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ZAMBIA AGRICULTURE COMMODITIES MARKETING SYSTEM

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Abstract *— Zambia Agricultural Commodities Marketing System is an online website which links buyers and sellers of agricultural commodities. It is a product created after identifying the problem of lack of an online organized platform for Zambian Agricultural Commodities producers and buyers meet and initiate transactions and a system that provides the producers and buyers with information about the price for different Agricultural Commodities, by district and province.*

Case study or document review of published work and observation were the fact-finding methods used to understand the problem further and to outline the requirements of the new system.

The evolutionary model of development was used in developing the system.

The Result of the document review and observation was the detailed system design specification which were used to create a solution that solved the problem outlined above.

Keywords*—Traders, Producers,; agriculture trade, agiculture commodity*

I. INTRODUCTION

Trade requires communication and Information and communication technology – particularly mobile communication technology have changed the way people communicate and interact. Small scale farmers and traders using information and communication technology can have access to market information and agriculture policy makers can have accurate information to influence policy in the agriculture sector.

In Zambia information and communication technology have been used in agricultural trade to disseminate pricing information about agriculture commodities using the Short Message System (SMS).

The above system lacks in the following areas.

1. The cost to receive the SMS is transferred to the farmers.
2. The system is mobile service provider dependent making it difficult to reach areas

where that mobile service provider does not have mobile network coverage.

3. The cost of implementing the Short Message System in high as this requires a short code which in costly to acquire and maintain.
4. Pricing information is collected by only agents of the implementing organization and therefore might not be up-to-date and accurate with some degree of bias.
5. Lack of transparent price discovery as well as institutions and instruments to manage price risks keeps a lot of players away from the agriculture markets.

The goal of this project is to enhance the interaction between farmers (producers of Agriculture Commodities) and traders (buyers of the commodities and provide accurate information to both the producers and buyers using widely available Information and Communication Technology. To fulfill this goal the project has the following objectives:

1. Be able to link farmers (producers) to traders (buyers) of agriculture commodities.
2. Reduce the cost of communication by providing information in the format that is accessible to all the without hindrance by the type of technology being used.
3. Collect accurate and timely information that can be used by policy makers in agriculture trade.
4. Introduce transparency in agriculture trade to reduce exploitation by 'brief case buyers' and to enable predictability of prices in order to maximize profits and reduce post-harvest losses.

II. MATERIALS AND METHODOLOGY

To solve this problem, feasibility study was conducted that showed that most of Zambians use mobile phones to access the internet, of which 80% of internet users are people between the age of 15-35 (ZICTA, 2015) therefore, it is not just possible but cost effective to undertake this project.

A case study on the use of Information and Communications Technology to improve agriculture trade and data collection by review of published materials and the analysis and observing similar websites (websites that are promoting agricultural trade) was conducted.

From the articles reviewed the requirements of a new system are drawn and the evolutionary software development methodology was chosen to develop the system.

Requirements Analysis

Requirements analysis is the process of finding out, analyzing, documenting and checking the services and the constraints the new system requires. The requirements of the system are drawn from review of published material and the observation and

specifications from similar systems that deal with agricultural commodities.

There is a vast amount of literature that relates on electronic agriculture commodities exchanges Marketing Information Systems even though most of it centers on models that have been implemented in other countries and regions in the world and not in Zambia.

"ICT TO ENHANCE WAREHOUSE receipts and Commodity Exchanges in AFRICA" by Sophie Walker (Walker, 2010) is part of a series of paper that looks at how ICTs can be used to improve agriculture markets. It shows that ICTs can contribute to Warehouse Receipts and commodity exchange by shifting from paper based administration to an electronic system and to accommodate 24-hour trading. The paper further states that electronic warehouse receipts will benefit small scale farmers indirectly as there will be more resources to purchase the commodities from the market and therefore the buyers will keep going back to the market. Walker (2010) was mentions the Zambia Agriculture Commodities Exchange (ZAMACE) and other successful commodity exchange systems like the South African Commodity Exchange, the Uganda Commodity Exchange System and the Ethiopian Commodity Exchange System.

