**PROJECFIT: SMART WATCH WITH TOUCH PROJECTOR TECHNOLOGY**

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**Jehaan Darbari Urvi Chavan**

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**Kailash Bharti Ritik Chaurasia**

**Harsh Faganiya Tushar Chandak**

**Jaysukh Chavda**



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**THE HUMANITIES DEPARTMENT**

**THADOMAL SHAHANI ENGINEERING COLLEGE UNIVERSITY OF MUMBAI**

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**PROJECFIT: SMART WATCH WITH TOUCH PROJECTOR TECHNOLOGY**

*Title Page*

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**FOR**

**THE HUMANITIES DEPARTMENT**

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**BY**

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**Jehaan Darbari Urvi Chavan**

*Names:*

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*Line Spacing: 1.5,*

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**Kailash Bharti Ritik Chaurasia**

**Harsh Faganiya Tushar Chandak**

**Jaysukh Chavda**

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**BANDRA, MUMBAI – 400050**

**UNIVERSITY OF MUMBAI**

**SIGN PAGE**

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Project Entitled – **PROJECFIT: SMARTWATCH WITH TOUCH**

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**PROJECTOR TECHNOLOGY**

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Submitted by – **Jehaan Darbari**

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**Urvi Chavan**

**Kailash Bharti**

*Subtitle Content (Names):*

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**Ritik Chaurasia**

**Harsh Faganiya**

**Tushar Chandak**

**Jaysukh Chavda**

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In the partial fulfilment of the degree of TE for BCE Project, Humanities Department, in Electronics & Telecommunications Engineering is approved.

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Guide Examiner

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In-charge Principal

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Date:

**LETTER OF TRANSMITTAL**

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September 26, 2020

*Salutation of the letter:*

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Dr. Rita Sharma

Head of Humanities Department

Thadomal Shahani Engineering College

W. P. G. Kher Marg, Off Linking Rd

TPS III, Bandra (West)

*Subject line of the letter:*

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Mumbai- 400050

*Leave one line*

**Sub: Report on Projecfit, a smartwatch with Touch Projector Technology.**

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Dear Madam

*Leave one line*

This is to inform you that we, students of EXTC Department, are submitting this report on Projecfit as a part of the Business Communication and Ethics syllabus. With countless smart wearables in the market, Projecfit is a unique product which incorporates touch projection technology in a smartwatch. We have presented a comprehensive study of our product and it’s working in this report.

*Leave one line between every paragraph*

Projecfit is a smart wearable which projects the screen of the smartphone onto one’s arm thus allowing users to manage all of the activities by a simple tap on the arm. It also comes with an integrated health monitoring system, making it possible to track one’s health at all times. The touch projection technology behind the smart wearable is implemented using Pico projectors and depth sensing array for touch detection purpose. The input received to the proximity sensors is then processed by the microprocessors and the various options are thereby selected. What makes Projecfit unique from other smart wearables in the market is this interactive screen projection. The technology allows one to perform all the activities from their phone without actually having to use the phone.

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The objective of writing this report is to introduce our product in the market, explain the technology to the users and to assist manufacturers. The report has covered every aspect of the technology behind it. The prerequisites, hardware and software required for the product have been introduced in the report. It also gives a brief description of the assembly of the product. The report discusses the limitations of the product in terms of cost factor and heat dissipation. It examines the problems encountered in the course of making of the product and various strategies implemented to tackle them. The content provided in the report has been taken from books, articles, journals, papers and information from the internet. We also collected first-hand information through the medium of surveys to get feedback from the users and also to estimate the market and the potential audience.

The report provides implementation of this technology on wider scale and also encourages further research in this area. Even though the smart wearable uses latest technology, the issues regarding heat dissipation and further compactness can only be achieved with advancement of the technology thus giving scope for development.

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Sincerely yours,

*Leave two lines*

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Urvi Chavan

**TABLE OF CONTENTS**

*Title:*

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**Cover i**

**Title Page ii**

**Sign Page iii**

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**Letter of Transmittal iv**

**Table of Contents vi**

**List of Illustrations viii**

**Summary ix**

**Introduction xii**

*1st Title of the Body:*

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*Space before paragraph: 8 units*

