Development of a Weight-Based Pricing System for Agricultural Produce using C Sharp Programming Language

Z.K Adeyemo, W Adekunle, A.O Amole, R.O Abolade

Abstract— The Weight-Based Pricing System is developed in a way to quantify items in kilograms and give their prices which have been programmed into the system. Some of the existing systems have superimposed noise on useful signal which serves as a constraint in achieving higher accuracy and wastage of energy. Therefore, this paper developed a weight-based pricing system for the agricultural produce using C-Sharp programming language with high level of accuracy. A weighing system consists of a weighing sensor that serves as transducer which converts weight to electrical signal and sends it to the developed digital pricing system which was implemented in C-Sharp programming language. The digital weight-based pricing system displays the price on the Liquid Crystal Display (LCD). The system has a Graphical User Interface (GUI) for easy assessment of the system and used to compute the prices of different agricultural produce such as yam tuber, maize grain, rice, cocoa seed, beans grain and cashewnut at various prices per kilogram. The performance of the developed system was evaluated using price (₦). The price in Nigerian currency (₦) of the weight-based pricing system for maize grain sold at ₦5 per kilogram obtained for 20kg, 40kg, 60kg and 80kg were ₦100, ₦200, ₦300 and ₦400 respectively. Similarly, the prices for various weight of each of the agricultural produce items stated above were computed at the appropriate price per kg. The system was developed put an end to visual assessment and local measuring techniques. It also enhances price stability as the transactions of every seller is monitored and recorded in the database.

Index Terms— Weight, GUI, Price, System, Database Minimum

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1 INTRODUCTION

The usefulness of weight-based pricing system is increasing day by day in most business enterprises because measuring the weight to determine the price of farm produce is user friendly with varieties of different applications. Praise, price and prize began to diverge in old French, with praise emerging in Middle English by early 14th century and prize being evident by late 1500s with the rise of the z spelling. To set (or put) price on a material which implies "offer a reward for capture" emerged in 1766. Hence, price is the quantity of payment or compensation given by one party to another in return for goods or services [4].

The concept of heaviness (weight) and lightness (levity) dated back to ancient Greek philosophers. To Aristotle, weight and levity represented the tendency to restore the natural order of the basic elements: air, earth, fire and water. Absolute weight to earth and absolute levity to fire is ascribed. The first operational definition of weight was given by Euclid, who defined weight as the heaviness or lightness of a material, compared to another, as measured by a balance [3].The modern technology makes use of The Graphical User Interface (GUI) which is a type of interface that allows user to interact with electronic devices through graphical icons and visual indicators such as secondary notation as proposed to text-based interfaces, typed command labels. GUIs were introduced in reaction to the perceived stiff learning curve of command-line interfaces (CLIs), which require commands to be typed on keyboard. The actions in GUI are usually performed through direct manipulation of the graphical elements [5], [6], [7], [8], [9].

Many researchers have worked on weighing system among is Dahikar [2], who worked on the "Design of an Embedded Platform for Digital Weighing System to Enhance Measuring Capabilities" in which its design and implementation showed high resolution advanced digital weighing scale designed based on 24-bit sigma-delta ADC along with fully featured embedded system. The system had superimposed noise on a useful signal from the weighing system which served as constraint in achieving higher accuracy. Aberg in [1] also worked on "Weight-Based Charges for Domestic Solid Waste Disposal" with primary objectives of investigating the effect of the introduction of weight-based charges for domestic waste collection. A special subroutine was written in order to convert the data on the weights of waste collected from the format used in West Cork County Council's routines into household-based files. The elasticity of the system with respect to waste-based was found in one study. The effects of Unit-Based Garbage Pricing, a Differences-in-Differences Approach was used

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on garbage pricing and it was found out that weight-based systems reduced garbage quantities more than volume-based quantities [10], [11], [12], [13], [14].

