



ATHLETIC
INNOVATIONS

Sam Hafezi, CEO

January 26th 2015

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

Re: *RunWare by Athletic Innovations Project Proposal*

Dear Dr.Rawicz,

The attached document, *RunWare by Athletic Innovations Project Proposal*, outlines our project for ENSC 440. Our team aims to tap into the growing market for wearable technology, by creating a product that combines the benefits of indoor ergometers with the freedoms of outdoor activity.

This proposal covers the following: an overview of *RunWare*, an analysis of the scope of our project and the potential we see within *RunWare*, a market overview of wearable technology, an outline of competitors we face, a summary of the hardware and software design, our project scheduling for the next four months and our team's organization, a projected budget and our sources of external funding and sponsorship, and lastly our sources of information.

Athletic Innovations is composed of a highly talented team of individuals. Our organization alongside myself includes senior engineering students Ricky Tran, Chelsea Huang, Michael Ng, and Neha Chhatre. With our diverse background and expertise, I am certain we can achieve everything we set out to with *RunWare* and more. If you have any questions or concerns about our proposal, please do not hesitate to contact me by phone at (778) 885-0499 or by e-mail at shafezi@sfu.ca.

Sincerely,

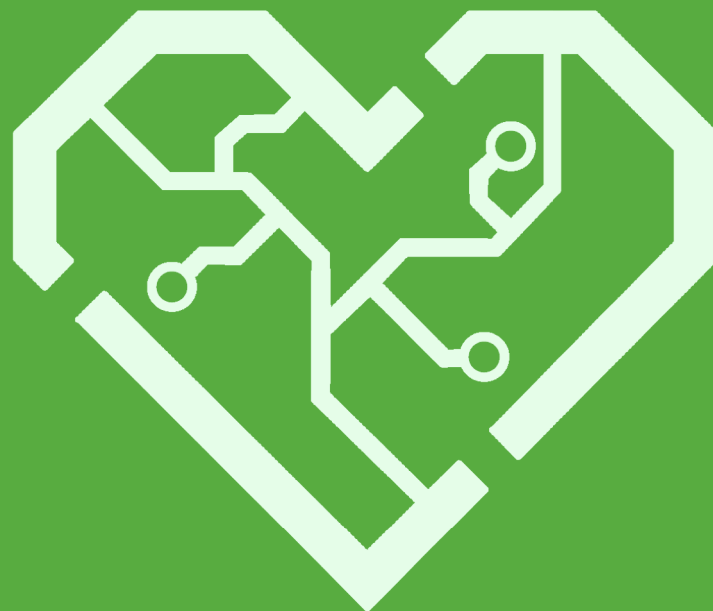
Sam Hafezi
Chief Executive Officer

Enclosure: RunWare by Athletic Innovations Proposal

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RunWare

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January 26th, 2015

PROPOSAL

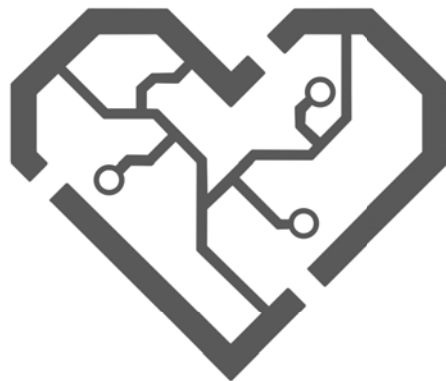
Executive Summary

Maggie wakes up early in the morning to go for her daily jog. She tiptoes around the house searching for her heart rate monitor, her light reflector and her headphones. She plans out her route and memorizes the path. After half an hour she is ready to go, she grabs her jacket and she begins her run. But imagine if she only needed to grab one thing...

Most runners face the same dilemma: should they run indoors on a treadmill or outdoors in nature? If they run on a treadmill they get instant feedback on their heart rate, distance, and calories. They don't have to worry about visibility, or cars. However, avid runners prefer the feel of running outside on trails or along the water. In an ideal situation, a runner would be able to have the euphoric feeling of running outdoors and still obtain the statistics associated with monitored running indoors.