# **1. Introduction to Projecfit 1**

*All Subtitles of the Body:*

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1.1 Historical Background 1

1.2 Need for Smartwatches with Projectors 6

*Space in between: 1 Enter space (Font Size: 16, Line Spacing: 1)*

*All other Titles of the Body:*

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**2. Requirements 9**

2.1 Software 9

2.1.1 Wear OS by Google 9

2.2 Hardware 10

*All Headings of the Body:*

*Font Size: 15,*

*Line Spacing: 1,*

*No space before/ after the paragraph*

2.2.1 Interactive Touchscreen Projection 10

2.2.2 Splash Proof Technology 14

2.2.3 Health Monitor 16

2.2.4 GPS 19

2.2.5 Connectivity 20

**3. Assembly 22**

**4. Working 24**

4.1 Health Monitor 24

4.1.1 MAX30101 24

4.2 Touchscreen Projector Technology 26

4.2.1 Projection 26

4.2.2 Sensors 27

4.2.3 Touch Detection 31

4.3 Connectivity 32

4.3.1 Wi-Fi 32

4.3.2 Bluetooth 33

4.3.3 Network Chip 34

4.4 Display 34

4.5 Computing 36

4.5.1 Microprocessor 36

4.6 Input- Output 39

4.6.1 Microphone 39

4.6.2 Speaker 39

4.7 Miscellaneous 39

4.7.1 Battery 39

4.7.2 Charging 41

**5. Survey 42**

**6. Advantages and Limitations 47**

6.1 Advantages 47

6.2 Limitations 47

**7. Conclusion 49**

**Appendix 50**

*Topics of the Back Matter (Appendix to Glossary):*

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**List of References 51**

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**Bibliography 55**

**Glossary 57**

**LIST OF ILLUSTRATIONS**

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*Subtitles:*

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**List of Images**

Image 1.1 The 1972 Hamilton Watch Company’s Pulsar 1

Image 1.2 Seiko T001 (1983) 2

Image 1.3 RC-20 Wrist Computer of 1985 2

Image 1.4 The Microsoft SPOT watch in 2004 3

Image 1.5 First generation Apple smartwatches (2015) 4

Image 1.6 Russian-made Displair screenless 3D multi-touch display 5

Image 1.7 Windows Mixed Reality on Microsoft HoloLens 6

Image 2.1 Wear OS by Google 9

Image 2.2 Interactive Touchscreen Projector Technology 10

Image 2.3 PhlatLight LED chips running at 1% of their illumination potential 12

Image 2.4 Working of Hydrophobic and Oleophobic coatings 15

Image 2.5 PPG sensors of a smartwatch in action 16

Image 2.6 Sensirion SHTW2 Humidity & Temperature Sensor IC 17

*Content of subtitles:*

*Font Size: 12,*

*Line Spacing: 1.15,*

*No space before/ after the paragraph,*

*Left aligned*

Image 2.7 Nordic Semiconductor’s nRF5340 chip 20

Image 2.8 Qualcomm QCA3979 Wi-Fi Module 21

Image 3.1 PCB Board with various integrated components 22

Image 4.1 MAX30101 Pulse Oximeter and Heart Rate Sensor 25

Image 4.2 Projector experimented at different angles 27

Image 4.3 Omnivision OVM9724-RADA Proximity Sensor 29

Image 4.4 Sharp IS471F Infrared Sensor 29

Image 4.5 HC-SR505 PIR Motion Sensor 31

Image 4.6 A 0.91 Inch OLED Display module 35

*Space in between:*

*2 Enter spaces (Font Size: 12, Line Spacing: 1, No space before/ after the paragraph)*

**List of Diagrams**

Figure 5.1 Responses to Survey Question 1 42

Figure 5.2 Responses to Survey Question 2 42

Figure 5.3 Responses to Survey Question 3 43

Figure 5.4 Responses to Survey Question 4 43

Figure 5.5 Responses to Survey Question 5 44

Figure 5.6 Responses to Survey Question 6 44

Figure 5.7 Responses to Survey Question 7 45

**SUMMARY**

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Smart wearables are one of the emerging technologies in the current market. Projecfit takes this technology to a whole new level. Projecfit incorporates existing concepts to give an absolutely unique product which projects the smartphone screen onto the arm & functions as a health monitor and GPS tracker all at the same time.

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**Introduction to Projecfit**

Projecfit is a self-contained and fully functional projection smartwatch implementation which contains projection, touch detection and health monitoring capabilities. It is a wrist-worn device that connects to the smartphone and acts as a mini-window onto your digital life. While being already powerful as a stand-alone device, the capabilities of the product increases when connected to other devices. Projecfit demonstrates continuous 2D finger tracking with interactive, rectified graphics, transforming the arm into an interactive touchscreen. It offers easy access to all the applications without having to use the phone. The skin provides a natural surface for dynamic projection which is digital in nature. Projecfit also provides frequent health monitoring and computes all the user inputs to display heart rate, steps, body temperature. In addition to this, it comes with a GPS tracker through which you can never lose your watch.

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**Requirements**

Projecfit is a compact design enclosed in an aluminium body to avoid over-heat dissipation. The device is powered with a 740 mAh, 3.8 V lithium-ion battery. It includes a logic board, projector, depth-sensing array, metal enclosure and a battery. The logic board integrates a Qualcomm APQ8026 system-on-chip, which has a 1.2 GHz quad-core CPU, 450 MHz GPU, and Bluetooth 4.0 and Wi-Fi controller. For projection, it uses a custom 15-lumen Pico projector module with RGB lasers and a pair of MEMs mirror. The touch input is captured using a 1D depth-sensing array (7×38×3 mm), consisting of ten STMicro VL6180X time-of-flight sensors.

