Research Journal of Applied Sciences 2 (10): 1036-1042, 2007
ISSN: 1815-932X

Design of a Framework for the Implementation of Electronic-Cattle Transaction (E-Cattle) in Nigeria

Olabode Olatubosun
Department of Computer Science, Federal University of Technology, Akure, Nigeria

Abstract: Cattle transaction in Nigeria is a very lucrative business that has contributed significantly to the nation's economic growth. Most developing countries where cattle business strives have witnessed many setbacks as a result of the prevailing political, environmental, socio and economical factors. Cattle dealers are susceptible to attack by armed robbers and conveying cow from place to places pose high risk interns of road safety. With deeper penetration and spread of Internet, more and more online transaction applications are becoming available. In this study, a framework for the implementation of a functional e-commerce for cattle business using Nigeria market as a case study is presented. The study focus is on a market place for cattle business on the internet. The architectural framework is christened e-cattle. The decision variables that constitute the content of the site were presented. The relational database model of the e-cattle was also presented. Apache, php and Mysql server are considered good for its implementation. It addresses concept such as the cattle business in Nigeria in a nutshell. A wide range of initiatives for e-payments over the internet and wireless networks which have been developed by a large number of payment service providers, including financial institutions and new providers of payment services comprising technology and telecommunication companies such as e-money schemes, personal online payment services and prepaid cards were presented. The E-cow which is based on the Internet is expected to bring together the buyers and sellers of cattle and cattle related goods and services.

Key words: E-commerce, cattle, network, e-payment, personal online payment services and prepaid cards

INTRODUCTION

Cattle transaction in Nigeria is a very lucrative business that has contributed significantly to the nation's economic growth. Most developing countries where cattle business strives have witnessed many setbacks as a result of the prevailing political, environmental, socio and economical factors. Cattle dealers are susceptible to attack by armed robbers and conveying cow from place to places pose high risk interns of road safety. With deeper penetration and spread of Internet, more and more online transaction applications are becoming available. E-commerce provides a new way for enterprises and entire sectors to inter-relate and therefore enables the development of new business models. The increasing use of new communication technologies and the need for specific payment mechanisms for e-commerce have created opportunities for new intermediaries to facilitate the sending and processing of payment instructions. At the same time, banks have also developed new means to access customer accounts and to originate payments. In this study, a framework for the implementation of a functional e-commerce for cattle business using Nigeria market as a case study is presented. The study focus is on a market place for cattle business on the internet. The architectural framework is christened e-cattle. It addresses concept such as the cattle business in Nigeria in a nutshell. A wide range of initiatives for e-payments over the internet and wireless networks which have been developed by a large number of payment service providers, including financial institutions and new providers of payment services comprising technology and telecommunication companies such as e-money schemes, personal online payment services and prepaid cards were presented. The E-cow which is based on the Internet is expected to bring together the buyers and sellers of cattle and cattle related goods and services.

Electronic commerce (e-commerce) has very attractive features such anywhere, anytime shopping/banking (24 h×365 days) and no holidays, zero inventory, no middlemen and so forth. It helps customers to compare various products in the range and class, study their features/performance and make an informed decision about the merchandise before purchasing. On the other hand, sellers/producers also get advantage of targeted

customers without doing active marketing. If information about goods/merchandise is made available on web (internet), the intended buyer will get the information, without active advertisement of the goods by the producer. Thus, both the parties, buyers and sellers, get unique advantages by ecommerce technology, (Murthy *et al*., 2000).

E-commerce is a new method of transacting business using information technology, which allows physical processes to be replaced by electronic ones. It is fundamentally an open system, usable by all enterprises anywhere, provided an appropriate infrastructure is present and has low barriers to entry, unlike earlier forms of electronic data interchange. Bolger (2000) observed that the introduction and use of e-commerce have an effect in four ways, viz: Improve economic efficiency (via the supply chain), allow the use of new business models (based on online trading), magnify the effect of other changes going on in business and result in some changes to our society. E-commerce provides a new way for enterprises and entire sectors to inter-relate and therefore, enables the development of new business models. In this study, focus is on a market place for cattle on the internet. The architectural framework is christened e-cattle.

Cattle in nigeria market: Animal protein is an important dietary component for Nigeria's middle and elite classes but its cost limits its accessibility by the poor. The trading and marketing side of cattle is dominated by the Hausas both at local and national levels. As reported in Adamu *et al*. (2003) Sokoto region is a major supplier of livestock for the country's meat protein and leather needs, while Ibadan is one of the major southern cattle markets and centres of meat consumption.