Currently there are products on the market associated with tracking physical activity but there is no all-encompassing product. This document proposes developing a high-end running jacket called *RunWare*, which will use wearable technology to simplify and improve a runner's experience. The jacket will be able to provide: Communication, Health Monitoring, Entertainment, Navigation, and Safety. An Android based application will allow the consumers to use voice commands to navigate their route, play music, and list running statistics like distance, step count and heart rate. Now a runner can grab *RunWare* and go!

Athletic Innovations (A.I.) consists of five engineering students with varying backgrounds. A.I. members have experience working with audio systems, electronic circuits and programming. In the next thirteen weeks A.I. will research, design and implement a jacket and an Android application. The budget for this product is \$802.13. A.I. has applied to ESSEF for funding and hopes to get sponsorship for the jackets from local athletic clothing companies.



The freedom to Run Anywhere, with RunWare

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Table of Contents

| | |
|--|----|
| Executive Summary..... | ii |
| Table of Figures..... | iv |
| Introduction..... | 1 |
| System Overview..... | 2 |
| Possible Design Solutions..... | 3 |
| Wristbands (Samsung, FitBit, LG, Nike, Mio, etc.)..... | 3 |
| Chest Strap Heart Rate Monitor..... | 3 |
| Self-powered Shoes..... | 3 |
| Proposed Design Solution..... | 4 |
| Sources of Information..... | 5 |
| Budget and Funding..... | 6 |
| Schedule..... | 7 |
| Team Organization..... | 8 |
| Company Structure..... | 9 |
| Conclusion..... | 10 |
| References..... | 11 |

Table of Figures

| | |
|--|---|
| FIGURE 1 - ENJOYING THE FREEDOM OF OUTDOOR RUNNING | 1 |
| FIGURE 2 - RUNWARE SYSTEM ARCHITECTURE | 2 |
| FIGURE 3 - ANDROID APPLICATION MOCKUP | 2 |
| FIGURE 4 - GANTT CHART | 7 |

Introduction

[1] "People who enjoy running outdoors find that there's a lot of variety because the scenery is changing and this distracts them and keeps them motivated to go and continue on their run,"
- Canadian Living

One of the biggest debates runners have is whether to run inside or outside. Running outdoors is fun, interesting and rewarding, but running indoors has its advantages. Runners get immediate feed back on their heart rate, distance, calories burnt, and the weather isn't an issue. What if there was a way to combine the benefits of exercise machines with the rewarding experience of running outdoors?

[2] "Companies are betting big on wearable technology, but so far devices like Google Glass and fitness trackers have remained niche products. " - Globe and Mail

Athletic Innovations hopes to create a top of the line athletic jacket that uses wearable technology, giving users a jacket they will reach for time after time. *RunWare* will provide a product that goes beyond a niche market and integrates communication, health monitoring, entertainment, navigation and safety. *RunWare* will have LED lights to maximize visibility and safety. *RunWare* connects to the users smartphone via Bluetooth, enabling voice control for music, GPS route information, heart rate and distance travelled.

In the wearable health technology market no product like *RunWare* is available. With health and fitness awareness on the rise, there is a growing market for an all-inclusive product. With the convenience *RunWare* provides, indoor runners can finally enjoy nature. By incorporating the latest technology, *RunWare* will encourage an active lifestyle.

In this proposal there is an overview of *RunWare* and the impact it will have on the wearable technology market. We have included our tentative design as well as alternate solutions. Our estimated budget is outlined along with sponsorship plans. Finally, we have provided a brief profile of the company and its members.



FIGURE 1 - ENJOYING THE FREEDOM OF OUTDOOR RUNNING [3]

System Overview

RunWare's system architecture consists of a hardware and software component. Communication between these two is conducted via Bluetooth connection to the users Android smartphone. The high-level architecture is outlined in Figure 2 below.

The hardware design consists of a waterproof microcontroller, which functions as the central processor of data from *RunWare's* peripheral sensors as well as from the application. Within the jacket will exist two subsystems: input sensors and output devices.

Input sensors collect data on the user as they exercise and send it to the microcontroller to be processed. The output devices on the other hand, will provide the user with feedback on various health parameters that are calculated by the microcontroller or on the Android application. The user can audibly receive the information using voice commands or visually through the mobile phone application.

