

**ICON College of Technology and Management**

**Department of Information Technology, BCS Hons Computing**

**Accredited by Falmouth University**

**Bachelor Dissertation and Final Project**

**Music Education and Entertainment System: A Digital Guitar Instrument Hardware with an Integrated Web Application**

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*A person playing a guitar

Description automatically generated with low confidence*

*"*I long for instruments ob*e*dient to my thought and which, with their contribution of a whole new world of unsuspected sounds, will lend themselves to the exigencies of my inner rhythm.*"*

*Edgard Varese, 1917*

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# 1. | Introduction

We, Earthly creatures, are very fortunate. Extremely few places in the vast vacuum-filled Universe have a suitable medium that supports audio signals to travel. However, here on Earth, sound vibrations can move through the atmosphere, providing information about our environment. As a result, mammalian evolution adapted to transform soundwaves into electrical signals, genetically engineering us to detect sounds. Hearing sounds increased our survival chances by identifying danger outside our visual zone and extending our communication channels.

Even though humans are not the only species communicating by creating sounds, we discovered a way of self-expression that conveyed broader spectrums of emotional range beyond mere spoken words; music. And from as early as 40000 years ago, music has played an essential part in our everyday life. Our humans' innate musicality drove us to experiment with new ranges of sounds, inventing the primary types of instruments. Ideophones (clapping and bells), membranophones (drums), aerophones (flute), and most importantly, chordophones (harp).

Although the exact origin of the modern guitar is debated, the instrument is already mentioned in the Bible, and it can be traced back to the Greek kithara **κιθάρα** or Arabic qitharah **قيثارة** words. By the 17th century, it became popular among amateurs. With the advent of the jazz age, the electric guitar's success elevated its status to become the instrument of virtuosos and rock stars. However, this is not the final step on the guitar's evolution ladder. The modern digital era opened opportunities to combine the latest technology with musical skills. This project's goal is to bring digital technology, musical entertainment and education under the same roof.

## 1.1 | Inspiration

I hold in my hand my old buddy, Gabriel's Guitar Hero. Again, I am ready for the next round; this time determined to overdo his performance. Little did I suspect that years of sketchy guitar practices on my side would not score against a seasoned hero like him. After several failed attempts to show off my talent, he concluded that even though I had guitar experience, rhythm sense and some music theory in my pocket, my chances of winning against him were astronomical as a first-timer.

How about him, I asked myself, what type of guitarist would he make, with all those hours of playing the virtual guitar console? The answer came weeks later when he visited me, and I handed him my electric guitar and taught him the intro of a song I knew he liked. Soon enough, he could play a simple piece surprisingly well, though. So, I asked him.

- Why do you waste your time practising an imaginary instrument? You'd become a great guitarist by this time.

- You'll see me playing when they invent guitars for the console. – He answered with a smirk on his face.

Since then, I have been thinking about the wasted talent playing on five plastic buttons and a strum bar. If I could create a lightweight device that resembles an actual guitar, I would be able to develop an online interface that is free, available for everyone, vendor-independent, and educational. I am confident it would be at least as attractive an entertainment option as playing Guitar Hero. Well, the time has come, Gabrel, to wipe off your smirk from your face; you will be the first to play.

## 1.2. | Setting Up Aim and Objectives

To create our final product, we must set our aim and objectives. Without a clear specification

### 1.2.1. | Existing Technologies

### 1.2.2. | Comparison

## 1.2.3. | and Gap in Current Technologies

### 1.2.4. | Problem Statement

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## 3.4. | Project Phases and Schedule

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### 4.1.2. | Microcontroller Programming

### 4.1.3. | Instrument Design Implementation

## 4.2. | Middleware

## 4.2.1. | Communication and Protocols

### 4.2.2. | Skeleton Prototype

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#### 4.3.1.1. | Webdesign and Wireframes

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## 6.7. | Functional Testing

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# 7. | Retrospective: Review of the Final Project

## 7.1. | The End Product

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## 7.4. | Conclusion

# References

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# Appendices