

Research Manual

Powerlifting app using Movesense wearable technology

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# Abstract

This document/manual will outline the research which will be taken in the creation and of the development of a fitness/strength related mobile application using Movesense Technology. With this document it will provide a written account of the research done in creating the powerlifting app “Power Athlon”. This application will improve strength training for a number of sports athletes but in particular powerlifters. With this application a user will be able to see his acceleration, speed and power of a user’s 3 main lifts. The squat, bench and deadlift these are the 3 main compound lifts these lifts our also the 3 lift that would be tested in a powerlifting meat.

The research done will cover already existing applications or even similar applications with similar functionalities of the one that is being developed. This document will also cover technologies which could be used as well. This application will be suitable for any user with any level of strength training.The information that will be provide from the application will also be extremely useful for elite athletes, as this can now show valuable information to their coaches so help them see where improvements in training can be made. As they will have an accurate information on their strength training.

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# Introduction

The purpose of this manual is to document and detail the all the research that will be done for this project. The aim of this project is to create an application to help athletes or users that wish to improve their strength training by recording their main lifts and displaying valuable information like acceleration, speed and power.

As this project will be great use for strength athletes and in particular powerlifters. Powerlifting as a whole will be researched in dept while briefly going into similar strength training styles like strong man and CrossFit. Fitness will also be touched on as well and how reps and sets work.

Research on existing application will be a big part of this research document. A good amount similar application will be reviews and broken down into what the application did well and what they don’t do so well. With the information that will be achieve from these reviews. This will in turn help while trying to develop an application that customer will want. Application that I will reviewing/researching will be Beast Athlete Motion Sensor Gym, Fitbit Charge 2 Heart Rate, Strenx Gymwatch and Atlas Wearables Wristband. The main research will be done on the power and strength application for in particular powerlifters and crossfitters as they will be more simlair to the application that will be created. Beast Athlete Motion Sensor Gym and Strenx Gymwatch will be the two application that would be the most similar to Power Athlon.

As wearable technology will pay a large part in this project lots of research will be done on it. The reviews that will be done will be more tech based then application based. One of the best ways of reviews these technologies will be by using website reviews, video review and reading documentation.

Movesense wearable will be the wearable technology that will be used in this application so lots of research on the hardware will be done. Research on the firmware being used and how it works will be done. Research on how developer will integrate this firmware with the software they have created. Lots of movesense projects will be researched to see what mistakes were made and how they were resolved through out the development part of the project.

The technologies that will be used in the development part of this project is very important this will in turn struct the way the app will be developed. The front- end technologies that will be discussed in this document will be C++, C, Java, Python and Xarmin. The back-end technologies that will be discussed will be MySQL, NoSQL and MongoDB. There will also be a discussion about if the application should be server based or cloud base using technologies like AWS, Google cloud platform, Python anywhere, Oracle Cloud and Microsoft Azure. With all the possible technologies that could be used I will talk in dept about each then pick the best technologies that would suit my skill sets and my goals for the project.

# Powerlifting (4 page)

## Strong Man

## CrossFit

# Existing Applications (8 page)

## Beast Athlete Motion Sensor Gym

## Fitbit Charge 2 Heart Rate

## Strenx Gymwatch

## Atlas Wearables Wristband

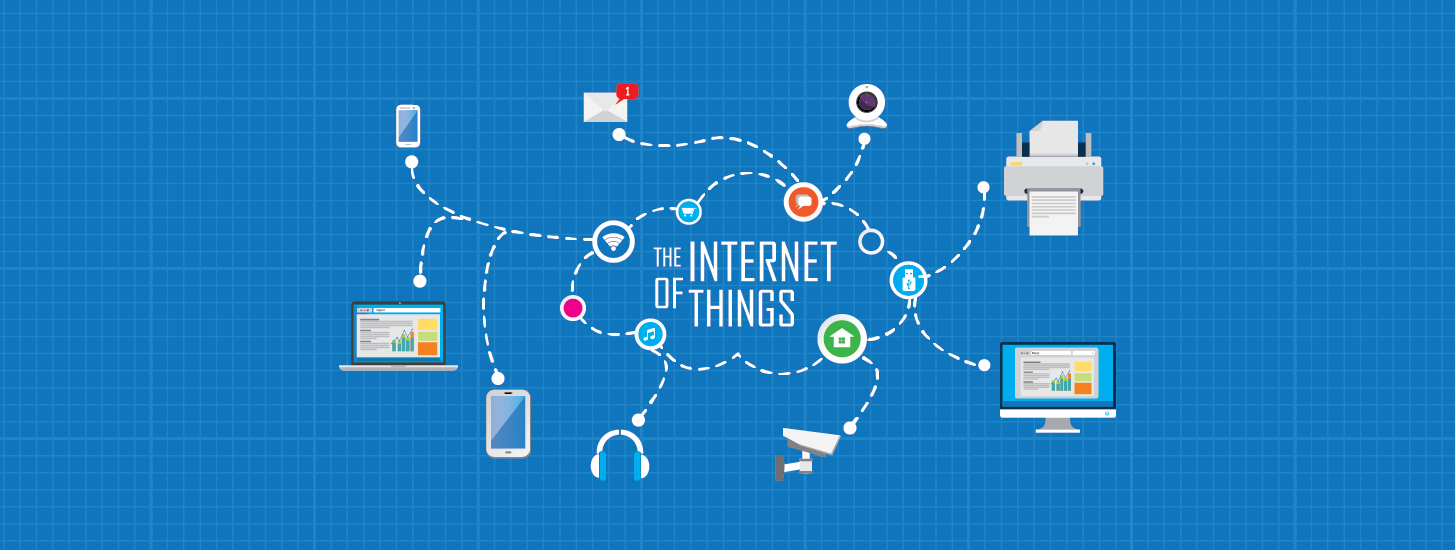
# Wearable Technology Market (4 page)

Wearable technology is when electronics devices which can be worn on the body in the form of clothing or accessories like watches. This technology can collect information to improve the user’s natural abilities. The world’s top wearable technology companies are now offering numerous of wearable technology products like fitness trackers, smart watches, smart clothing, head mounted displays, smart jewellery, and implantables. The sensors in wearable tech devices records and analyses wearer’s data in real time and provides valuable insights related to the user’s activities, fitness and in my case strength. Some wearable devices such as VR headsets and smart glasses also provide virtual and augmented reality experience to the users.



