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**DESIGN AND IMPLEMENTATION OF A WEB-BASED RADIO AUDIENCE MEASUREMENT SYSTEM**

**BY**

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**DEDICATION**

This project report is dedicated to God Almighty my Creator, who has been my rock, guide, source of inspiration, wisdom, knowledge and understanding. He has been my strength and in his arms I have been sheltered. I also dedicate this work to my lovely siblings who have encouraged me every step of the way and whose encouragement has made sure that I give it all it takes to complete that which I have started. To my parents Mr. and Mrs. Ayegba who have been affected every step of the way by this quest, the words that will express how much appreciation I have for you have not been invented yet. So, in all sincerity I say thank you and God bless you.

# INTRODUCTION

## BACKGROUND OF THE STUDY

The classical view of audience measurement is the estimation of the number of viewers who are tuned to a particular TV program or channel, or the number of listeners who are tuned to a particular radio program or channel. Audience measurement takes into account, the behaviour of the audience as well as its demographics [1]. Direct and indirect methods of measurement are used and, usually, results from a carefully chosen sample are extrapolated to produce figures for the whole population. Audience research is an important aspect of television and radio production broadcasting as well as newer forms of media material. Internet, IPTV, mobile phones, and personal computers are all examples of delivery methods. Audience measurement can be used for everything from self-promotion to fine-tuning a service [2].

One of the solutions that audience measuring technologies strive to bring about is content consumption measurement. One of the most common approaches used by service providers or broadcasters to get important data for improving service offerings or setting advertising rates is to evaluate content consumption. Its uses are much broader than that. Without accurate audience data, many firms may be reluctant to join in the new delivery platforms.

### BRIEF HISTORY OF AUDIENCE MEASUREMENT

First launched in the late 1940's soon after the start of commercial broadcasting, the audience measurements allowed radio broadcasting business to flourish through networks which offered advertisers, who paid for the estimated number of ears listening on commercials, a way to quantify the financial value of radio audiences. The first measuring techniques had several limitations because the acquisition of reliable, large-scale data was costly. Despite the limitations, standards for measurement remained largely unchanged for years until the explosion of digitally accessible data resulted in such devices as cable boxes, video on demand boxes and cell phone as well as web apps, internet browser clicks, web queries, and social media activities. Radio listeners now leave digital footprints that may be used to follow practically every part of their everyday lives, enabling large-scale aggregation across data sources for individual users and groups, as well as tracking of more individuals on more dimensions for more programs. Data is now more substantial, real-time, and less expensive to get, allowing for precise and fine grained radio audience monitoring [1].

### AUDIENCE MEASUREMENT IN DIGITAL SIGNAGE

Digital signage service provides advertisements and useful information using terminal equipped with electronic displays, and it is also possible to aggregate information using various kinds of sensors including camera. In comparison to standard DID (Digital Information Device) services, which only supply one-way content, digital signage services can offer more advanced features like user interactivity and audience measurement. It is feasible to give appropriate material to users and boost advertisement effects by measuring audience behavior. Digital signage services are becoming more popular these days for a variety of reasons allowing for increased contact and intelligence services especially now that digital signage devices are being put in a variety of locations including public spaces [3]. Bus stops, hallways, and shopping malls are examples of public spaces. Static signs are losing their impact, but digital signage, on the other hand, are designed to capture consumers' attention and convey messages that are tailored to improve their experience. It is useful for obtaining audience and environmental data to aid the kind of content to present to then. This project presents a web-based approach for gathering these data, using machine learning to accurately predict and identify different sound data.

## PROBLEM STATEMENT

With the rapid technological advancements that the world is experiencing, a shift from the traditional way of doing things to a more efficient way is required. Currently, radio audience measurement is done in a way that requires full human input by recalling their listening patterns which is prone to some inaccuracies. It has been noted that humans are inherently fallible, and errors are highly inevitable. Therefore, there are high possibilities of errors gotten from data taken from human inputs to lead to errors in the calculation of radio audience listenership.