Therefore, this paper developed the weight-based pricing system to be used for farm produce using C-Sharp programming language with reduced complexity and higher accuracy. The electronic pricing system was developed to purposely display the price of a commodity based on weight of the commodity. The system is designed to resolve price conflict between sellers and buyers in local markets. The developed system is user friendly. A load cell and a Graphical User Interface are embedded in the device to enhance the effective functioning of the price based weighing system. A load cell is a transducer used to create electrical signal whose magnitude is directly proportional to the force being measured. The various types of load cells include hydraulic load cells, pneumatic load cells and strain gauge load cells. The strain gauge load cell operates through a mechanical process, the weight being sensed deforms a strain gauge. The strain gauge measures the deformation (strain) as a change in electrical resistance, producing the force and the weight of the commodity which is the applied force in this case measured and displayed the price of the commodity.

2. SYSTEM MODEL

The weight-based pricing system was modelled using equation (1);

$$P(x) = f(x).W(x) \tag{1}$$

where P(x) is the price given as an output (price of farm produce in this case), f(x) is the price/kg which varies from one commodity to the other, W(x) is the weight of the commodity in kilogram (kg).

Block diagram of the system is shown in Figure 1. Weighing system was used to measure the weight of the commodity. The weighing sensor senses the measured weight and converts it to electrical signal. The sensor which is a transducer then sends the electrical signal to the polarizing filter which has a vertical axis to polarize light as it enters. Glass substrate with Indium Tin Oxide (ITO) determines the shape that will appear when the LCD is turned on. Vertical ridges etched on the surface are smooth. The signal is passed to twisted pneumatic liquid crystal. The glass substrate with common electrode film, ITO, with horizontal ridges lines up with the horizontal filter. The polarizing filter film has a horizontal axis to block and pass light and the reflective surface to send light back to viewer. The pricing system calculates the price of the farm produce based on equation (1) and the price of the commodity is displayed on the Liquid Crystal Display (LCD) which is a flat panel display. The information was stored on a database for future retrieval or editing. The database is used to record the transaction of the sellers for monitoring purpose if every seller sells a particular commodity on the agreed price based on the weight of the commodity. In the database, each seller is assigned a personal identification (ID) number so that every transaction is easily traced to the seller. The data are organized to model aspects of reality in a way that support processes requiring information. This can be used for modelling the transactions of each seller in a way that support price control.

Fig. 1. Block diagram of a Weight-Based System
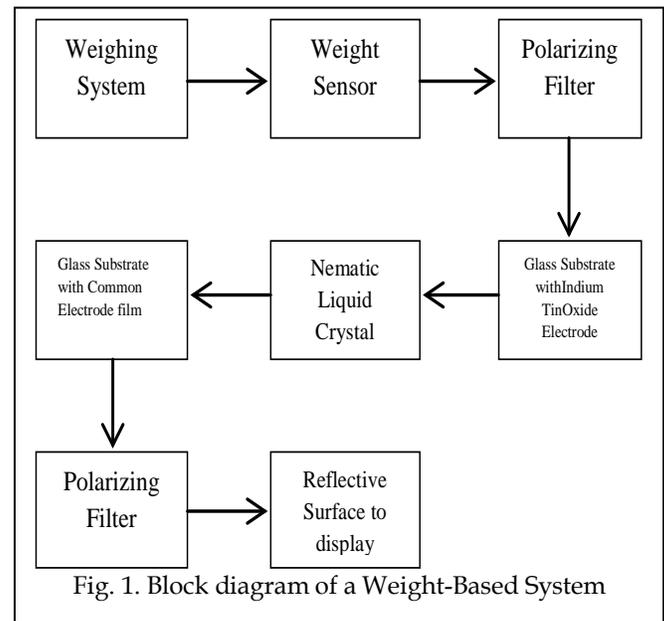
2.1 Software Architecture

The mathematical model was implemented with C-Sharp programming language which was developed by Microsoft within its .NET initiatives. It is for both object and component-oriented programming.