Eleni Gabre-Madhin (2006) provides information on fundamental to the understanding of a commodity Exchange system in the paper entitles *"The Devil is in the details: Understanding a Commodity Exchange"*. This paper highlights the function of a commodity exchange which help in the transformation of some of the functions into an electronic function that can be used in an electronic commodity exchange system. The paper is biased towards the implantation of a commodity exchange system in Ethiopia but a lot of ideas can be drawn from this paper on how to create a function and useful electronic exchange system.

"Impact of Information Technology in Agriculture Commodity Auctions in India" (Banker, R., Mira, S., 2005) is a research paper that compares the use of ICTs in coffee markets as compared to the traditional physical markets. It developed hypothesis that justify the use of electronic trading to improve agriculture trading. It also shows the benefits of electronic exchange commodity systems.

"Intelligent Electronic Trading for commodity Exchanges" (Lee, H., and Lee, R., 1993) provide an overview of the requirements to develop an algorithm that can intelligently match buyers and sellers. This paper also shows the characteristic present in commodities and how information technology can be exploited to these commodities.

The development of warehouse receipt systems (WRS) emerged as an important means of improving the performance of agriculture marketing systems in Africa. Progress in promoting WRS and related

market institutions in Africa has generally been slow or limited but interest remains high in East and Southern Africa. In Zambia, stakeholders are advocating warehouse receipt legislation in order to build confidence in the receipt system, while investing in rural aggregation infrastructure to expand scope for smallholder access to the receipt system (Onumah, 2010). This paper shows the benefits of warehouse receipts and the challenges that hinder their implementation.

Dissemination of information is a key factor to enhancing trade in Agriculture Commodities Systems. Daria Gage in the paper entitled *"Revitalizing Zambia's Agriculture Marketing Information Centers"*, presented some problems related to collection and dissemination of Agriculture Commodity information, solutions to the problems and the benefits of the solutions to the problems outlined. Some of the problems outlined are that the formalized method of collection and analysis of data hindered by lack of manpower, inconsistency in the timeliness of collection of information and in the dissemination of this information. Dissemination is mainly by radio transmission and the data is mostly historical therefore loses relevance. Daria Gage proposed using robust data collection methods and on demand analysis and dissemination of information to the consumers of this data. (Gage, 2011)

The paper *"Strengthening Agriculture Marketing with ICT"* identifies and impediment to the use of agriculture information being the language that the message is sent (Neil, 2011). This is in the same line as the paper by Michael Clasen and Rolf A. E. Muller (Clasen Michael, 2006). Clasen further suggest factors that make it possible for an Agriculture Commodity Marketing Information System to be successful and what factors can lead to the failure of Agriculture Commodities Marketing Information Systems.

The system design, implementation and testing part of the system are the work of the author even though they follow paradigm present in most Software Systems books like Software Engineering by Ian Sommerville (Sommerville, 2004)

Requirements Specification

The result of the requirements analysis is the requirements specification document which is a detailed specification of the requirements of the proposed system that will be solved both operationally and technologically using information and communication technology. It specifies

The system requires the following to be deemed successful.

1) Functional Requirements

These requirements describe what the system will do.

1. The systems should provide information about the price and place where a particular Commodity is based.
2. Users should be able to search for a commodity they need to buy or sell.
3. A form to post Commodities to buy or to sell.
4. An information board where the price for commodities from a particular area are displayed on a demand basis.

Non-Functional Requirements

These are requirements that are not directly concerned with the specific functions delivered by the system. Some of the functional requirements in Zambia Agriculture Commodities Marketing Information System are:

The system should be easy to use by all users regardless of the literacy level. This will be made possible by designing an easy to use user interface with short description of what has to be done at every stage of use of the system.

Reliability-The system should not be overwhelmed by high degree of access rendering it in accessible. Therefore, it shall be deployed on a server with high bandwidth, fault tolerance and security.

Dependability-The System should be dependable. It should provide timely accurate unadulterated information to traders.

The system will be backed up on a regular basis

Fault detection-Input errors will be capture before processing in order to provide accurate data capture.

Platform independence – This entails the system should be created such that it can run on most of the available devices without restrictions to the hardware and operating system. This requires a design paradigm that is mobile friendly while retaining the experience of the personal computer users.

