is estimated at around \$850. However, the product would be marketed in the range of \$70-\$90.

This document outlines the general overview of the product and introduces the design and financial profile of the project. In addition, a Gantt chart is provided to summarize the milestones of the project at each main stage. Last but not least, this document outlines the company profile as well as the team background and organization.

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Introduction

“Through memory we travel against time, through forgetfulness we follow its course” said Joseph Joubert, a French essayist and moralist of the 18th century. Joubert speaks truth in the sense that over the course of time individuals of society will age and therefore become more forgetful. This can be proven biologically by the degradation of tissue with age, however, at what age do important tasks become forgotten. This raises the question “at what point can forgetfulness become harmful”. The answer to this questions lies within the social structure and activities of Canadian Society.

The Canadian population is considered an aging population. According to Statistics Canada, almost 14% of the Canadian’s is over the age of 65 and thus considered a senior citizen. In addition, Statistics Canada also states that approximately 87% of all senior citizens are currently taking at least one type of medication and that roughly 33% are taking multiple medications, totaling five or more. As the baby boomers start to become senior citizens, Statistics Canada predicts, by the year 2021 approximately 20% of Canada’s population will be over the age of 65. Of that senior citizen population almost 10% will be at risk of developing dementia, of some form, whereas the other 90% are expected to have some kind of age related memory decline of varying severity.

To surmise, with age, any elderly individual is likely to become more and more dependent on regulatory medications and it is expected that they will become increasingly forgetful. It is immediately apparent that these two results of aging are not beneficial, especially if combined such that the individual were to forget to take their medicine. As a result, precautionary measures should be implemented now to help reduce the mental burden of up-and-coming as well as future senior citizens. This calls for a system that will empower as well as increase the independence of the elderly.

DispensAlert™ will be designed to be an effective, safe, and simple to use system which will serve as a means to store medication, dispense medication and to remind the user to take their medication at the appropriate times. For the matter of convenience, DispensAlert™ will be broken into two units. The first being the main station that will store and dispense the medication when needed and the second being a simple wristband that will communicate between the main station and itself in order to remind the user when it is time to take their medicine. The reason for the implementation of two units is so that the user need not be in the same location as the main station at all times. This product is targeted towards the elderly whom are in a sound state of mind (i.e. free of dementia or rapidly degrading memory loss), living in a private residence and not in a form of institutionalized care, and want to maintain their independence.

As this product is geared towards an elderly market, DispensAlert™ will be designed to be as user friendly as possible. A simple touch screen interface will be implemented on the main unit for inputting data and general interactions as well as a barcode scanner for an alternate input method. A barcode labeling system will be designed to contain all the necessary information of the medicine bottle (i.e. how many to take, when to take them, etc.). Simply put, DispensAlert™ is the peace of mind that all senior citizens deserve.

System Overview

DispensAlert™ mainly consists of two units: a main unit and a wristband unit. The basic interactions between the main unit, the wristband unit and the user with each other are shown in Figure 1.

