



**BUSITEMA
UNIVERSITY**
Pursuing Excellence

FACULTY OF ENGINEERING
DEPARTMENT OF COMPUTER ENGINEERING

**A MOBILE-BASED IoT PREPAID WATER CONSUMPTION
AND REGULATION SYSTEM**

By

KASOZI AKIM

BU/UG/2020/1975

EMAIL: kasoziakim1320@gmail.com

TEL: 0785727208.


SUPERVISOR: PROF. OCEN GILBERT

**A Final Year Project Report in partial fulfillment of the requirements for the
award of Bachelor's Degree of Science in Computer Engineering at Busitema
University.**

MAY, 2024.

DECLARATION


I, **Kasozi Akim**, do hereby declare that this project report is my original work and has never been published and/or submitted for any other degree award to any other university or institution of higher learning.

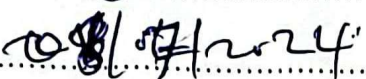
Signature..... 

Date..... 04-JULY-2024

APPROVAL

This is to certify that the project titled "*Mobile-based IoT prepaid water consumption and regulation system*" has been done under my supervision and is now ready for examination.

Signature..... 

Date..... 

Prof. Ocen Gilbert.

Department of Computer Engineering and Informatics

ACKNOWLEDGEMENT

I would love to thank the Almighty Lord Jesus Christ for the life and good health he has given me, my family, my supervisor and friends.

I would love to thank my Parents for providing me with all the necessary equipment and other financial and emotional support. I would also love to extend my heartfelt gratitude of thanks to my supervisor Prof. Ocen Gilbert for all the support rendered to me throughout the writing of this report. I would also love to thank my room mates, Ssali Lawrence, Nakabale Godfrey and Tiondi Gilbert and all my other course-mates for all the support they rendered me during the implementation of this project. For all individuals not particularly mentioned, I would love to thank you as well for all the support you rendered me.

LIST OF ACRONYMS

AIDC	Automatic Identification and Data Capture
AMR	Automatic Meter Reading
API:	Application Programming Interface
DB:	Data Base
HTTPS:	Hyper-Text Transfer Protocol Secure
IDE:	Integrated Development Environment
IEE:	Institution of Electrical Engineers
I/O:	Input, Output
IoT:	Internet of Things
MIT:	Massachusetts Institute of Technology
PC:	Personal Computer
SQL:	Structured Query Language
URL:	Universal Resource Locator
UI:	User Interface
Vs	Versus
Wi-Fi:	Wireless Fidelity
XSS:	Cross-site Scripting

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ABSTRACT

Traditional water management systems, which rely on manual post-billing meters, face challenges such as inaccurate billing and delayed consumption notifications[1]. These systems lack real-time data, limiting user control and hindering proactive water conservation. In Uganda, about 81% of the population lacks access to piped water, largely due to high service costs associated with traditional post-billing system[2]. Manual readings often lead to billing inaccuracies, causing financial losses and reducing conservation incentives. Technological advancements, particularly IoT coupled with the use of a water flow sensor, an electromagnetic solenoid valve and an ESP32., offer solutions through real-time monitoring and prepaid models, providing users with greater control and accurate billing[3]. Implementing these technologies, supported by community engagement and policy reforms, can revolutionize water management. This project aims to develop a Mobile-based prepaid IoT Water Regulation and Consumption System to enhance water management, improve user control, and promote sustainable usage

CHAPTER ONE: INTRODUCTION

This Chapter includes the background, the problem statement, the objectives fulfilled, the justification and scope of this project.

1.1 Background

Traditional water management systems heavily rely on conventional post-billing meters, where water consumption is measured manually by a service-person[1], typically at the end of a billing cycle. This postpaid model entails users being billed for their actual water usage after the consumption has taken place[4].

Despite their widespread use, traditional post-billing water management systems encounter several challenges such as inaccurate billing and delayed notifications as users receive information about their water consumption well after the fact[5]. Additionally, the lack of real-time data and limited user control hinder proactive efforts in water conservation. Out of Uganda's population of about 48.5 million, 38million people which is about 81% of the total population lack access to piped water[2]. This is contributed to the high costs incurred into water services such as connection costs, disconnection and the continuous post-billing costs[6].

The challenges observed in traditional water management systems are caused by various factors which include manual readings which are often prone to human error, contributing to inaccuracies in billing such as underestimation, overestimation or biased readings. This inaccurate billing in traditional systems may result in users being charged based on estimated or averaged consumption rather than actual usage. This can lead to a disconnect between perceived costs and actual consumption, reducing incentives for conservation. In some cases, overestimation of water usage may even prompt users to use more water to "get their money's worth" leading to financial losses for both consumers and water service providers, while the high costs associated with post-billing systems pose a barrier to accessing clean water for low-income households, perpetuating socio-economic disparities.

However, technological advancements offer promising solutions to revolutionize water management systems. The emergence of Internet of Things (IoT) technology enables real-time monitoring and control of water consumption through mobile devices and prepaid models[7]. This empowers users with greater control over their usage and ensures fair and accurate billing

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