

## Examining the Market Trends, Applications, and Innovations of the Wearable Technology Sector

E. Daniel Kirby<sup>1</sup>, Ravindra Thamma<sup>2</sup>, An Nguyen<sup>3</sup>, Pavan Patel<sup>4</sup>

<sup>1,2</sup>(Robotics and Mechatronics, Central Connecticut State University, USA)

<sup>3,4</sup>(Engineering, Central Connecticut State University, USA)

**Abstract:** With this sector's rapid technological advancements and market success, wearable technology continues to dominate the electronic industry. With applications ranging from fitness and healthcare to military use, these factors are used to help drive its ongoing success. Nevertheless, as the COVID-19 pandemic continues to impact the global market and the wellbeing of all those who are affected, companies have turned to wearable technology in hopes of developing devices that aid in self-monitoring health and wellbeing of both healthcare workers and patients.

**Keywords:** Wearable Technology, Market Innovations, Applications, COVID-19

### I. INTRODUCTION

Wearable technology is one of the fastest growing sectors in the electronic industry. From rapid technological advancements and innovations to an exponentially expanding consumer base, this sector possesses great potential in various application sectors. These application sectors include fitness, healthcare and many others. These factors, along with the continuing trend of digitization, are what primarily drive the market for this technology. However, as the global pandemic of COVID-19 continues to prevail, the need for innovation in this sector has become increasingly paramount.

### II. MARKET GROWTH AND APPLICATIONS

The global market for wearable technology has grown significantly in the last few years, especially in Asia and North America. According to a report published on Mordor Intelligence, the main factors driving the wearable sensors market in North America are a) the increasing demand across various application sectors (fitness, healthcare, etc.) and b) the rapid advancements and innovations in technology. It is expected that the value of the wearable sensors market reaches 31.96 billion USD by 2025, which is a 195 percent increase from 10.82 billion USD in 2019. The largest sectors in this subcategory of technology are fitness and healthcare, and the major companies that dominate these markets include Fitbit, Apple, etc. Fitbit, a manufacturer of health-related wearable devices (smartwatches, trackers, etc.), has seen an exponential rise in active users from 560,000 in 2012 to 27.63 million in 2018 [1].

As consumers become more aware of their personal health, the growth in sales for wearable devices will continue to increase. More evidence of this growth can be provided by the following entities: Consumer Technology Association, Statista and Grand View Research. Firstly, according to the Consumer Technology Association, a standards and trade organization (statistics provided by Mordor Intelligence), the sales of smartwatches had increased significantly from 5 million in 2014 to 141 million in 2018. In other words, sales of smartwatches within a 4-year span had resulted in a percent increase of over 4,800 percent. As for general wearable devices, Cisco Systems, a manufacturer of various computer networking products and services, shared their own statistics (provided by Mordor Intelligence); there were 325 million devices in 2016, which then increased to 593 million devices in 2018, a percent increase of nearly 83 percent [1]. Secondly, according to a study by Statista (statistics provided by AiThORITY), an online portal that provides statistics and other data for various topics and sources, there were 526 million users of wearable devices connected to a 4G network in 2017, and it is expected for that figure to exceed 900 million users by 2022, translating to an increase of over 71 percent [2]. Lastly, according to Grand View Research (statistics provided by Machine Design Magazine), a market research and consulting firm, it is expected for the market to reach the \$70-billion mark by 2022, with fitness, healthcare and infotainment being the leading markets [3].

Compound annual growth rate is a mathematical formula used to measure the annual rate of return of an investment over multiple time periods. Over a 5-year forecast period (2020 – 2025), where 2019 is treated as the base year, the compound annual growth rate for this market is 19.15 percent [1]. This information further reinforces the potential of this market and what may be expected years later.

**III. PREVALENCE IN THE MILITARY SECTOR**

Applications in the wearable technology sector are not just limited to fitness and healthcare. Use in the military are also prevalent. According to Visiongain, an independent business information provider for various companies, such as Lockheed Martin, Raytheon, and many more, had assessed in their market report in 2019 that the military wearable sensors market was set to reach 179 million USD by that same year [4]. These sensors, which are located on, in or near the user’s body, allow an effective means of providing various services.