## IOT

IOT devices like wearable technology devices are gaining popularity among medical, automotive and the consumer industries. These IOT device can connect to the internet and exchange data among the device and the network. While in turn helps in resolving some supply chain issues for end user’s industries by Improving their decision-making process. This will mean that the increasing preference for a connected environment and the need to access real time data is driving the wearable technology market growth during the up in coming years.



The main market that wearable tech is increasing in is healthcare industry. Wearable device manufacturers are constantly trying to improve and focus on the development of specialized wearables for the healthcare sector. This will in turn allow doctors to collect patient’s data easily leading to leading to advanced diagnosis. The integration of haptic technology (tactile feedback technology) in smart watches will be another important trend that will drive the growth within the up and coming years.

## Movesense

Movesense is one of the best open development platforms for motion sensing and biometrics and will be the used and integrated within Power Athlon. It is an easy and innovative tool allowing developers to build their own wearable device quickly and cost-efficiently. With this technology you can track sports, heath, equipment and machinery so anything that moves. This was company was created by the Finnish sports watch expert Suunto.

### Movesense Sensor

The Sensor from Movesense our Versatile, light and small but extremely durable sensor capable of measuring any movement and much more. Very customizable functionality through open APIs that enable development of unique in-device application. The functionality can easily be tailored to fit the exact needs of the target use case.

* Swim and shock proof construction, suitable for any sports.
* User replaceable coin cell battery.
* State of the art ultra-low power components.
* Small in size and light in weight.
* Available with custom branding.

**Technical highlights**

* 9-axis motion sensor: acceleration, gyroscope, magnetometer.
* Heart rate, R-R- intervals, BLE heart rate service, optional: single channel ECG.
* Tools for developing customized applications that run inside the sensor.
* Software libraries for developing compatible mobile applications.
* iOS and Android mobile libraries with wireless sensor firmware update capability.
* Wireless firmware update capability.
* Easy to use C++ Movesense Device API.
* Bluetooth® 4.0 radio.
* Temperature.

## Totem Open Health

Totem Open Health is another open platform and ecosystem for wearable health technology. Ecosystem includes sensors, data collection, storage, sharing and analysis and algorithmic interpretation. With the open nature of Totem Open Health provides opportunities beyond what is currently possible in proprietary shut solutions. Such as unhindered collaboration, faster innovation, localized development, addressing of low-volume niche problem areas, transparency and shared knowledge for the benefit of all.

Totem Open Health are currently developing the first product for the Open Health ecosystem. The Totem Health Patch is a cost effective, completely open sourced. Small wearable device containing great sensors, packaged in robust casings, flexible to be applied in many contexts and circumstances.

Along with the development of the Totem Health Patch development of solutions for data storage, analysis and algorithm development and sharing.

**Technical highlights**

* 3-axis accelerometer and gyroscope.
* Temperature.
* Raw data on MicroSD.
* Bluetooth low energy.
* Battery up to 40 days.
* 100Hz sampling frequency.
* Compact form factor.

## FitBit

Fitbit is one of the worlds largest health tracking smartwatches. Fitbit Inc is an American company founded in 2007. The products Fitbit creates are activity trackers, wireless-enabled wearable technology devices that measure number of steps walked, heart rate, quality of sleep, steps climbed, and other personal metrics involved in fitness. Before October 2007 the company was previously named Healthy Metrics Research Inc. Some evidence has found that the use of similar devices results in less weight loss rather than more.

Fitbit also offer website and mobile app for IOS, Android and window 10 mobile. Trackers are synced to device such as mobile phone via Bluetooth. Last year the Fitbit charge 3 won tracker of the year by Wearable. Amazon Alexa is also integrated into the new Versa 2 smartwatch. Fitbit offer 7 smart watches the Ace2, Inspire, Inspire HR, Charge 3, Ionic, Versa Lite Edition and Versa 2.

Every Fitbit device includes a variety of sensors that have been exposed through the Sensor APIs.

**Technical highlights**

* Accelerometer
* Heart Rate
* Barometer
* Orientation
* Gyroscope

## Suunto

Suunto is a Finnish company that produce measuring instruments and market sports watches, dive computers, compasses and precision instruments. Headquarted are in Vantaa in Finland the company was founded in 1936. Suunto produce up to 15 smart watches ranging from €169 - €700. With

## Garmin

# Technologies (8 page)

## Front end

### C++

### C

### Java

### Python

### Xarmin

## Back end

### MySQL

### NoSQL

### MongoDB

## Cloud infrastructure

### AWS

### Google cloud platform

### Python Anywhere

### Microsoft Azure

### Oracle Cloud

# Conclusion (3 page)

# References

1. <https://blog.technavio.com/blog/top-10-wearable-technology-companies-worldwide>
2. <https://www.movesense.com/wp-content/uploads/2017/11/Movesense-Sensor-Datasheet-_-20171109.pdf>
3. <https://wearablesforgood.com/finalist-totem-open-health/>
4. <https://en.wikipedia.org/wiki/Fitbit>