System Requirements

The requirements outline below are the minimal required to run the system.

Server Requirements

- Apache Server
- 1 terabyte Hard Disk Drive
- 8 Gigabytes Memory
- Network connection with high bandwidth.

User requirements

- Personal Computer with Keyboard, pointing devices and Display System
- Internet Connection

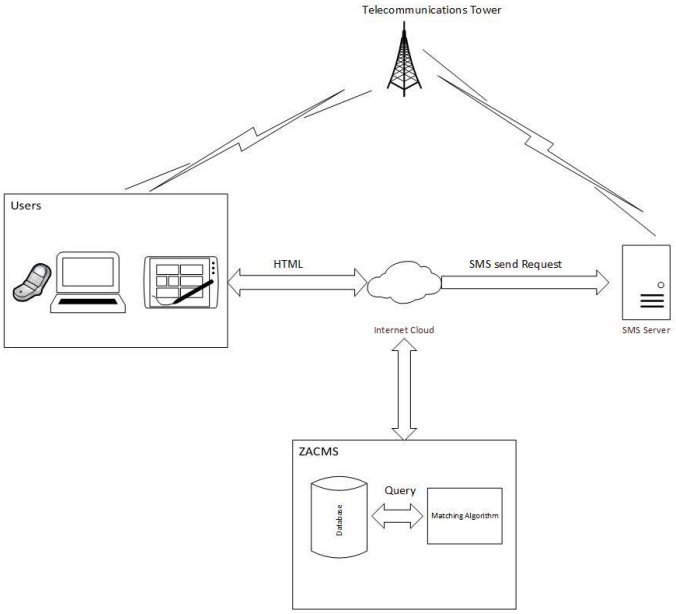
System Design

System Architecture

This section describes the hardware and software required for the system to run properly.

Hardware

- Personal Computer connected to the internet – to access website
- Mobile phone – to receive SMSs
- Server – to host the database and the webserver.

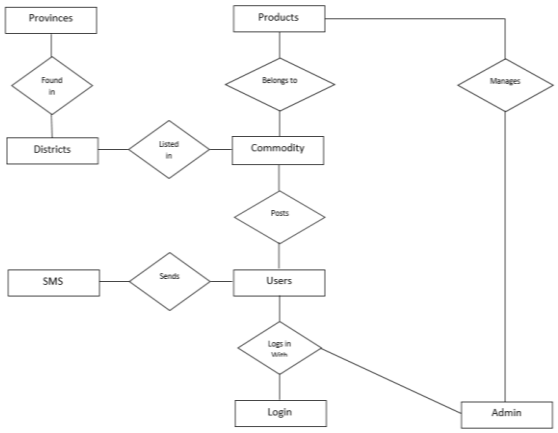


Software

- Apache webserver – the parse (serve) the request to HMTL pages and interpret Php server-side code
- Browser
- Login module – to authenticate the identity of the users
- Registration module – to register the user's credentials to logon to the system
- Trade match algorithm – to match the buyers with the sellers.
- Communications Module – to initiate the communications between the buyers and sellers using short message service (SMS)
- External SMS Server – to provide third-party SMS services to the clients of the system
- Statistical algorithm that will query the database and provide the dashboard that will provide information on commodity prices based on location and the supply and demand for each commodity for a particular place.

Database Design

Entity Relationship Diagram of the Zambia Agriculture Commodities Marketing System show the entities that are part of the data needs for the system to solve the user problems and how the entities are related to each other. This is the conceptual database design of the system. The conceptual database design guides in the implementation of the physical or actual database design.



System Implementation and testing

The results of the system design stage in the a fully functional system which on the front-end is coded in basic Hypertext Markup Language (HTML) and the

back-end is coded in PHP-Hypertext Preprocessor programming language.

Standard Structure query language statements were used to build the database.