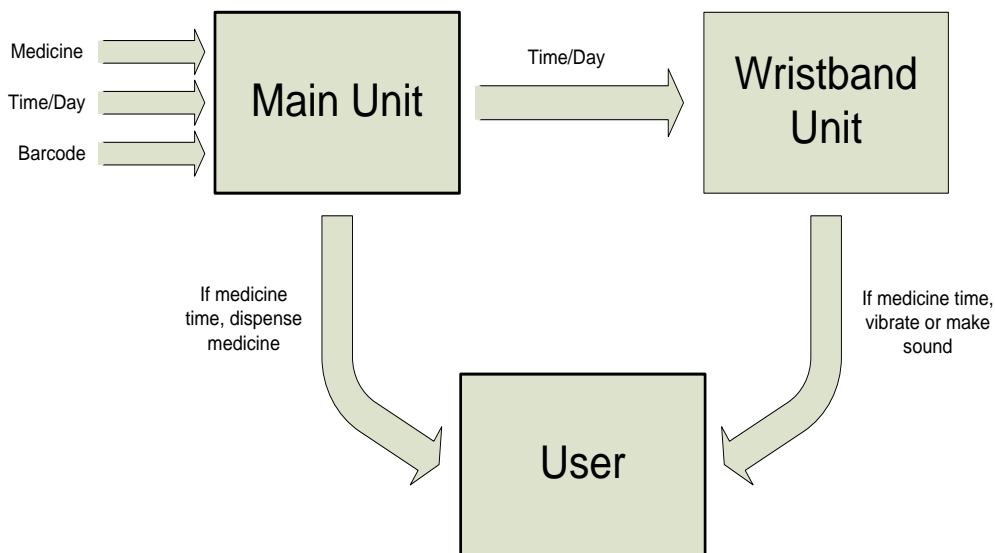


Figure 1: Basic System Overview

The main unit is a portable device meant for in-house use and it can be placed in various locations such as the kitchen counter or bedroom dresser. The primary functions of this unit are to store and dispense the medicine the user needs, act as the interface between the user and the DispensAlert™ system, and send data signals containing alarm times to the wristband unit. Working in conjunction with the main unit, the wristband unit is a small alarm device that will alert the user to take their medication at the proper time by emitting sound and/or vibrations. Having a device that is small and wearable will encourage the user to always have it on them and thus enabling DispensAlert™ to act as an effective medicine dispensing alert system.

The user of DispensAlert™ must place the medicine they wish to take into little compartments embedded into the main unit. These compartments will be specially manufactured to protect medication sensitive to light. The user also has to input data into the main unit regarding the time the medicine needs to be taken, the amount of medication required per dosage, as well as any special notes regarding the medicine (i.e. medicine needs to be taken after meals). To input this data, the main unit will have a touch screen with a simple to use interface in order to make it as user-friendly as possible. From here, the data will be saved onto the memory embedded in the main unit.

To make things easier, a barcode scanner will be embedded into the main unit which will provide an alternative to using the touch screen. Simply by scanning a unique barcode, the important medication information found on the label will be programmed into the main unit. Such protocol does not currently exist but, in hopes for change, the pharmacies can directly place pertinent medication information onto the barcode label. When it is time for the user to take their medication, the main unit will dispense any medicine that is needed using an electromechanical system. In order to control this system and its peripherals there will be a microcontroller and other circuitry embedded into the unit.

The wristband unit will alert the user, at the designated times, to take their medication regardless of where the user is relative to the main unit. Whether the user is one meter or one kilometer away from the main unit, the wristband unit will alert the user to take their medicine. To allow such an action, data regarding the time to take medicine in the main unit will be transferred wirelessly to the wristband unit whenever there is a change in the data and the user is in close proximity to the main unit. To surmise, the wristband unit needs some memory to hold said data and a microcontroller to manage the corresponding vibrations and sounds. The simplified mechanism by which the DispensAlert™ system operates is given by the flowchart in Figure 2.

