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GIS Supported Bank Collateral Mapping: A Case Study of Cooperative Bank of Kenya, Thika District

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KEYWORDS
Banking processes, loan facility, collateral

ABSTRACT:

The cooperative Bank of Kenya is one of the leading financial institutions in the country providing credit to its customers. The existing system entails filling of application forms which are then vetted through a grueling and error prone process. The bank needs to verify the authenticity of documents submitted as collateral, evaluate the credit worthiness of the client and establish that the client does not have huge outstanding loans with other financial institutions.

In this study both spatial and non-spatial information on all securities owed to the bank was collected and stored in a spatially aware database. From this databank, a solution was developed that allowed customer information to be interrogated prior to processing his/her application. This solution will minimize human error, reduce fraud in the banking sector and provide a spatial representation of all property used as loan security

The solution features an array of functionality to support loan appraisal, ensure security of access to the system via a logging in interface and prepare reports and maps about customer information held by the bank. These can be used to inform the customers why their applications were rejected. This solution largely automates the process of loan appraisal to the point of award or rejection.

1 Introduction

Recently, Kenyans have increased their investments by embarking on new projects. Investments range from single businesses, agriculture, corporations, to larger empires such as the shipping industry, security firms and real estate. Over the years banks have reduced their lending rates and this, coupled with the improving Kenyan economy owing to tighter security has led to increased consumer spending and investment (Kuria et al, 2009). The Kenyan economy maintained a rapid growth between 2005-2007 of 5.9% and 7.0%. However, the growth recorded a major decline in 2008 of 1.6% owing to the global recession and the 2007 post-election violence. In response, the government put up measures to stimulate growth including, restoring investor confidence and expansionary fiscal policy such as the economic stimulus package (ODI, 2010).

The financial sector expanded by 4.6% in 2009 compared to 2.7% in 2008. This was mainly caused by increased profitability by banks, and attributable to the reduction of the minimum cash ratio requirement from 6.0% in December 2008 to 4.5% by July 2009 (CBK, 2009). This in turn has increased the money in circulation availing more money to the banks to lend out to the general public at lower rates, with more people signing up for loans. With so many loan applications to be processed using manual verification and checking, there is an attendant risk of losing documents or misplacing files and possibilities of double allocation. This creates an avenue for fraud in the banking sector leading to loss of millions of shillings in revenue.

In the past banks kept their records in files but currently loan requests are persisted in computerized databases. However, spatial data is still kept in hardcopy form making it difficult to verify availability of spatial entities used as collateral to the loan application. When one puts up collateral, the bank uses a surveyor, to verify the

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record, and an appraiser, to conduct the valuation of the property, to ascertain the true value of the property. This process typically takes a minimum of three weeks.

A Geospatial Information System is a unique geographic database that can provide a great deal more problem solving capabilities than using a simple mapping or adding data to an online mapping tool (Kuria *et al*, 2009a). Some of the benefits such a system offers include: increased efficiency, increased revenue, better communication within the organization, better decision making, better storage and updating of data, efficient information retrieval and the ability to trade in the data collected.

The main objective of the research was to create an efficient bank security banking system to display the location of bank assets and attach the value of the security and aid in the processing of loans. This will be accomplished through (i) showing the distribution of the Bank securities, (ii) showing the location of bank securities and the value attached to the property, (iii) countering fraud in the banking sector in the office by connecting land parcels with customer information, (iv) minimizing human error during data entry by maintaining a single database and putting in place mechanisms to validate data entry and assigning responsibility for database modification.

2 The study area

The study area is Thika district which lies between 0° 45’ S - 1° 00’ S and 37° 00’ E and 37° 15’ E.