2.2 Application Flow

This describes the operations of the main modules of the software application and their connections. Figure 2 shows the flowchart of the process. Production Identification (PI), Product (P), Quantity (Qty), Quantity Requested (QR), Price Per Quantity (PP), Seller Name (SN), Seller Address (SA), Seller Identification (SI) are the parameters supplied as inputs. The system automatically assigned a unique Seller ID to any user of the system whose name and address was entered as input to the system. Hence, the other parameters when supplied as inputs were determined by a condition that if the inputs are supplied to carry out transactions (seller)to stock goods (product). If it was for stock purpose, the product's name and price per kilogram were input to the system where the system in turn assign a unique product ID to the product, price per quantity and the quantity available in stock. The process further led to where a request was made to carry out transactions. The process in turn dealt with SI, PI and Qty parameters, this results in an output being given as price of the total quantity demanded. The other condition is to carry out transactions based on the quantity demanded from the seller, this inputs led to the consideration of PP and PI before giving an output in form of price.
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Fig. 1. Flowchart of the process
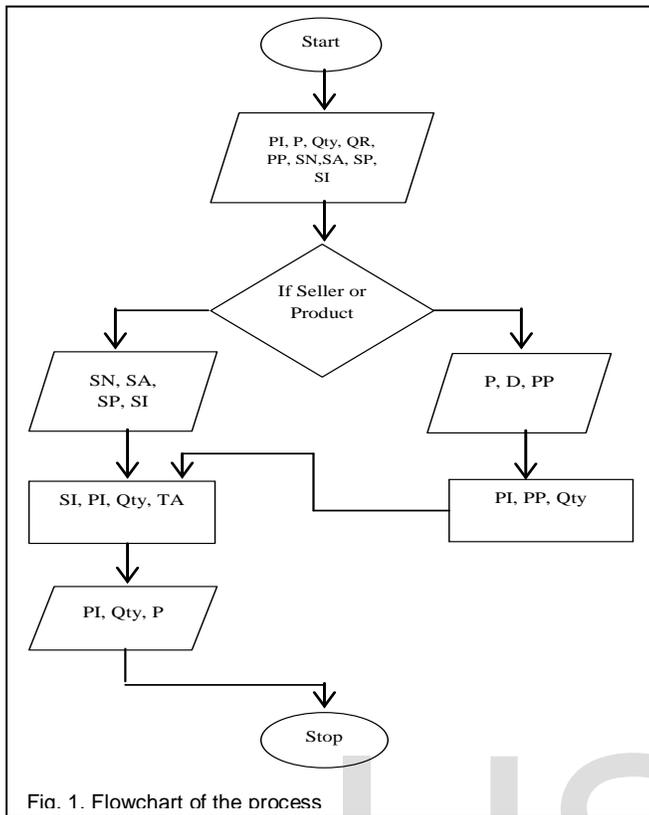
The system model of the system was implemented with C-Sharp programming language. The model was designed to possess sub-interface such as the Stock Interface, New Seller Interface, Seller's Request Interface, Equipped Store Interface, Transactions Report Interface.

The screenshot of the Stock Interface is presented in Figure 3. The Stock Interface allows the seller to enter newly available farm produce to be sold into the system. It has sub-menus like the name of the farm produce, the commodity category (cash crop or grains), the price per kilogram of the commodity and the save sub-menu that allows the seller to save the information entered in the other sub-menu.

The New Seller Interface caters for the inclusion of new seller into the database; this is shown in Figure 4. The new user supplies information needed like state, city, name and phone number, the system automatically generates an identification number based on the state and city of the user. The information is saved in the database making use of save sub-menu and updated if the need arises.

The Seller's Request Interface which allows the seller to calculate the price of the commodity ordered for by a particular customer is presented in the screenshot shown in Figure 5. The interface allows the seller to select the category of the farm produce purchased by the customer and as a result, the available farm produce in the selected category are displayed on the food item sub-menu. The seller inputs the quantity demanded by the customer and the system automatically generates the price of the commodity based on the weight of the commodity ordered for. The transaction is recorded and stored in the database. Figure 6 shows the screenshot of the

Equipped Store Interface used to update the farm produce item in stock. The seller supplies the item's name, category, price per kilogram and an assigned commodity identification number. Upon the provision of the necessary information, the system updates the store based on the information provided using the insert sub-menu.