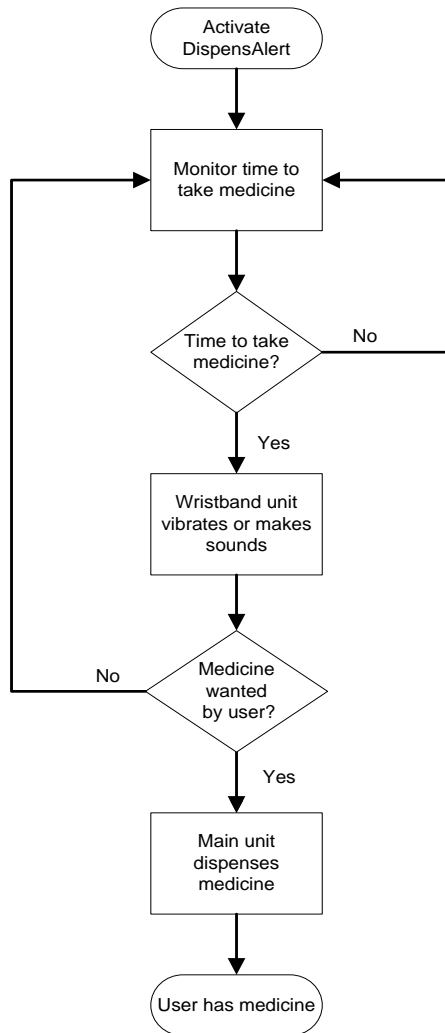


Figure 2: DispensAlert™'s Basic Mechanism

When the user is alarmed to take their medicine by the wristband unit, they will proceed to the main unit to pick up their medication for that time. However, the user has to first acknowledge that they want to take their medication. The acknowledgment is needed for a few reasons, one being safety. It would be irresponsible to have medicine dispensed without the user's approval or awareness. Without the user's acknowledgment, the medicine would be left unattended where it can potentially be used by children, possibly causing harm. In the future, DispensAlert™ may have the capability to serve more than one person. To avoid confusion between the different users, it would be best to have an acknowledgment system in place as mentioned above. For example, if the DispensAlert™ system was used by two people and the wristband units went off at the same time for both users, there would be confusion to whose medicine has just been dispensed if the main unit dispensed the medicine automatically without acknowledgment from the users.

Budget

Xypnios Innovations Inc. has researched the various components required for the design and development of the DispensAlert™ system. A tentative price list for all materials required is listed in

Table 1. Prices include taxes, shipping, as well as a 15% contingency.

| COMPONENT | COST |
|---------------------------------|--------------|
| Touch Screen Panel | \$75 |
| Microcontroller | \$100 |
| Motors | \$100 |
| Enclosures | \$100 |
| LCD Screen | \$50 |
| Force Feedback Device | \$50 |
| Wireless Transmitter / Receiver | \$95 |
| Barcode Scanner | \$80 |
| Power Supply | \$100 |
| Contingency | \$100 |
| Grand Total | \$850 |

Table 1: Estimated Budget for Production of the DispensAlert™

While the final manufactured product should become low cost due to economies of scale, the initial prototype we wish to build will cost substantially more because of the testing and development involved in the projects various stages of pre-market development. As a result, identifying multiple sources of funding is paramount to the success of this venture. We have already been offered \$600.00 from the Engineering Science Student Endowment Fund (ESSEF) and are actively pursuing funding from the Wighton Engineering Development Fund.

We realize that in the current financial climate, it may not be possible to generate sufficient capital to meet our budgetary constraints completely. In this situation, Xypnios executives are willing to contribute personally in order to fund the endeavor. Personal backing will be equally matched by each executive and invoices will be kept as records for possible future cost recovery.

Time Schedule

The Gantt chart below illustrates the time allotment for various states of design (Figure 3). This is a preliminary time schedule that will be followed in order to meet deadlines.