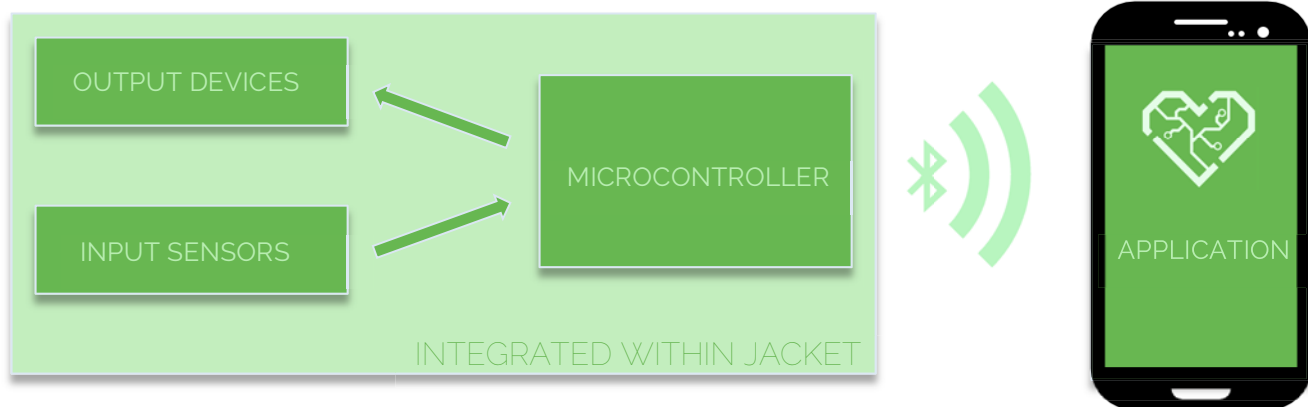


FIGURE 2 - RUNWARE SYSTEM ARCHITECTURE [4][5]

Additionally, the application will map the user's path, allowing for accurate statistics of their exercise. They will also be able to see their current heart rate, calories burnt, music playlist and more all from their smart phone. A mock up of our proposed application is shown in Figure 3 below.

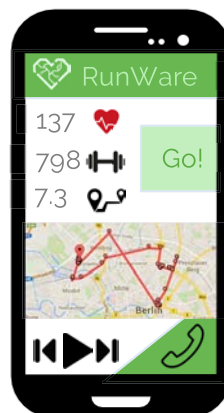


FIGURE 3 - ANDROID APPLICATION MOCKUP [6][7][8][9][10][11][12][13]

Possible Design Solutions

Wearable technology is an emerging market with many new devices that will monitor various health parameters. Though there are many companies entering this market, most of the innovation is centered on watches and wristbands. However many of these potential solutions have problems that our solution will encompass.

Wristbands (Samsung, FitBit, LG, Nike, Mio, etc.)

Wristbands provide the highest degree of portability and are the main focus of many companies in wearable technology. On the other hand, wristbands have downsides that are difficult to address while being confined to their limited size. Previous designs have been known to cause irritation and discomfort [14]. In order to innovate, more features have to be added to the wristband while maintaining their lightweight form factor. *RunWare* avoids the issues of intrusiveness and limited space by moving away from the wristband format.

Chest Strap Heart Rate Monitor

Chest strap heart rate monitors provide the highest level of accuracy for monitoring your heart rate. While accuracy is important, chest straps have two downsides to them that our design solution will address. The first downside is user comfort while performing any form of exercise, such as jogging or cycling. Having a monitoring device strapped tightly around your chest will create discomfort for the user when breathing heavily. The second downside is wireless interference between the monitoring device and the receiver. Interference can cause the heart rate data to not be sent correctly to the receiver, therefore inaccurate readings are given to the user.

Self-powered Shoes

At CES this year, Sensoria presented their wearable sock which has the ability to track metrics such as the weight distribution of their user's feet, and transmit the data to the user's mobile phone via Bluetooth [15]. Adding a heart rate monitor and trying to capture the energy expended through the foot to power the device can further expand this product. This can be achieved using piezoelectric components [16]. Unfortunately, it would just become another item our users would have to use in combination with other products without adding any navigational, safety, or entertainment features.