Cattle, commonly referred to as cows, are domesticated ungulates, a member of the subfamily Bovinae of the family Bovidae. They are raised as livestock for meat (called beef and veal), dairy products (milk), leather and as draught animals (pulling carts, plows and the like). In some countries, such as India, they are subject to religious ceremonies and respect. It is estimated that there are 1.4 billion head of cattle in the world today (FMARD, 2000).

Cattle rearing have been given the greatest prominence in discussions of Nigeria's livestock industry (FMARD, 2005). The country's cattle territory is essentially in the Sudan Savannah where the limiting factors are the amount of water supply available as one moves north from the Middle Belt or Guinea Savannah towards the Sahara and the existence of tsetse-fly infested forests to the south. This main cattle territory contains about 90% of the country's cattle population. The two other cattle-producing areas are the southern forest zone where the Muturu cattle which is tolerant to typanosomiasis is found and the Guinea Savannah where the Ndama cattle and crosses of Muturu and northern Zebu cattle are found. These two lesser areas contain the remaining 10% of the country's cattle population. The White Fulani, Sokoto Gudali and Zebu cattle are the main breeds of cattle employed for traction in northern Nigeria.

The major challenges faced by cattle business are: the network distribution of ready to sell cattle, correct pricing, meeting specification and management of fraud. In cattle trading, it is of great expectation that transaction of cattle between buyers and sellers must be a smooth easy process. This process has to be as price competitive as possible and satisfy both the buyer and the seller.

Cattle market operation in Nigeria: As described in (Adamu *et al*., 2005) many actors and processes are involved in cattle trade. The first stage in the North is carried out by small traders who moved among the cattle rearers who have between 5-10 herds of cattle. *Dillali* (selling commission agents) and yan kwamisho (transport commission agents) build up herds for transportation to the south of Nigeria. At the market, retailers operate through a host of intermediary traders who seek carcass butchers in the urban and perurban areas to petty traders who take the cattle into more remote similar rural areas. There, the butchers and meat buyers form the last link in the chain. They either operate direct from their own retail outlets or through subagents who carry meat as itinerant meat sellers in the urban areas.

Central to the cattle commodity chain in Hausa society is the Kara (Hausa for livestock market). Sources of livestock in Acida kara are breeders from villages and towns of Niger republic, Sokoto, Zamfara and Kebbi states. Once in the market, the sale is done by a Dillali (dillalai-plural, dillanci the system or practice) for a commissioned fee. The sale could be done either direct to a consumer, to a whole seller, to a butcher or to a long distance trader. At what ever stage, there are have the drovers (Yan'kora,) who transport the livestock by foot to the abattoir, to the resident of a buyer or to the long distance trade section of the market for loading to other markets. Figure 1 presents a conceptual chart showing the cattle marketing structure in Nigeria market.

In southern Nigeria the sale of cattle at Akinyele Kraal is done by the Hausa dealers (dillalai). The dillalai

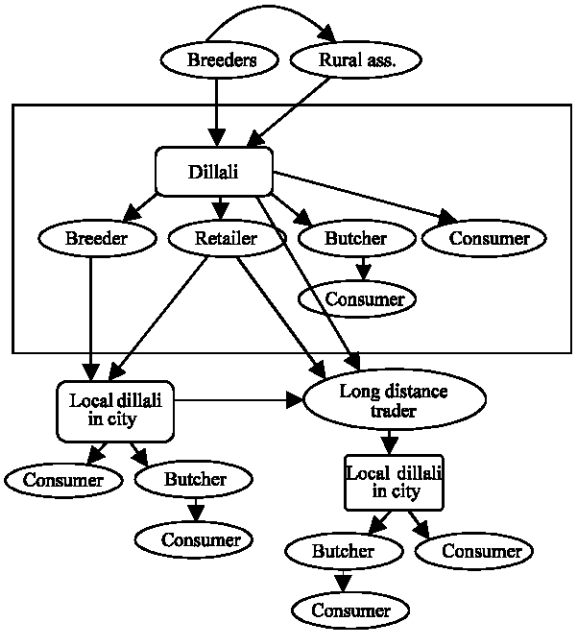

Fig. 1: Cattle Trading Chain (Source: Modified Fatima *et al*., 2005)

are under the control of the landlords to whom they report on transactions with buyers. There are some middlemen called 'barandas' locally. These are people who stay around the Kraal waiting to work on new buyers who are not accustomed to the cattle business practice.