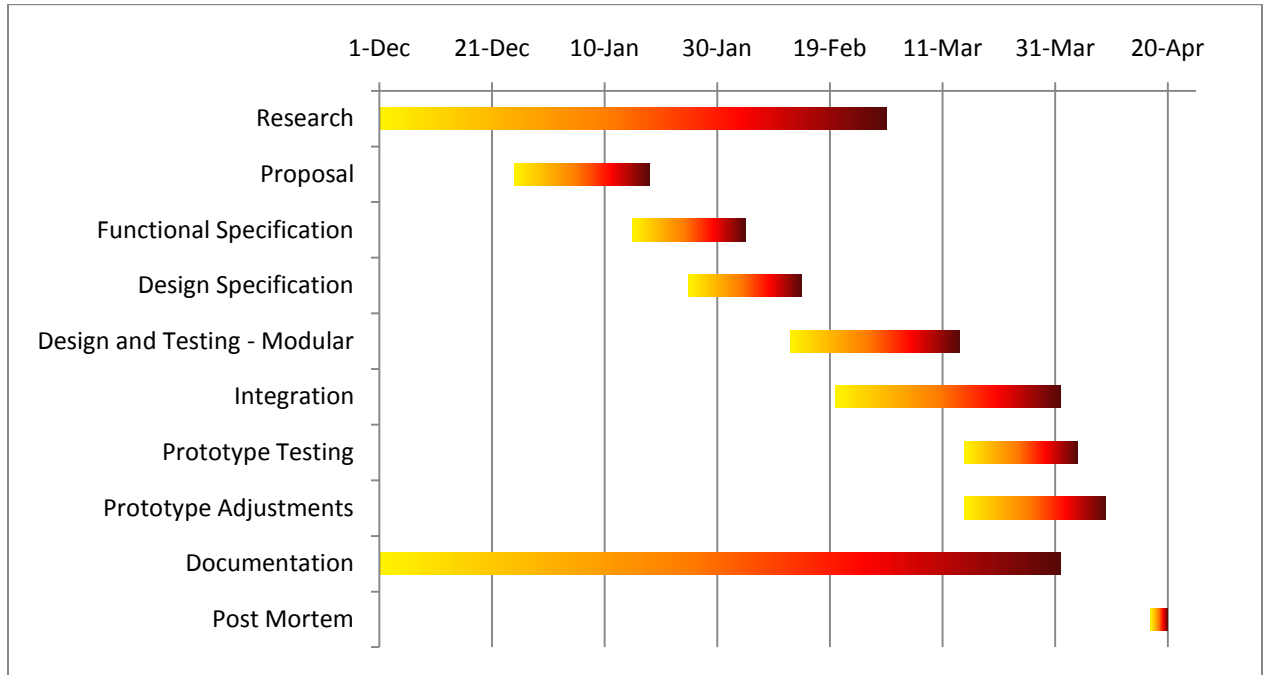


Figure 3: Gantt Chart

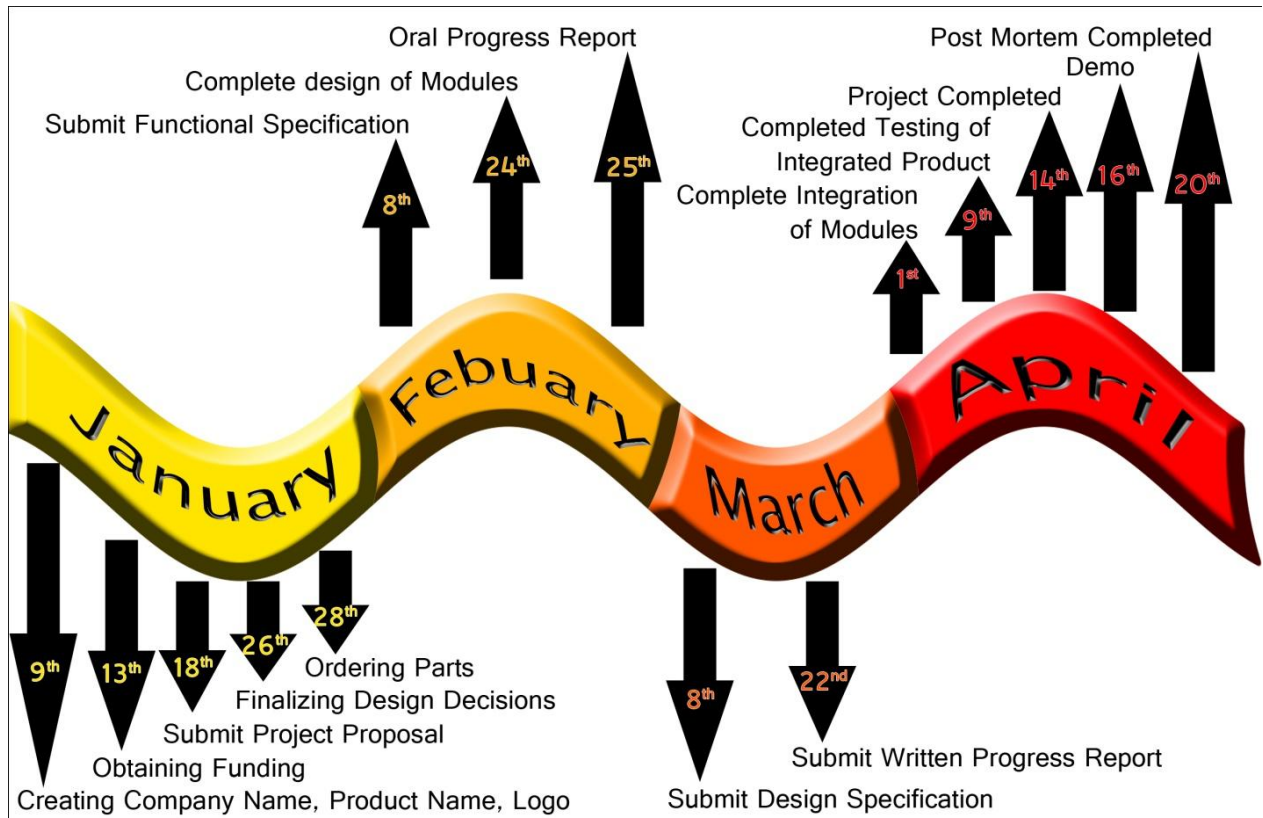


Figure 4: Milestone Chart

The milestone chart seen in Figure 4 outlines key completion dates. Working within the time constraint and allotment proposed in Figure 3 and Figure 4 will assist in developing DispensAlert™ in an effective and timely manner.