The screenshot presented in Figure 7 shows how the Transaction Report Interface is used to record the seller's transactions in the database. The transactions of each seller were filtered by date (between two given dates) and the seller's unique identification number.
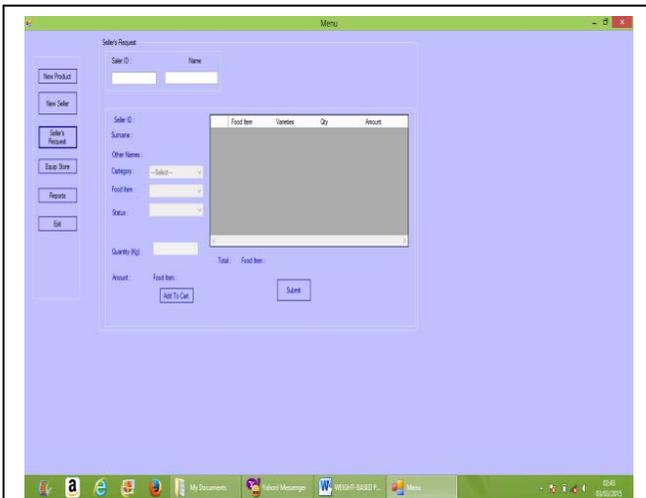

Fig. 3. Screenshot of Stock Interface.

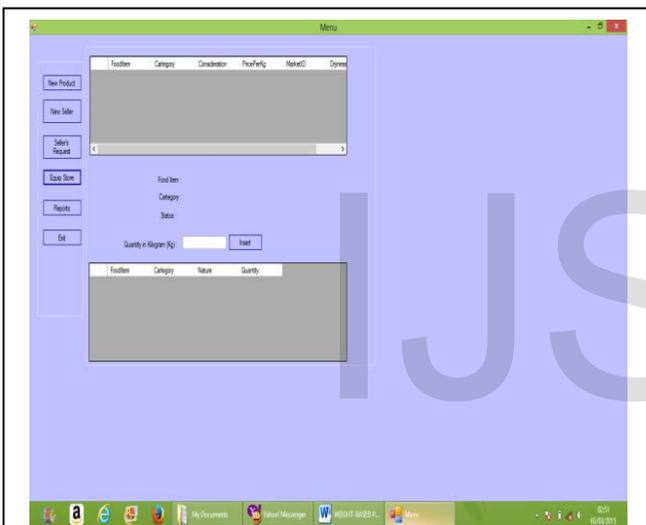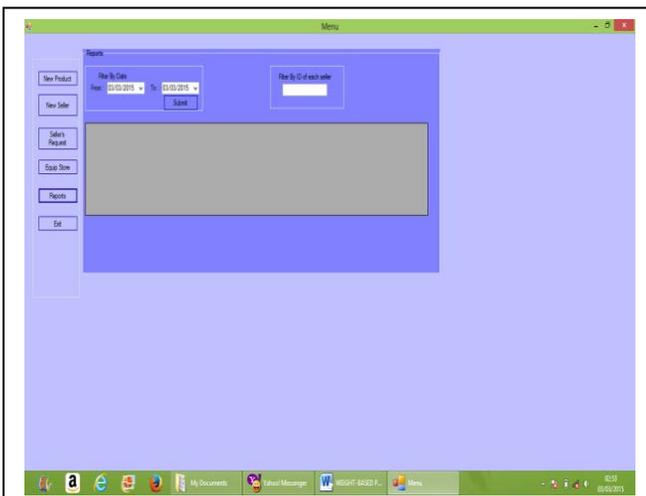Fig. 4. Screenshot of New Seller Interface.
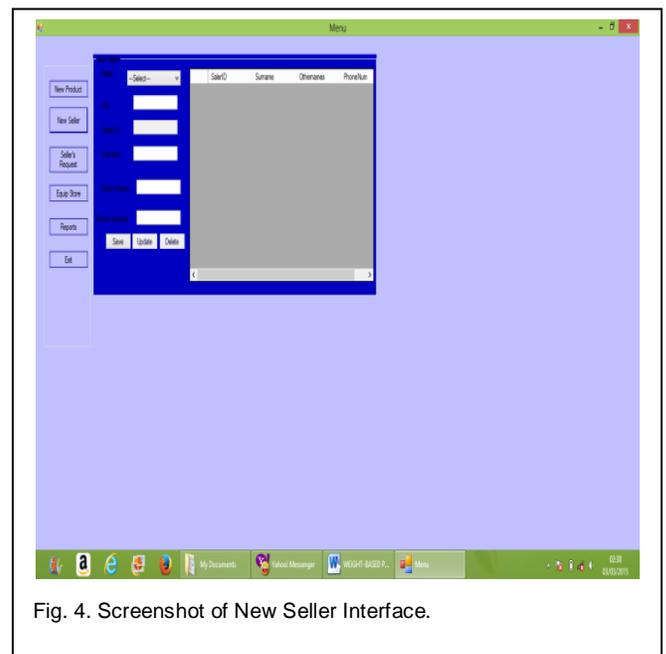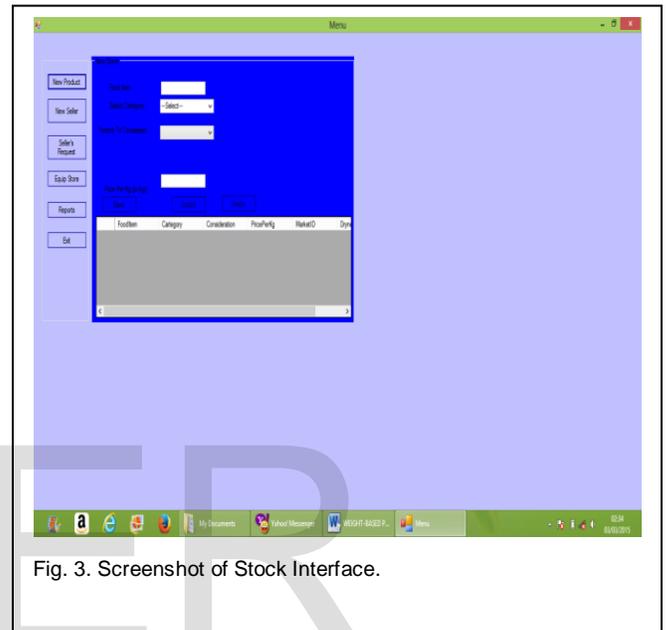
Fig. 5. Screenshot of Seller's Request Interface.