They link the new buyer with the dillalai and often do the bargaining on behalf of the buyer. After any successful bargain, the buyer then pays the middlemen fees, ranging from N500.00 to N1,000.00. This is in addition to the N1,000.00 paid as 'la'ada' to the dillalai. In other words, it is more costly to buy through a middleman. This is why they concentrate on new buyers. A cow may change hands up to between 5 and 7 times between the sources in the northern markets to the slaughter slab at Bodija market.

At Akinyele only live cattle are sold, at the Bodija market cows are sold either live or slaughtered. The majority of the dealers are retailers who buy different parts of the slaughtered cows for transportation to other markets in Ibadan metropolis.

The choice of the market by cattle dealers depends on information they receive about prices at various markets before embarking on their journeys, easy availability of transport and the varieties of cattle species in demand at any point in time. Information on prices and markets is got from dealers on fresh arrival. Most traders in the north rely on trader associations, followed by personal links by GSM and telephone lines. Drivers commonly have a mobile GSM which they use enroute to inform others about happenings on the route (e.g. where police check points are encountered armed robbers, etc). Few government sources of information are used, largely because the information is obsolete by the time it is received. The type of information mostly required includes supply and demand situation, prices of cattle, security and fuel situation. Within Acida market, on the basis of the market information on prices provided by the *Dillali*, the livestock owner fixes a minimum and a maximum fee for his livestock. The owner can decide to stay around or not, it does not make any difference. If a buyer comes, it is the *Dillali* that negotiates the price and sells within the price fixed. If the market prices have fluctuated, the dillali seeks out the owner and informs him of the changes for a new price to be fixed or the owner may decline to sell. No sale is made without the consent of the livestock owner.

Selection of southern markets is made through the dan kwamisho's network of road transport workers across the country, now facilitated by the mobile phones. The *Dan'kwamisho* is able to provide the trader with price information of all the livestock markets in the country. Armed with this information the trader can decide where to send his livestock for sale. The cattle traders in southern Nigeria at Akinyele have phones and those without have access to public mobile phones through which they contact their counterparts in the northern markets. Through such contacts they exchange information on prevailing prices and the cattle market situation both in the south and the north. They also get information on the dates of departure of drivers bringing cattle to the south.

OVERVIEW OF E-PAYMENT SYSTEM

Research has revealed that both e-commerce and traditional transactions are most commonly settled by means of traditional payment products. Payments over the internet are currently dominated by the credit card, the transfer order and the direct debit mandate. Except for the credit card, such payments are effected off-line: The delivery of payment orders to the banks is not made over the internet (DNB, 2003; European Central Bank, 2002).

Traditional payment services: A wide range of initiatives for e-payments over the internet and wireless networks have been developed by a large number of payment service providers, including financial institutions and new providers of payment services comprising technology and telecommunication companies. The new payment service providers offer their products either directly to customers (positioning themselves between the banks and their customers) or to financial institutions (providing the technical know-how and/or operational facilities).

The following includes the methods and techniques, which have been developed to adapt the traditional payment instruments for use over the internet:

Credit cards: Credit cards allow customers to make purchases and/or withdraw cash up to a prearranged ceiling. The credit that is granted is either settled in full by the end of a specified period, generally a month, or can be settled in part, with the remaining balance extended as credit. The former arrangements are sometimes called delayed debit cards, but for the sake of simplicity both variations are called credit cards.

Credit transfers: A credit transfer is an instruction from the payer to his/her bank to transfer on demand deposits of a certain value to the beneficiary's account.

Debit instruments: Debit instruments allow the payer to have purchases directly charged (debited) to funds on his/her account at a deposit-taking institution. A distinction is made between 3 types of debit instruments: direct debits, debit cards and cheques.

Direct debits: Direct debits are pre-authorised debits on the payer's bank account that are initiated by the beneficiary. Direct debits are currently often used for recurring payments, such as utility bill payments (e.g. for water, electricity and telephone usage), or for one-time payments where there is no direct contact between the payer and beneficiary.

Debit cards: Debit cards provide a convenient way to present the cardholder information needed to debit the cardholder's bank account. This information is embedded in the magnetic stripe (or chip) on the back of the card. A dedicated terminal is required to read the information on the debit card and possibly to verify whether the debit card is still valid and whether the transaction would exceed usage limits set for the card.

Cheques: A cheque is a written order from one party (the drawer) to another (the drawee, normally a bank) requiring the drawee to pay a specified sum on demand to the drawer or to a third party specified by the drawer. An electronic cheque follows the same principle, except that the order is in electronic format rather than in writing. Mainly payment providers in the United States have begun to offer electronic cheques (e-cheques) to allow customers to pay for purchases online. The system works with prior registration where cheque account information and the e-mail address of the payer are provided.