Team Organization

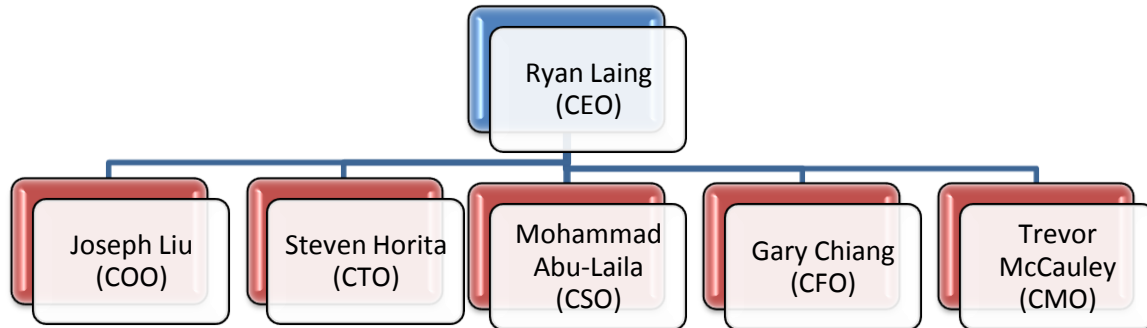
Xypnios Innovation Incorporated is composed of six fourth year engineers: Mohammad Abu-Lailla, Gary Chiang, Steven Horita, Ryan Laing, Joseph Liu, and Trevor McCauley. Our team has expertise in biomedical, computer, and systems engineering. Together, the team can receive contributions from different fields and strive towards a common goal.

The corporate structure of Xypnios Innovation is defined by each member's specialized field. Ryan Laing, President and Chief Executive Officer (CEO), oversees all technical and financial operations within the group and maintains good team dynamics throughout the term. Joseph Liu, Chief Operations Officer (COO), is in charge of all technical operations and leads the team in the technical aspects of designing and building. Mohammad Abu-Lailla, Chief Science Officer (CSO), heads the research and development team for our project. Steven Horita, Chief Technical Officer (CTO), is responsible for the technical support in our team. Gary Chiang, Chief Financial Officer (CFO), manages the budget and maintains financial stability of the incorporation. Trevor McCauley, Chief Market Officer (CMO), manages all market plans and generates corporate relations with other companies.

To effectively achieve our goal for this project, the team is meeting on a weekly basis to discuss the progress of the project as well as to continue building team dynamics. In addition, meeting agenda and minutes will be recorded and sent out to keep track of all the items that were discussed.

With the wide variety of engineering background and creative minds, we believe our skills can aid us in delivering the project on schedule. In addition, our organized schedule will allow us to design this project to match all of the proposed specifications.

Company Profile

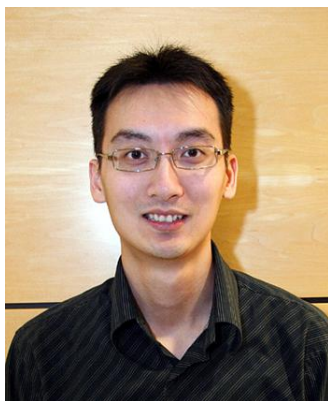


Ryan Laing—Chief Executive Officer (CEO)



Mr. Laing is a fourth year Systems Engineering student at Simon Fraser University. He also serves as President of the Engineering Science Student Society at SFU. In the process of completing his degree, he has developed strong technical communication skills as well as experience programming in C++, MATLAB, and Assembly languages as well as experience working in a real-time environment via QNX. In addition to his technical abilities, Mr. Laing has demonstrated strong teamwork, leadership, and organizational abilities, all of which allow him to serve as an effective CEO for Xypnios Innovations Inc.