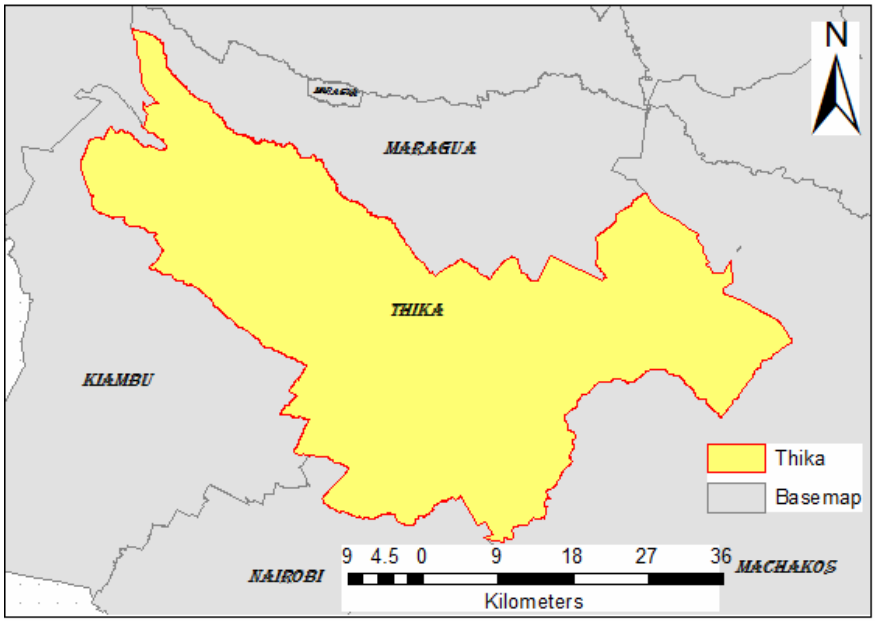

Figure 1 Study area Thika District

Figure 1 show the area extent of the study area. This work was carried out for the Cooperative Bank of Kenya, Thika District. The bank has various branches within the district, it has a substantial customer base in the area and it has been dispatching various financial products for its customers among which are loan facilities.

2.1 Process of loan taking

When taking up loans there are two major players involved, the lenders and the borrowers. The lenders in a loan syndication have the responsibility of conducting due diligence with regard to the borrower. The borrower may provide relevant information (e.g., organisational documents, annual reports) to the lenders through the arranger or agent, and the lender could use such documents for due diligence purposes (including customer identification) as appropriate. Identity may, however, be verified on a non-documentary basis, and lenders may obtain relevant information from other sources. The lenders do not have a due diligence obligation with respect to each other, nor does the arranger or agent have such an obligation with respect to the borrower solely by virtue of its capacity as arranger of, or agent under, the credit facility.

GIS can be a useful tool for decision making supporting verification as it makes location related decisions and analysis very easy. It makes the analysis simple and precise if the inputs are correct. Thus one can have the benefits of analysing spatial data as well as socio-economic data from within a GIS platform.

In secured loans where the borrower pledges some asset such as plots and buildings, the use of GIS can be very instrumental since the assets are positioned on the surface of the earth and therefore possess spatial qualities which can be used to accurately locate the asset and all the available information on it. GIS can be used in the form of an Land Information System (LIS) which contains parcel information such as owner information, parcel size, parcel definition, land use and administrative information. This information can prove imperative to lending institutions when assessing the collateral offered by borrowers and ascertaining their legitimacy and nature and condition of the asset. The LIS may also be used to get legal information such as if there are any charges on a parcel put up as collateral and save the institution a lot of money and time (Khan, 2006)

3 Materials and methodology

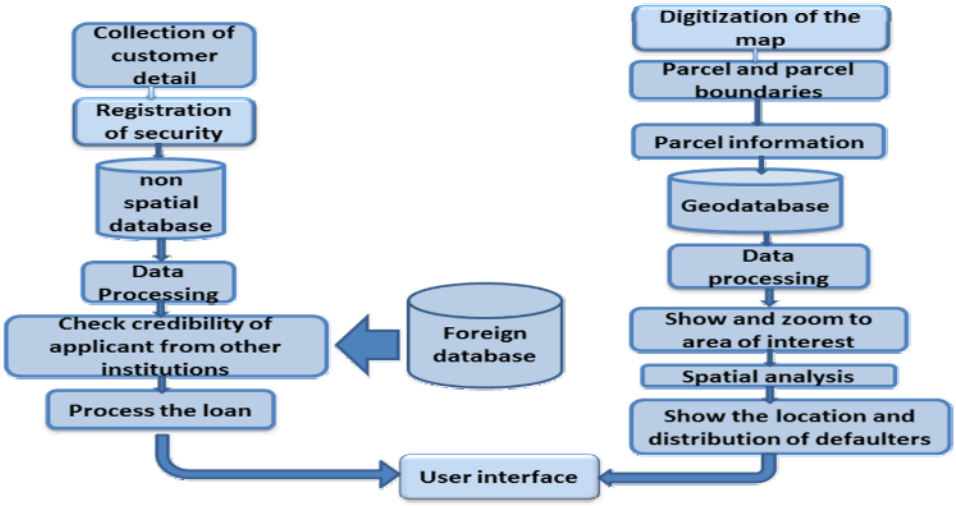

Figure 2 Methodology flowchart

Figure 2 show the steps taken to realise the solution developed in this work.

3.1 System design

An analysis of the existing system was made and the following are the main details that the bank collects: full names, gender, date of birth, marital status, nationality, postal address, plot number, number of dependents.

The above information is collected on a form and the details are filed pending approval and later fed into a digital database with all the details of the customer. Before approval a search is carried out to ascertain the legality of the title holder and find out is the land is charged by another institution.