INNOVATIVE PAYMENT INSTRUMENTS AND SERVICES

Common to these innovative payment instruments is the use of information and telecommunication technologies that were previously not available for payment purposes.

Prepaid payment services: Several prepaid schemes have emerged in for small-value e-payments. A distinction is made between three groups:

- E-money schemes which were originally developed to replace small cash payments in everyday life.
- Personal online payment services which were initially developed to allow person-to-person payments in online auctions.
- Prepaid cards which were developed for anonymous and small-value payments over the internet.

Common to all of these is the fact that they are based on prepayments, where the user (payer) transfers value in advance to a personalised account at a payment service provider or to a device such as a smart card. These funds can then be used to make payments to other participants in the scheme.

E-money schemes: Electronic money (also referred to as digital cash or electronic cash) is broadly defined by the European Committee for Banking (ECB) as an electronic store of monetary value on a technical device

that may be widely used for making payments to undertakings other than the issuer without necessarily involving bank accounts in the transaction, but acting as a prepaid bearer instrument (Report on electronic money, ECB, August 1998).

The electronic value is comparable to cash (although unlike cash it is not in open circulation) and can be stored e.g. on a smart card (card-based schemes) or on a personal computer (software-based schemes). Some card-based e-money schemes allow payments over the internet as well. Software-based e-money schemes are based on tokens, which can be described as digital coins. The tokens (or coins) are obtained from a payment service provider via the internet and are stored in a digital wallet on the user's PC. From the PC, they can then be used for making online payments on merchants' websites that accept these tokens. The merchants can redeem tokens with the payment service provider.

Personal online payment services: The growing success of auction sites on the internet has led to the emergence of payment service providers, which allow person-to-person e-payments over the internet. The schemes operate similarly to banks, i.e. customers open accounts with the payment service provider and funds on these accounts can be used to make payments. The main innovation common to these initiatives is the use of e-mails and the payment provider's website for communication between the payment provider and the users and the ease with which new accounts are created in these schemes.

Before payers can initiate payments, they have to sign up to the scheme and make a prepayment into a bank account of the payment service provider using traditional payment instruments such as credit cards, cheques or credit transfers. When making a payment, the payer connects to the payment service provider's system (generally through its website) and submits the payment order. The payment service provider then transfers the funds on its internal accounts from the payer to the beneficiary. Generally, e-mail addresses serve as a means of identification in the systems and e-mails are sent to notify the sender and beneficiary of the payment transaction details. After the transaction has been made, the beneficiary can either withdraw the money from his/her account in the system or, if he/she wants to participate in the system, can keep the money stored in the system. Since payments within the system are executed in real time, the payment service provider does not get any float income for these transfers.

According to European Central Bank (2002) these schemes have the advantage that they allow person-to-person payments across national borders. Furthermore, the payer can pay and receive funds using an account that is funded by traditional payment instruments regardless of the physical distance. Payments can also be initiated and received conveniently (only an e-mail address is required). According to this business model, private customers are not normally charged for using the service and thus payments through it have lower costs than the services provided by banks. Also no additional hardware is required (such as smart cards and terminals) to use the service.

Prepaid cards: In these schemes, the payer's prepaid accounts are funded through cards that are sold in kiosks and shops. A number printed on the card and only visible after scratched provides access to a prepaid account on the internet. The prepaid accounts are held in remote servers instead of being stored on the user's PC or smart card. The value on the account can be used for e-commerce transactions of small value, although it is possible to combine the value of several cards. The advantage of these schemes is similar to the personal online payment services, i.e. that no additional hardware is required and no additional costs have to be borne by the customer. The scheme also allows for anonymous payments because no registration is needed and no bank connection or credit card details have to be sent over the internet.

ARCHITECTURE OF THE FRAMEWORK FOR E-CATTLE TRANSACTION

The basic component of the e-cow model includes the traditional payment instructions (credit card, cheques or credit instructions), wed interface to display product for interested buyers, payment service providers, banks, database to keep record of all transactions and dillali.