Both portable and wearable devices in this sector are in high demand. For instance, in Natick, Massachusetts, officials of the Army Contracting Command had issued a sources-sought notice, a notice used by United States government agencies to seek potential sources for a project, during the end of March (2020) for the Soldier Combat Protective Ensemble (CAPE) project. The goal for this project is to develop new body-worn equipment for infantry rifle platoons and squads that is capable of withstanding various harsh environments. This equipment includes, but are not limited to, wearable sensors, wearable computers, GPS receivers, etc. [5].

In Arlington, Virginia, U.S. Defense Advanced Research Projects Agency (DARPA) officials are reaching out to companies to develop small and lightweight wearable laser detection systems; thus, an issue has been made via a small-business innovation research (SBIR) solicitation for the Wearable Laser Detection and Alert System. The criteria for the detection system is provided in Table I [6]. Considering how recent this event occurred, this only further solidifies the high demand in wearable technology.

Table I: Criteria for Wearable Laser Detector

<b>Criteria</b>	<b>Required</b>
System weight	No more than 3.53 ounces
Battery weight	Less than 3.3 pounds
Battery power	72 hours of continuous operation
	Be comfortable to wear
	Be easily integrated into existing military head gear
	Be able to detect laser illumination over 450-to-1600 nanometer visible to shortwave infrared region
Capability	Be able to detect laser irradiation at energies of 500 microwatts per square centimeter
	Be able to not react to bright non- laser sources
	Be able to have all technology fall under all guidelines of the International Traffic in Arms Regulation (ITAR)

**IV. COMBATTING THE CORONAVIRUS**

As the COVID-19 pandemic continues to impact the global market and economic state, companies and other entities are being compelled to develop and test various solutions to mitigate the dilemma. There are two instances that will be discussed. The first instance is a study that is currently being conducted by the University of California, San Francisco, where a smart ring is being tested on over 2,000 UCSF healthcare workers to determine its capability in predicting symptoms related to COVID-19. The smart ring called Oura will track the user’s body temperature readings and vitals, such as heart rate and respiration rate, from the user’s finger through various sensors [7]. With this, Oura users will be able to be notified of any indication of symptoms, therefore will allow them to seek medical treatment and self-isolate more effectively than those without the ring. The second instance is similar to the first, where Stanford Medicine researchers are partnering up with Fitbit and Scripps Research, a biomedical research institute, to develop algorithms for various Fitbit devices to detect symptoms of the coronavirus through collected data. Also like the smart ring, the devices, which Fitbit will donate 1,000 units to the study, will monitor and alert and fluctuation in heart rate and body temperature that provide some indication of the body fighting an infection. Scientists from Scripps Research will assist Fitbit in tracking the behavior and spread of the infection within a community [8].

In relation to self-monitoring devices, according to PRNewswire, a distributor of press releases, Cassia Networks, Inc., a developer and manufacturer of Bluetooth router products, is partnering with VivaLNK, a medical equipment supplier, to support the Shanghai Public Health Clinical Center (SPHCC) and several other hospitals throughout China in alleviating the spread of coronavirus in the country. This will be possible by utilizing their products: VivaLNK’s body temperature sensors, Cassia’s gateways and IoT Access Controller.

These products will be remote monitoring patients' health and minimize the risk of cross infection. VivaLNK's body temperature sensors are applied directly to a patient's body and are used to monitor their body temperature fluctuations in real-time; Cassia's gateways are used to receive and relay real-time patient data from the sensors to a nurse's station; and Cassia's IoT Access Controller (network management tool) is used to monitor and provide a comprehensive view of a patient's vital in real-time [9]. As per the instances mentioned, the integration self-monitoring devices have become increasingly popular in the medical field to combat the spread of the coronavirus and aid healthcare workers monitor patient health.

## V. CONCLUSION

In conclusion, the statistics and figures provided show substantial support for the growing market success of the wearable technology sector in the electronics industry. These findings consider the various types of applications used in this sector, as well as the solutions developed to deal with the current COVID-19 pandemic impacting the global economy. It is expected for the general market trend of this sector to be in line with the predictions included in the reports and articles discussed, with the leading markets being healthcare and fitness.

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