Joseph Liu—Chief Operations Officer (COO)



Mr. Liu is a fourth year Systems Engineering student at Simon Fraser University. He previously studied at British Columbia Institute of Technology and holds a diploma in Biomedical Engineering. He is currently employed with Ultrasonix Medical Corporation as a technical support, repair, and logistics representative. His previous work experience consisted of a placement with Siemens Canada as a field service representative and a position as a research and development assistant for Océ Display Graphics Systems. His versatile experience will be a great asset to Xypnios Innovations Inc. with respect to technical design.

Steven Horita—Chief Technical Officer (CTO)



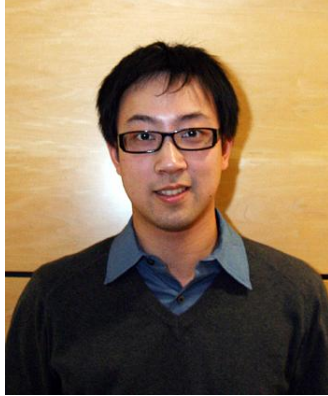
Mr. Horita is currently in his fourth year of Computer Engineering with special focus on software engineering. He has experience working in C, C++, JAVA, Python, and Visual Basic. In the past he worked for a short time in the gaming sector working on Army of Two: The 40th Day. Mr. Horita has also excelled in studies related to hardware design having completed a project where his team designed both the hardware and software to run Super Mario Bros. on an FPGA. Mr. Horita also has experience in computer graphics both 2D and 3D with significant Photoshop experience. He will bring much needed computer hardware and software expertise to the company.

Mohammad Abu-Laila—Chief Science Officer (CSO)



Mr. Abu-Laila is a fourth year Biomedical Engineering student at Simon Fraser University. During his time at SFU, Mr. Abu-Laila has lead many groups in the research and development of electronics devices such as amplifiers and digital systems, which involved working with transistors to FPGAs. In addition, Mr. Abu-Laila has extensive experience with programming using C++, Java and MATLAB for uses such as biomedical signal processing. As the head engineer of developing a Dynamometer, he took on the task of the design of all electric circuits and the programming of the Dynamometer using LabVIEW. Mr. Abu-Lailas experience in research and development in past projects will be a great assist to Xypnios Innovations Inc. in future and current projects.

Gary Chiang—Chief Financial Officer (CFO)



Mr. Chiang is a fourth year Biomedical Engineering student at Simon Fraser University. He previously held the position Vice-President Student Services in the Engineering Science Student Society (ESSS) and looked over student funding distributions for the department. In addition, as the Merchandise Committee Chair, he overlooked all the designing and marketing of the new SFU Engineering merchandise. Mr. Chiang is currently the Vice-President Professional Relations in the ESSS and he maintains corporate sponsorships and relations. Through these experiences, he was able to improve his business development skills and expand his professional network. Furthermore, Mr. Chiang is involved with APEGBC's student advisory program that helps promote APEGBC awareness within the student body and act as a liaison between the students and the association. His repertoire aid him as the CFO of Xypnios Innovations Inc.

Trevor McCauley—Chief Marketing Officer (CMO)



Mr. McCauley is a fourth year Biomedical Engineering student at Simon Fraser University. Over the course of his education at SFU, Mr. McCauley has developed strong communication skills and a proficient understanding of physiological systems. In addition, he has had extensive programming experience with the use of MATLAB, Java, and C++ for applications such as biomedical signal processing as well as filter and numerical analysis. Furthermore, Mr. McCauley is an “outside of the box thinker”, which when coupled with his education makes him a valued team member. His creativity, innovate ideas, and unique design and marketing solutions will be a great asset to Xypnios Innovations Inc. in current and future projects.

Conclusion

Xypnios Innovations Inc. is a dynamic company motivated to improve the quality of life of all individuals, especially the elderly.

The proposed medicine dispensing unit, DispensAlert™, will increase the independence of the elderly as well as to help reduce the risk of overdosing and under-dosing on medication. In addition, the device will prompt the user to take medication on a timely and regular basis, thus reducing the risk of missing essential medication. Due to the dispensing automation, DispensAlert™ will eliminate the need to prepare and sort the proper dosages of all medications to be taken at the predetermined time.

DispensAlert™ is a reliable, user-friendly and cost-effective device that, as stated, is the peace of mind that all senior citizens deserve.

References

Joubert, J. (2010, January 15). *ThinkExist.com*. Retrieved January 15, 2010, from Forgetfulness: <http://thinkexist.com/quotes/with/keyword/forgetfulness/>

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