It is very essential for the dillali or any of the actors that deals on selling cattles, to design a web page to display all ready to be sold cattle. On the web, appropriate attributes to describe cattle must be presented on the web to enable buyers see and know what to buy. The seller must also have a designated financial manager (bank or payment service provider) to manage payment. Any of the traditional payment system can be adopted as well as the new innovation systems to make payment either via the internet or direct transfer. On this note, a desiring customer searches through products on the internet,

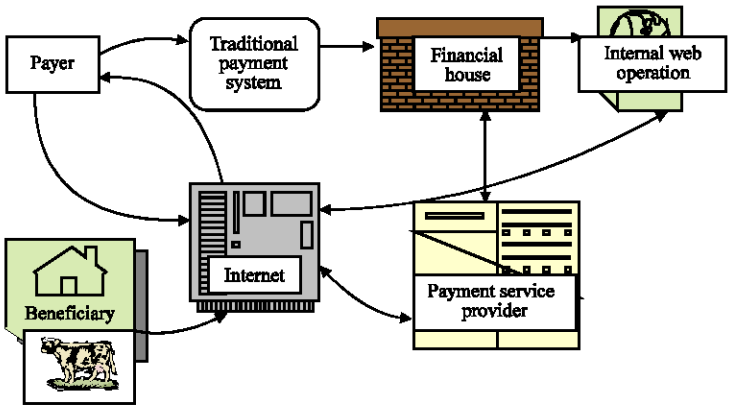

Fig. 2: Network of the buyer/seller and the payment service provider

settle for what to purchase, make contact with seller with links and then agree on the payment method. On payment, the seller makes adequate arrangement on shipment to the buyer. Figure 2 present the scenario.

Information to be contained in the Web site should include:

- Market location
- Variety of cattle
- Type of cattle and specification
  - Colour
  - Size
  - Weight
  - Height
  - Structure of the horn
  - Body structure
  - Age
  - Animal health
  - Price
  - Shipment method and price

The systems database should contain the following relations:

- Cattle[catle_id, source, variety, colour, size, weight, height, structure of the horn, body structure, age, animal health, price].
- Dealer[dealer_id, fname, lname, address, tribe, age, next_kin, location, preferred_banker,].
- Banker [dealer_id, client_id, catle_id, quantity_ purchase, total_payment, payment_means, transport_means].
- Client[client_id, fname, lname, address, age, banker, variety, colour, size, weight, height, structure of the horn, body structure, age, animal health, price_range, quantity_purchase, payment_means].

CONCLUSION

In this research study, an e-cattle system, an internet based cattle transaction system has been presented. The system consists of a payment system that handles the payment and remittance of the cattle transaction, the dillali who is the cattle seller, the traditional payment system which means one can make payment to the payment system and the innovative payment system. Participants of e-cattle will be able to trade cattle like never before. Designing and using e-cattle as a means to buy, ship, feed and sell cattle globally could produce a new breed of white collar ranchers. It can also link together producers and buyers who seek specialized products. A cattle buyer would not be limited to the choices in his or her area, but can now choose from a much larger supply of livestock over the internet. If e-cattle is implemented, it will enhance an open exchange, for example, might allow a producer to sell directly to a consumer, bypassing traditional intermediaries and provide intermediaries with opportunities to adapt their roles. Buying cattle via the internet will reduce the risk involved in moving liquid cash around thereby eliminating fraud that may result from robbers. Payment through the internet would makes it possible for people who are not familiar with the cattle market to buy their cattle without going through the middle men.

For further research, one can look at designing a wed site for e-cattle in the region.

REFERENCES

Dan B., 2000. The Direct Impact of E-Commerce, located at http://www.maf.govt.nz/mafnet/publications/

DNB, 2003. Paying on-line any time, anywhere?, Quarterly Bulletin 2003. www.thuiswinkel.org/onderdeel/welkomspagina/home_shopping_netherlands/engels/dutch_online_consumer_expenditure.asp.

European Central Bank, 2002. E-Payments in Europe published by the European Commission.

Fatima, A., M. Filani and A.B. Mamman, 2005. Market and Transport Institutions In Nigeria's Livestock, Trade: Case Studies From Sokoto and Ibadan.

Federal Ministry of Agriculture and Rural Development (FMARD), 2000. Opportunities in the Agricultural Sector, NigeriaBusinessInfo.com

Federal Ministry of Agriculture and Rural Development (FMARD), 2005. Opportunities in Nigeria's Agriculture Sector (Reviewed, 31st Oct 2005).

Murthy, N.N., B.M. Mehtre, K.P.R. Rao, G.S.R. Ramam, P.K.B. Harigopal and K.S. Babu, 2000. Technologies for E-Commerce: An Overview, Institution of Electronics and Telecommunication Engineers 43rd Annual Technical Convention (ATC-2000) on E-Commerce, New Delhi.