## AIMS AND OBJECTIVES

This project aims to design and build a web-based audience measurement system that will be used in the estimation of the number of people who are tuned to, and actively listening to radio stations. The implementation of the application was done as a modern system that would reduce all forms of human error and, also make the data gotten from the system reliable.

The objectives of this project are to:

1. To design a mobile and web application using figma.
2. To build out the mobile and web application using javascript, with frameworks like React native and React js respectively.
3. To use a cloud storage platform like firebase to store the audio recordings of participants.
4. To use machine learning to accurately predict the nature of the recordings that participants have uploaded.
5. To determine the effectiveness of the system by comparing the results to a predetermined set of results.

## SIGNIFICANCE OF THE PROJECT

The data gotten implementation of this project will be beneficial to the following groups of people:

1. **Advertisers**: Data gathered from this project could be used by advertisers to target a specific audience to advertise their content to.
2. **Researchers**: Researchers are constantly looking for ways to improve the spread of good and reliable information. The data gotten from this project could be of tremendous help to achieve this goal.
3. **Students**: The project provides more information for further works and research on the subject area.
4. **Data analysts**: Data analysts need data sets to analyze, to predict future problems as well as solutions. Data gathered from this project could aid them.

## MOTIVATION FOR THE STUDY

With the rapid increase in the population of the world today, there is also a progressive increase in the demand for good and quality information content. Advancements in technology are gradually bringing about a change in what people engage in as well as their interests. It is clear, that what people listened to some 40 years ago on radio stations aren’t what they are interested in listening to these days. Thus, the need for some way to accurately determine what people are really interested in listening to. This project tries to measure the listening patterns of radio audiences and predict people are interested in listening to.

## METHODOLOGY

Two client-side applications were built- a web application for administrators and a mobile application for participants. The mobile application sends audio data to a server-side service called firebase. The server-side service handles things like user authentication to allow participants sign up and login. The mobile and web application were built using javascript with frameworks like React native and React js respectively. A javascript library called ml5 js handles machine learning on the administrators’ dashboard, to predict the kinds of recordings that participants have sent to the server. These results are then analyzed and used to estimate the listening audience.

## PROJECT ORGANISATION

**Chapter 1**: Contains a general overview on the project, the background information, the aim and objectives of the project, what problems the project seeks to solve as well as a brief outline of the methodology.

**Chapter 2**: Gives the literature review, it discusses the past related works on the project subject area. It contains theoretical background and other concepts necessary to make the project well understood.

**Chapter 3**: Contains the methodology of the project, how the project is going to be carried out, design of the project, it contains all components required for the design and block diagrams and software design.

**Chapter 4**: This chapter describes the implementation phase of the project as well as testing. The functional system design will be shown in detail as well as real pictures of the project undergoing testing. The results of the project will be analyzed in this chapter.

**Chapter 5**: This is the last chapter of the project report, and it contains conclusions and recommendations for the project. It also shows the results the project was able to achieve.

# LITERATURE REVIEW

## INTRODUCTION

To propel the realisation of smart cities of the future, every industry has to have its fair share of automation. This will be evident in the application of smart monitoring systems and automated replacements in all industries, including the agricultural sector. Over the years, intelligent and automated solutions in farming have witnessed extensive development. These continue to penetrate several applications from complex subjects like genetically modified crops and animals to simpler aspects like irrigation and monitoring. Due to the lack of sufficient irrigation provisions in various countries, irrigation solutions have been among the crucial points of interest for several studies. This study seeks to explore a new solution to monitoring the conditions of the soil and providing automated irrigation based on the observed conditions. Recent studies have explored different thematic areas in this domain which includes, but not limited to, automated solutions in the agricultural industry, application of intelligent soil monitoring systems in agriculture and automated irrigation solutions.