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The heart rate monitoring systems uses an LED and the electrical connectivity of the skin is measured using the Galvanic skin sensors. A series of motion sensors like accelerometer, gyroscope, geomagnetic, and atmospheric pressure sensors are used for the purpose. GPS chip is used which allows walkers, runners and cyclists to easily map their exercise and analyse the terrain where they were exercising. The watch uses Android Wear as the software which is specifically designed for smart wearables.

**Assembly**

The design constraints of smartwatches are dictated mainly by their functions, whether the need to pack in sensors or to provide a screen user-friendly enough to be easily used. The main aim is to place the components without wasting much space but maintaining a sleek look. Projecfit uses a square display and aluminium casing to assist heat dissipation. The hardware is designed with higher priority to the elevation of the projector to ensure clear projection.

The projector is placed at the topmost of the watch so that the aperture is 13mm above the skin. The battery is placed at the very bottom. The logic board is placed centrally which mostly consists of the sensors. The aluminium casing is coated with nano and hydrophobic coating to make them durable and water resistant. Thus, the assembly design is so chosen as to attain minimalism without compromising the efficient functionality.

**Working**

Projecfit is designed to work at its best when connected to a smartphone but it can also function individually. Once connected, the user account generation is required which includes filling up one’s personal data for more accurate and efficient results. The display of the smartphone screen is done using Scanned Laser Pico Projector which emits a 1024×600 image on the am. The user can manage all of the mobile applications like receiving calls, playing games, watching movies, etc. at the tap of fingers. The touch detection is carried out using 1D depth-sensing array. The reflected rays are given as an input to the microcontroller and is further used for computing the distance to find the position of the finger which ensures accurate selection of icons.

Projecfit also functions as a health monitor to calculate steps, oxygen levels, heart rate, body temperature. MAX30101 which is an integrated pulse oximetry and heart rate monitor IC, is used for the purpose of health monitoring. Photoplethysmogram process is used where the LEDs of this IC emit light onto the skin and the fluctuations in the reflected light are noted to determine the heart rate. The accelerometer and gyroscope sensors function together to calculate the steps. The GPS integrated chip used gives accurate maps and location so the user can always find their phone if lost. Projecfit comes with the water-resistant technology to keep it safe even when in contact with water. The results are displayed on the OLED screen.

**Survey**

In order to get a better idea of the market and collect first-hand information, our group conducted a survey. We prepared a set of 9 questions to satisfy the purpose and identify the potential consumers for our product. We managed to gather sufficient data to analyse and convey our product to target audience.

**Advantages and Limitations**

The smart wearable supports a host of functions without compromising the size or the battery. Projecfit makes it possible for the user to use their phone anywhere without physically using it. This feature allows access to the phone in crowded places and also reduces the threat of phone theft. Being water resistant, it can be used while exercising, washing hands, or walking in the rain. Projecfit offers up to 18 hours of battery life. However, the cost of the product in terms of manufacturing is slightly at the higher end which could be one of the drawbacks. Heat dissipation is limited due to the compact size of the watch but it can be tackled by limiting the usage of the device.

**Conclusion**

The report presents Projecfit, a first-of-its-kind smart wearable integrated with on-skin touchscreen projection along with health monitoring and GPS system. The making of the product faced a number of challenges with respect to the angle of projection, heat dissipation and the size which were later successfully dealt with. Projecfit presents a novel combination of hardware and software capabilities to give the absolute best performance. It also gives a growth to the market of smart wearables in the current scenario.

**INTRODUCTION**

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**Purpose**

The purpose of presenting the Projecfit report is to involve the audience in the new technology behind Projecfit. It aims at educating the manufacturers about the technology and encouraging them into making their own. Also, to interest individuals into funding needed for advancement in the current technology or simply to explain the process that goes into making the Projecfit smartwatch.

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**Scope**

The report elaborates the smart wearable technology & the process of assembling and making of Projecfit. Experts can use this report as the basis of their start-ups or for the purpose of improving the current technology. It can also promote the engagement of EXTC department engineers in the advancement of the electronics field and achieve practical knowledge.

**Sources**

The presented report is written with the help of internet websites, presentations, research papers, articles, journals and books covering related technologies. Online surveys and personal interviews have also been conducted and referred to in order to get a better idea of the market.

**Authorization**

We have been authorized by our Business Communication and Ethics Professor Dr. Rita Sharma to prepare this report as part of the BCE syllabus of third year EXTC Engineering. We learnt a great deal of skills in the course of writing the report and are appreciative of the opportunity given by her to present it.