Proposed Design Solution

RunWare provides a solution to our runner's dilemma. Athletic Innovations has designed an all-inclusive, technological, athletic jacket. By combining the analytical advantages of indoor exercise machines with the freedom and experience of outdoor activity in a seamless fashion, we will provide users with an efficient and satisfying product to fit with their active lifestyles. We want our users to have the freedom to run anywhere, with *RunWare*.

RunWare will tackle the problem from five perspectives: communication, entertainment, health monitoring, navigation, and safety. As the jacket will communicate with the user's mobile device via Bluetooth, we will also allow the user to make and receive phone calls. This will add to the safety of users, by providing the ability to call for help without physically accessing their phone, using voice commands. Also through Bluetooth, music will stream from the phone to the speakers in the collar of the jacket for added pleasure and entertainment. *RunWare's* open-ear speaker design will allow the user to be aware of their surroundings. A simplified mockup of *RunWare* is shown in Figure 4.

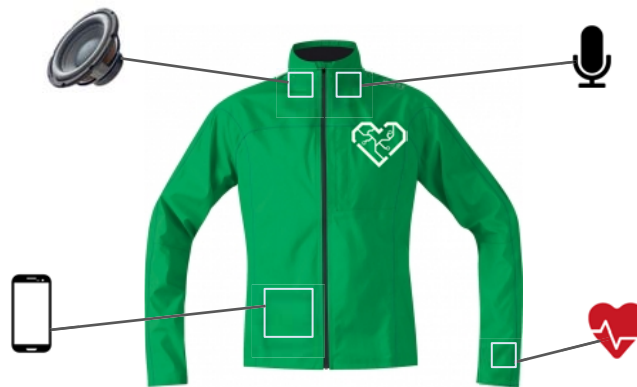


FIGURE 4 - MOCKUP OF RUNWARE JACKET [6][7][17][18][19]

Essential information such as heart rate, distance travelled, and pace will be provided to the user. We wanted all the information a treadmill could deliver, but make it easily available at almost any time. Additionally through use of the mobile application, the user will be able to backtrack and view their performance metrics throughout their workout. As *RunWare* may be used in multiple activities, our users will also be able to consistently track their physical activity through a single source. This product would cater to avid runners who would be using jacket to track and monitor all of their performance metrics. The jacket also caters to the casual runner, as they would be able to use the jacket to listen to music for a more pleasant running experience or use the built in navigation system to find new running paths.

The mobile application will also allow users to plan their route before their run and receive turn-by-turn directions. Further safety will be provided to our user through the use of light-sensitive LEDs. *RunWare* will be able to sense when visibility is lowered and automatically activate the strips of light located throughout the jacket. This provides more safety than the reflective strips currently in use by runners and bikers.

The advantage that this product has over its competitors is that it will be sleek and comfortable to use. Most other wearable technologies are awkward to use. At the most recent Consumer Electronics Show in the first week of January, many different companies have demonstrated their prototypes for wearable technology. As of 2014, there are around 19 million devices on the market and it's expected that the wearable technology market will expand to around 70 million devices by 2018 [20].

Unfortunately, this venture is not without risks. The project is constrained by time and limited funding. Given more than 4 months of planning and developing, Athletic Innovations would certainly be able to develop a more mature and streamlined product. In addition, since funding is limited, we're also seeking funding from other companies. Another potential shortcoming of the *RunWare* project is that this area of technology is relatively new and unexplored.

A problem that *RunWare* users may face is the amount of usage for the jacket. It would be unreasonable to assume a user would wear the same jacket everyday without ever washing it. Therefore, we have ensured that our electronic components will be either waterproof or removable. Connections and wiring within the jacket will also be resistant to abuse through strain relief. Together these designs will make *RunWare* weatherproof.

Sources of Information

Being a team consisting of fifth year students, every member of Athletic Innovations has a talent for discovering solutions to their problems. Our team will take full advantage of the vast amount of resources on the internet for this project. For our application, the software team has already spent weeks learning how to program natively for Android through the developer aid site created by Google.

Throughout our time at Simon Fraser University, we have built up quite a large reference of research articles, journals, as well as textbooks for a wide variety of topics. Our team members have also built great rapport with faculty professors and teaching assistants over their years as students. This allows us to access the immense amount of knowledge and experience of the engineers at Simon Fraser University, utilizing it to create an amazing product with as few hurdles as possible.

