**Smart water monitoring and billing management using IoT**

**Chapter I : Introduction**

1. **Introduction**

Water is one of the primary sources of survival for all life forms on earth. A lot of our day-to-day activities such as bathing, cooking is dependent on the use of water. Water plays a significant part in the global economy. Approximately 70% world is freshwater that used by humans goes to drink, etc. The world is progressively observing forward to adaptation and use of new technologies to enhance the excellence of life and also reduce the impact of social activities and utilization patterns on the environment. Availability of water, its increasing demand from urbanization and growing population in cities, the cost for management of water transmission, storage information, distribution and billing for consumption with pay fee are serious issues in. underdeveloped and developing countries. Quick lifestyle changes have an impact on the increased paying capacity. the end-users of water and related overheads on monthly.

Therefore, this study investigates and identifies the change of flow of the water through a microcontroller system for the telemetric measurement of water consumption using IoT and web technology. The system collects data from a water meter, which is equipped with a flow sensor, and sends information over the internet to a server such as Firebase for storage and presented through the website to get live data of water usage.

Also, the authorities’ user can see the changes in the flow of the water used. via Dashboard, and is presented the real-time monitoring system. the old manual system is ignored that was to go to the end-user water. also, for the users, an invoice will be sent each month.

* 1. **Background of the study**

Many people now live-in urban Cities than rural areas around the world. Because of the quick urbanization, urban communities are developing and the density of urban areas are expanding, which makes new requests on services and infrastructure. Simultaneously, with the rising consciousness of the significance of sustainability, there is an overall objective to empower progress towards a more reasonable city. The computerized upheaval with its new technologies, for example, the Internet of Things (IoT) and how these technologies could be joined in services and infrastructure have arisen into the term of smart cities. They have tremendous potential and it is perceived that smart cities could address these new difficulties presented by expanding volatility. Effectively several years back, smart cities were brought up as a future developing business sector which is relied upon to drive the digital economy forward(Dahlström & Söderberg, n.d.).

The new Internet of Things (IoT) applications is enabling Smart City creativities universal. It provides the capacity to remotely manage and control devices, and to create new visions and actionable information from enormous waterways of real-time data. The main structures of a smart city include a high degree of information technology incorporation and a complete application of information resources. Smart technology, smart business, smart utilities, smart management and smart life will be the basic components of city expansion for a smart city.

The Internet of Things is about deploying sensors (RFID, IR, GPS, laser scanners, etc.) and connecting them to the Internet through unique information sharing and communication protocols, to accomplish intelligent recognition, place, tracking and management. With the practical support from IoT, smart city wants to have three structures of being instrumented, interrelated and smart. Only then a Smart City can be shaped by integrating all these intelligent structures at its advanced phase of IoT development. The fiery growth of Smart City and Internet of Things applications creates many systematic and engineering challenges that call for inventive research efforts from both academia and industry, particularly for the development of Smart City based on IoT with effective, scalable, and reliable. New protocols, architectures, and services are in direct needs to respond to these challenges. The goal of the special issue is to bring together scholars, professors, researchers, engineers and administrators resorting to the advanced technologies and concepts to meaningfully improve the field of Smart City based on IoT (Kim et al., 2017).

Through using low-cost IoT hardware and mobile applications, the proposed smart metering solution varies from current commercial methodologies. This device allows both the Meter Reader and individual domestic or industrial customers to use standard smartphones to track meters and update the billing and payment server or database of the utility. The proposed system reduces operating costs for meter reading and billing facilities for the delivery of water in metropolitan and wide urban areas.

* 1. **Problem Statement**

Since many years ago humans have the sense of need to control things around them, these needs fulfil every day with man promotion. By inventing this system & installation on the water meters, we will now be able to remote control all the meters.

The main problems about reading meter's number & distribution of subscriber's fiches including, During the time the meter's number is read, no one is at home.

The low pace in reading the amount of the meter & delivery of subscription files & impairment of associated offices to implement the online distribution policy. There is no continuum supervision on the consumption there is low speed & accuracy, with a waste of time & cost.

The manual system uses workers to read and record water meter numbers, which are expensive labour costs. In particular, one meter-reader will estimate hundreds and thousands of meters per day. It often happens that meter-reader records a wrong number which can cause economic losses and disputes to users and water companies.

In this paper, we proposed the solution for the above issue by installing the smart water meter for every house to monitor the consumption level of water using IoT, Web And Mobile applications, The smart water meter offers a solution to this issue which monitors the volume of water that each household usage and helps the consumers to monitor the level of usage.

* 1. **Motivation of the study**

The motivation of this study is to design and build Smart water monitoring and data collection for end-user consumption. Somalia water companies have challenges in monitoring the water rate of end-users, analyzing the flow water meter rate, and sending the invoice to customers. There are also sometimes incorrectly recorded flow meters of users' consumption.

This study will make it easier for water companies to monitor water meter consumption and analyzing the flowing of the water meter by using IoT and web technology.

* 1. **Research Objectives**

To propose and Implement Smart water meter Reading system using IOT and web technologies Monitor, analyze accurate end-user consumption using the web and mobile technology.

* 1. **Research questions**

How To develop and Implement Smart water meter Reading system using IOT and web technologies?

* 1. **Scope of the study**

This system (Smart water monitoring and billing management using IoT) is used for all Water Companies in Somalia.

**Geographical Scope** will be Mogadishu, Somalia.

**Time Scope**: This study will be conducted between December 2020 to June 2021

* 1. **Significant of the study**

The importance of this project is to Develop Smart Water Meter that automatically reports the amount of water that end-users used while reducing the cost of staff used to read and record the Water Meter. This project will make it easier for customers or users to keep track of their daily and monthly water usage, as well as make it easier to pay their monthly water bill.

* 1. **Organization of The Study**

**Chapter I: Introduction -** This chapter will introduce our research study, discuss the

background of the study, problem definition, research objectives, questions, Significance,

and Motivations of study that motivated to research this study.

**Chapter II: Literature Review-** This chapter focuses on the previous literature about the history flood risks and researches related to this topic.

**Chapter III: Methodology -** This chapter discusses the methodological development of this project, which includes the techniques that were being used, also will discuss system's description, overview & features, development environment, Hardware, software

requirements, and the best choice device that we are selecting to develop this project.

**Chapter IV: Analysis and design –** This chapter discusses how the system works. Which analyses the current system status including the manual system and the attached software and vulnerability of that system among security and accuracy of the information, this chapter also discusses the solution given by this work to solve all possible problems in the current system.

**Chapter V: Implementation –** this chapter confers about the design and development of a system by using software tools and hardware devices.

it also displays the most important code which makes a fundamental impact on the system functionality and screenshot about system interface.

**Chapter six: Conclusion and Recommendation** - This chapter clears the overall summary of this project based on the objectives and findings, the drawback of our system and recommendations for future works that important will to improve

**References**

Dahlström, P., & Söderberg, A. (n.d.). *Turning Smart Water Meter Data Into Useful Information*. 83.

Kim, T., Ramos, C., & Mohammed, S. (2017). Smart City and IoT. *Future Generation Computer Systems*, *76*, 159–162. https://doi.org/10.1016/j.future.2017.03.034