Fig. 6 Screenshot of Equip Store Interface.

Fig. 7 Screenshot of Transaction Report Interface

The results presented in Tables 1 and 2 showed some transac-

tions carried out on the developed weight-based pricing system. In Table 1, the price per kilogram of maize was fixed using Nigerian currency of ₦5.00 naira and different quantities of maize were input into the system. The table contained the accurate prices against the quantity weighed. In Table 2, different items with different prices per kg were inputed into the system and quantities demanded were also varied. The system showed that the price calculation of the system was accurate.

TABLE 1.
Price computation for different weight of maize at ₦5 per kilogram

Quantity Demanded in kg	Total Price in Naira
20	₦100
40	₦200
60	₦300
80	₦400
100	₦500
120	₦600

TABLE 2.
Price computation for different farm produce at different prices per kilogram

Commodity	Quantity in kg	Price/kilogram	Total Price in ₦
Yam tuber	200	20	₦4000
Maize grain	300	3	₦900
Rice	50	5	₦250
Cocoa seed	1000	30	₦30000
Beans	400	4	₦1600
Cashew nut	500	15	₦7500
Garri	80	8	₦640

4 CONCLUSION

The paper has developed a weight-based pricing system using C-Sharp programming language which computed prices of commodities and displayed on LCD. The system developed has a graphical User Interface that made the system user friendly. The system can be adopted by sellers in local markets to resolve price conflict and for transaction tracking since a database where transactions are recorded was created.

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