III. RESULTS

The result of this project is the Zambia Agriculture Commodities Marketing information system found at www.kabwesec.net/zacms. This system as the following functions currently in place and functional:

- ***Registration component*** – this is the module from which users of the system register to use the system and to enter their login credentials (username and password).
- ***Add Commodity*** – This function adds an entry into the database of what the user is trying to buy or sell. When adding an entry, the search function is called to give suggestions of the possible matched instantly
- ***Search Function*** – the search function checks against the users' search criteria (what the users are trying to search for) with the entries of commodities in the database. The users' search is stored as an entry. The logon function is called to check if the user is currently logon on to the system.
- **User Interface Design –** User interface design shows the frontend of the system. This is part of the system that is open to the public, which is the entry point for users to interact with the system. The user interface shows the screens where the users enter data into the system and screen where the users get information from the system. The user interface should follow a design paradigm to be able to run on all the browsers starting with mobile phones that are java based but not smart phones. Therefore
- ***Home page*** **–** This is the first screen in the system when the user is logged. It is will be made up of a form with fields where the user enters their search criteria and a button to cancel and a button to submit the form for processing on the server.

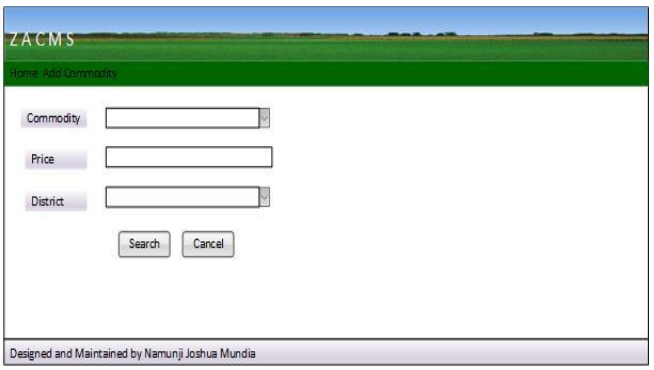


Figure 1 - Home page design

- ***Registration page*** – This is a page where the users enter their credentials that they are going to be using when conducting business on the system. These include their actual names, ID number, postal address, physical address and phone numbers. After entering these credentials, the registration module will

proceed to another page that will require the user to enter their logon details like the username and password. It is only after entering their logon details that they will be granted access to the system through an approval setting that will be changed. If not, they will have to complete the registration process.

- ***Search results*** – the result out of the search function will be displayed on the search results page. This page will provide a button to contact the other trade by sending a Short Message with the system's short message module which is hosted by a third party.

IV. CONCLUSION

Zambian Agriculture Commodities Marketing System has solved the problem connecting buyers to sellers of agriculture Commodities while creating a platform to collect and gather data for policy makers in agriculture sector to make timely and informed decisions. This will benefit all players in Agriculture trade as the traders and buyers will have timely market information to enable them to make intelligent decisions while allowing policy makers to make appropriate policies to improve and solve problems from accurate data.

In order to reap the maximum benefits users, all stake holders have to be encouraged to use the system to find buyer/sellers and in the process, generate accurate data that will generate data inputs for the policy makers to make accurate decisions that will improve farmers welfare and boast agricultural trade.

Operationally, the system requires to be deployed on a low-cost SMS server solution that can encourage users to use the system with minimal costs passed on to them. The kiosk system will be used in rural areas where the cost of electronic gadgets and off grid power solutions are prohibiting factors in the use of ICT while taking advantage of the expanding mobile service coverage.

The advantage of this system is that it can be accessed via any mobile phone that has GSM mobile browsing capabilities which are most accessible to most people owing the reduction in the cost of acquisition of these devices. The other advantage is that the system is not tied down to the single mobile operator and the cost is passed on to the user which will be minimal since internet speeds are increasing while the cost of data in reducing.

An automated trading system will be of much benefit as traders will add their proposed request to the system and the system will automatically match and contact other traders. That will increase speed in trade.

To increase confidence in the distant agriculture trade, there is need to integrate a warehouse receipting system that provide quality assurance to the buyers of agriculture commodities that what they are buying is actually available and in the right quality and quantity (Onumah, 2010).

V. ACKNOWLEDGMENT

Like any project, developing an application of this nature cannot be a one-man effort. In developing this application, I had the privilege of working with dedicated professionals. The contribution of many people has resulted in the development of the Zambia Agriculture Commodities Marketing Information System and made my project work enjoyable.

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