The main purpose of *RunWare* is to provide ease to our users' active lifestyles. To achieve this goal, it will be important for us to understand the wants and needs of our consumers. Therefore we will conduct informal interviews with friends, family, and colleagues to gain insight.

Budget and Funding

The budget of the male and female prototypes of *RunWare* can be found below in Table 1. In our preliminary research we have found what we have decided to be the best available and most cost effective products for our uses. We have provided realistic costs and model numbers with an additional 12% tax and \$10 for shipping on average for each component. Furthermore, we have added a 10% contingency on the final budget. We understand that throughout the process of assembling our product we may need replacements, and we expect our budget to change accordingly.

| Item | Quantity | Unit Cost | Cost (incl. tax + shipping) |
|--|----------|-----------|-----------------------------|
| Circuitry | | | |
| Arduino Lilypad Simple | 2 | \$23.95 | \$67.24 |
| JY-MCU Bluetooth Wireless Serial Port Module for Arduino | 3 | \$6.43 | \$23.52 |
| SUPERNIGHT (TM) RGB 5M Waterproof LED Strip Light | 2 | \$9.95 | \$22.28 |
| Heart Rate Sensor (AFE4400) | 2 | \$7.28 | \$26.31 |
| Piner Portable Wireless Bluetooth Stereo Speaker | 2 | \$25.90 | \$68.02 |
| Microphone (POW-1644L-B-R) | 2 | \$4.59 | \$20.28 |
| Waterproof wiring tools (Heatshrink, ports, etc.) | -- | \$50.00 | \$66.00 |
| Display Screen (NHD-C12865AR-FSW-GBW) | 2 | \$15.00 | \$33.60 |
| Rechargeable Lithium Ion Battery (VL-3032/GUFN) | 2 | \$9.00 | \$30.16 |
| Accelerometer (KXCJ9-1008-FR) | 2 | \$2.07 | \$4.64 |
| Photoresistor (PDV-P7002-ND) | 2 | \$1.77 | \$13.96 |
| Photocell/diode | 2 | \$1.50 | \$13.36 |
| Textiles | | | |
| Running Jackets | 2 | \$99.99 | \$223.98 |
| Texsport 15615 - Waterproofer/Seam Sealer | 1 | \$19.56 | \$21.91 |
| Sewing Materials (Thread, Zippers, Buttons, etc.) | -- | \$25.00 | \$28.00 |
| Miscellaneous | | | |
| Logo Design | 2 | \$8.50 | \$17.00 |
| Security | 1 | \$7.84 | \$8.91 |
| Wet Look (High Gloss Polymer for Speakers) | 1 | \$17.50 | \$29.60 |
| Epoxy | 1 | \$9.33 | \$10.45 |
| Chest Heart Rate Monitor | 1 | -- | -- |
| Contingency (10%) | | | \$72.92 |
| Total | | | \$802.13 |

TABLE 1 - PRELIMINARY BUDGET

We aim to balance our \$802.13 budget through various sources of sponsorship. A large portion of our budget is for the base jacket of our product. Therefore we have contacted various athletic wear companies based out of the lower mainland to request sponsorship in the form of an athletic jacket. So far we have contacted 4 companies, and we have heard back from one. We have also applied for the Engineering Science Student Endowment Fund (ESSEF), requesting \$550 in sponsorship. If we receive both athletic jackets, the full requested amount from ESSEF, and we incur no other unforeseen costs, we will ask the Wighton Fund for the remaining \$28.15. As Athletic Innovations is comprised of five members, we are also comfortable with contributing out of pocket funds of up to \$250 total to our prototypes.

Schedule

Figure 5 below shows the Gantt chart of the time we expect to spend on the various tasks associated with the project.

