## Abstract

Retail stores, commonly referred to as supermarkets in Kenya, are a core part of an urban community. A majority of the goods purchased by urban area dwellers are from these stores and their presence in major shopping Centers in the country goes further to prove their significance.

As a result of the continued increase of shoppers visiting these stores, long queues have continued to riddle supermarkets and retail stores that use a traditional cashier operated Point Of Sale systems. To the disgruntlement of the store owners, long queues have become a pain to many customers at major retail outlets. A quick visit to any of the retail stores in the capital to purchase a bottle of soda in the evening will have you queuing for close to twenty minutes awaiting your opportunity to get served by the often-tired cashier. This leaves you with the wish for a faster and more convenient mode of payment.

A Self-checkout mechanism is proposed to try and overcome this problem. the objective of this project is to develop a smart cart that will enable customers to scan and bag items while shopping. This will enable the decentralization of the goods payment process thus reducing the time required to obtain the service.

# CHAPTER 1

# INTRODUCTION

## Background

Retail enterprise has been one of the sectors that have experienced a dynamic shift over the past years both in developed and developing countries. Retailing occupies an important position, both socially and economically, in the economies of all modern societies.

In Kenya, the retail sector has experienced enormous growth due to the increase in the purchasing power of the general population. The last ten years have seen the coming up of various shopping malls around major towns in the country. This, however, has not been without its fair share of problems.

Supermarkets usually offer a variety of products at relatively low prices by using their buying power to buy goods from manufacturers at lower prices than smaller stores can. This has led to more shoppers preferring to purchase goods from these stores.

The implication of this is the formation of long queues at the supermarkets, Point of sale system. This impacts on customer satisfaction. Recent research conducted by, Qudini, London based SaaS customer experience management platform has revealed that 26% of customers who walk out of stores due to long waiting times and poor customer service will discontinue their purchase completely, costing British retailers £3.4 billion a year.

Commenting on the findings, Imogen Wethered, CEO of Qudini, said: “With online now allowing consumers to have more choice, convenience, and cheaper prices, they have become increasingly impatient and demanding within bricks-and-mortar retail stores. They expect retailers to deliver a superior service and in-store experience. Poor customer experience and long waiting times are no longer acceptable. As a result, retailers need to ensure that they are reviewing key customer pain points and integrating the right technologies and solutions.”

In a 2015 study of factors that influenced consumer preference for supermarkets in Kissi town [2], an adequate number of cashiers to reduce queuing time was ranked first among the factors.

1.2 Problem definition

**Long queues** continue to be a bottleneck in the retail stores' business model leading to customer frustration and reduced efficiency. According to a survey by Box Technologies and Intel in the UK, 90% of shoppers actively avoid stores with long queues. 70% even said they might not go back to a store with long lines. Hardware-based self-checkout machines have been proposed, that is similar to the tills cashiers operate, as a solution.

The **high cost of purchasing** a hardware-based self-checkout system has continued to discourage store owners from installing these systems in their retail stores. Being business people, return on investment is always a key factor they consider and there is a concern on the viability of the hardware option. This option is often left to multi-national companies that have the requisite financial muscle.

## 1.3 Objectives

The following have been designated as the core objectives of this project:

* Research, understand and describe a cheaper solution to queues that is easy to integrate with existing systems.

Emphasis will be on a hardware-based solution, not just to provide a self-checkout system but also overall efficiency and stability.

* Avail to shoppers a faster way to pay for goods purchased.
* Decentralizing the payment system to reduce time spent in retail stores.

## 1.4 Justification

The project takes a crack at solving the queue problem in the retail stores. Implementation of this project would see reduced queues in supermarkets. This would lead to enhanced customer experience thus boosting customer satisfaction that is paramount in the retail sector. The project also cuts down on the cost of current hardware-based self-checkout systems.

## 1.5 Scope

There are various inventory management systems available and in use by retail stores.in light of this, this project shall limit its scope to incorporating the hardware-based self-checkout solution available to the average supermarket user.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Introduction

Checkout systems have been in use since the 1900s where manual cash drawers were used .The advent of the computing age brought about the development of point of sale systems that could also perform inventory management roles. the self-service till was invented by David R Humble, inspired by standing in a long grocery checkout line in south Florida in 1984. The tills became popular in the 1990s. By 2013, there were over 200,000 in stores throughout the world.[6]

In the recent years, customers at retail stores have become increasingly impatient and demanding due to technology easing most user needs e.g. instant messaging. This has led to the advent and development of the self-check-out systems such as amazon go.

## 2.2 Existing systems.

**1.Amazon go.**

Amazon Go is a chain of retail stores in the United States operated by the online retail company Amazon. The stores are partially automated, with customers able to purchase products without being checked out by a cashier or using a self-checkout station. According to a promotional video published by Amazon, the store concept uses several technologies, including computer vision, deep learning algorithms, and sensor fusion to automate much of the purchase, checkout, and payment steps associated with a retail transaction. However, public rollout of the Seattle Amazon Go prototype location was delayed due to issues with the sensors' ability to track multiple users or objects within the store,[8] such as when children move items to other shelves or when more than one customer has a similar body habitus.[9]

**2.Panasonic’s RFID Based Walk-through Checkout Solution.**

With this "RFID based walk-through automatic checkout solution," customers can automatically checkout by walking through the checkout lane with the basket containing products with RFID tags. By scanning information of, for example, prepaid cards in advance, the solution will automatically scan products and complete payment.[10]

**3.Walmart’s self-checkout stations.**

Customers scan their groceries. Shoplifters are prevented from packing items without scanning them by technology that calculates the weight of products. If the weight of the bag does not match the weight the checkout has calculated based on barcodes, staff are alerted. For products without barcodes, customers choose the item from a list of photos on the screen. The item is then automatically weighed and priced. The customer can select the method of payment on the touch screen. This system however was faced with a weight measurement problem where the system kept on signaling false positives leading to the embarrassment of most shoppers.

# CHAPTER 3

# Methodology

## 3.1 System Analysis

### 3.1.1 feasibility study

#### Operational feasibility

#### Economic Feasibility

#### Technical Feasibility

### 3.1.2 DEVELOPMENT METHODOLOGY

### 3.1.3 DATA GATHERING

### 3.1.4 PROBLEM INVESTIGATION

### 3.1.5 REQUIREMENTS ANALYSIS

#### Functional Requirements

#### Non-functional Requirements

##### Data integrity

##### Performance

##### Usability

### 3.1.6 USE CASE MODEL

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# CHAPTER 5

## References

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