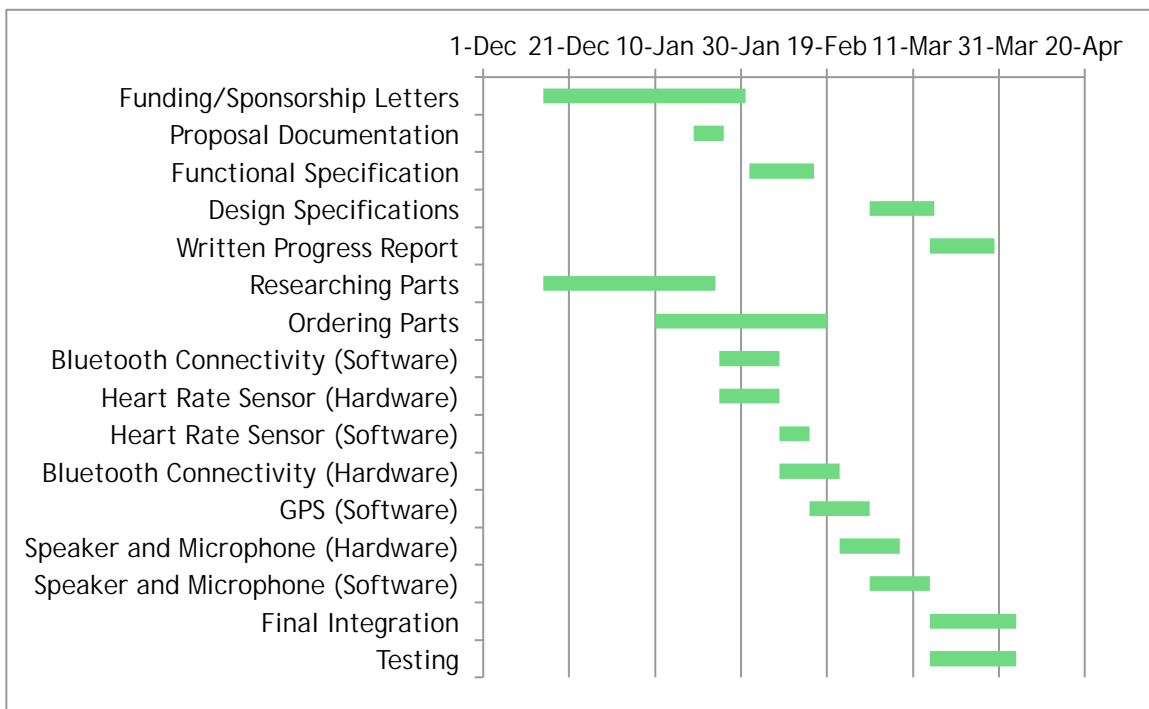


FIGURE 5 - GANTT CHART

Team Organization

The team is comprised of five unique and highly intelligent individuals, working together to progress the wearable technology industry. Each and every member of the team is a 5th year engineering student. In this team of five, there are a variety of different program concentrations, talents and specialties, making this collaboration very diverse. Together, these 5 individuals form the company, Athletic Innovations. The vision of the company is to promote a healthy and active lifestyle by integrating modern technology into the clothes we wear.

Athletic Innovations follows a matrix business structure, making us flexible and team oriented. The company is loosely based off each individual's elected role. Sam Hafezi is the Chief Executive Officer (CEO) and is in charge of overseeing the company, ensuring that everybody's task is completed in a timely manner. Neha Chhatre is the company Chief Marketing Officer (CMO) and will be in charge of researching the wearable technology market for ground-breaking concepts. Chelsea Huang, Chief Financial Officer (CFO) manages the budget and expenditures of Athletic Innovations and will also take the lead in contacting companies who may want to sponsor or finance the *RunWare* project. Ricky Tran, Chief Technical Officer (CTO), has the duty of researching heart rate sensors and power sources for our hardware. Michael Ng is the Chief Information Officer (CIO) of Athletic Innovations and is responsible for researching pertinent technologies, such as Arduino boards or other microprocessors that are relevant to *RunWare*.

To ensure group coordination and clear communication, the team has scheduled at least one official meeting as well as three group work sessions per week. In the situations where conflicts arise, we use a democratic approach to vote on the preferred route to take, only after hearing every side of the argument. Meeting minutes and agendas are kept and created for each weekly meeting.

To complete all of the tasks required of the *RunWare* project, the team has split into 3 sections: software, hardware and integration. There will be two members on the hardware team, two members on the software team, and one member as integration lead. The integration lead will work with both teams to ensure that the software and hardware sides are in sync. This way if one member in either section needs to focus on other areas of school, there will be 2 other members able to accommodate the demands of the project.

Company Structure

Sam Hafezi, CEO

Sam Hafezi is the Chief Executive Officer (CEO) of Athletic Innovations. His focus for *RunWare* will be as lead of the Software Team, while overseeing the project as a whole. Sam is *RunWare*'s visionary, leading the team with this entrepreneurial mindset and concrete standards for Athletic Innovations. Sam is currently in the last semester of his undergraduate degree in systems engineering. With experience working in small organizations at Icron Technologies, and a much larger corporation at Safeway Canada, he understands the differences and advantages of each. As a natural leader, Sam excels in finding the best way to motivate and unify the team at Athletic Innovations.



Chelsea Huang, CFO

Chelsea Huang is the Chief Financial Officer (CFO) of Athletic Innovations. For *RunWare*, she will be a member of the Software Team and she will also focus on speaker and microphone hardware aspects. Chelsea is currently studying at Simon Fraser University for a bachelors in computer engineering with an extended minor in music. With this background, her strengths lie in developing multimedia-focused software applications. Concurrently, she is undertaking a co-op at QNX Software Systems, where she will be bringing her experience with audio software and hardware. Outside of academia she participates in many team-based organizations. Her positions with the Engineering Science Student Society have provided experience in organizing events, seeking sponsorship, and working under budget constraints.

Neha Chhatre, CMO

Neha Chhatre is the Chief Marketing Officer (CMO) of Athletic Innovations. She will be focusing on implementing Bluetooth connectivity between the microprocessor and the mobile phone for the *RunWare* product. Also, she will help integrate the hardware and software components. Currently, Neha is studying at Simon Fraser University towards a bachelor's degree in Applied Science majoring in systems engineering. She has experience working with Arduino microprocessors and has created an Android Application before. Her creativity, teamwork and problem solving skills will help *RunWare* be successful product.

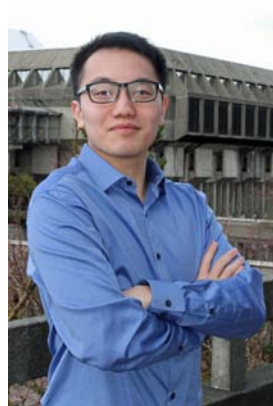


Michael Ng, CIO

Michael Ng is the Chief Information Officer (CIO) for Athletic Innovations and is one of the hardware leads on the team. Michael is currently studying electronics engineering at SFU and has previously worked at BlackBerry (formerly Research In Motion) as a co-op. His primary goal has been researching on the use of Arduino's and combining it with other existing hardware to create a functioning product. His other goals include finding an efficient way of powering the system with cost and weight constraints in mind.

Ricky Tran, CTO

Ricky Tran is the Chief Technical Officer (CTO) for Athletic Innovations and is the other hardware lead on the team. At the moment, Ricky is studying at Simon Fraser University to complete a bachelor's degree with honours in engineering physics. With a solid foundation in physics and electronics, Ricky will be a great asset in our hardware development process. His main responsibility with *RunWare* is to support the team in hardware design with an emphasis on the heart rate monitoring hardware.

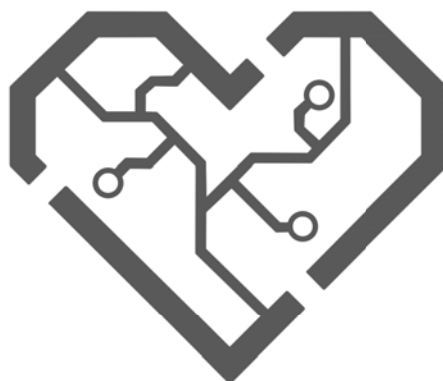


Conclusion

Athletic Innovations is focused on providing their users with the latest wearable technology. Our goal is to incorporate communication, health monitoring, entertainment, navigation and safety to create an elevated running experience.

RunWare meets a current market demand for an all-in-one athletic jacket. We have outlined the vision for *RunWare*, its unique features and our plan for implementing the design. We provided a Gantt chart to break down the process and set goals for each step. We have estimated our total budget and defined a clear strategy to implement the product.

Maggie wakes up early in the morning to go for her daily jog. She grabs her RunWare jacket, laces up, and is out the door.



The freedom to Run Anywhere, with RunWare

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