The following shortcomings of the current mode of operation were identified: (a) it is a tedious process and time consuming for a search to be conducted, (b) there is no immediate confirmation to the legality of the parcel ownership (establishing if the customer is who he/she says he/she is), (c) there is no way the bank can know the credibility of the customer from other institutions and (d) no spatial queries can be made to ascertain the authenticity of the plot (its location in space)

3.2 Collection of data

The cadastral data used was provided by Survey of Kenya and it included Thika parcels and roads as well streets. The parcel data contained information such as the owner, postal address and price of the parcel.

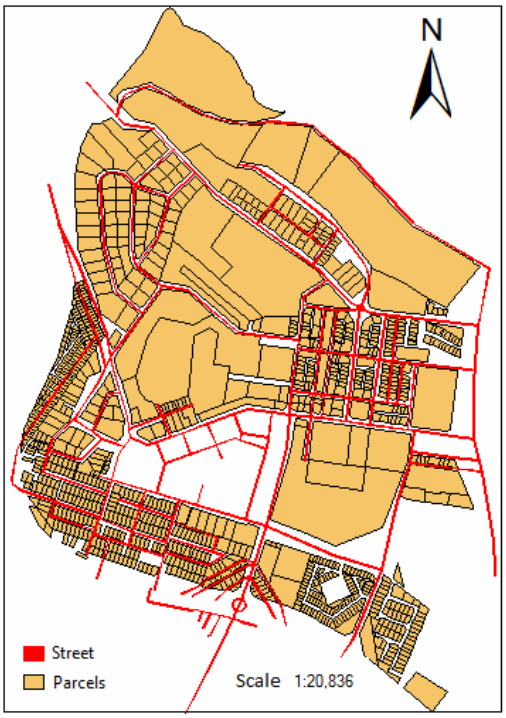

Figure 3 Topo-cadastral data

Figure 3 shows these topo-cadastral data digitized from the topo-cadastral sheets. These data were in UTM coordinate system zone 36 and arc 1960 reference ellipsoid.

All the non-spatial entities required for the system were stored in a MySQL database, with spatial entities stored in a separate Environmental Systems Research Institute (ESRI) geodatabase. The non-spatial database in MySQLwas used to store the account information such as applicants' names, loan information such as amount of loan applied for, the location of a clients assets. The spatial database can be used to show the security location of the loan applicant, zoom to it and show the distribution of the parcels of interest to the bank and flag defaulters.

The tables which were identified and created are:

Employees: - This table contains information on the list of authorised operators of the system including the administrators of the system.

Customers:-This table contains a list of all customers that have applied for a loan using land and business premises as collateral.

Security:-This table contains a list of all the security collateral owned by loan applicants.

4 Results and analysis

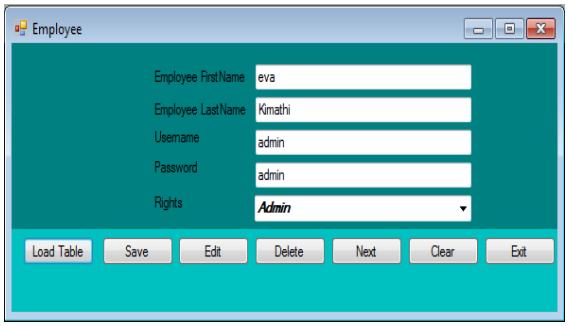

Figure 4 User assignment form only accessible by the administrator

Figure 5 shows the interface to retrieve customer information. These include textual information and images from the owner and the parcel. The system has the ability of querying an external database such as a database shared by other financial institutions flagging defaulters and delivering a message either passing of failing the applicants.

To enhance security a safe login system was created giving users access according to their clearance level and the highest of the clearance level being an administrator. To log in the user has to supply the correct login credentials. The administrator has the ultimate rights in relation to the system. He has access to all the functions offered by the system Figure 4 shows the interface used by the administrator in case modifying users' information is required.

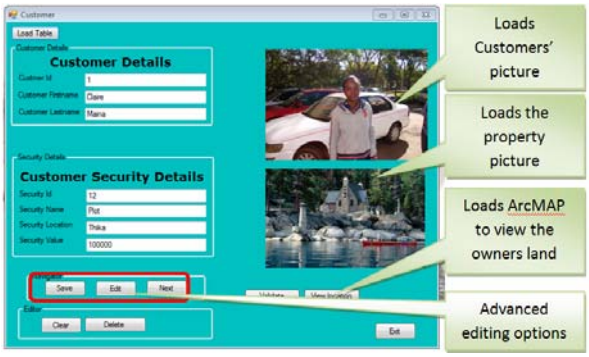

Figure 5 Customer details

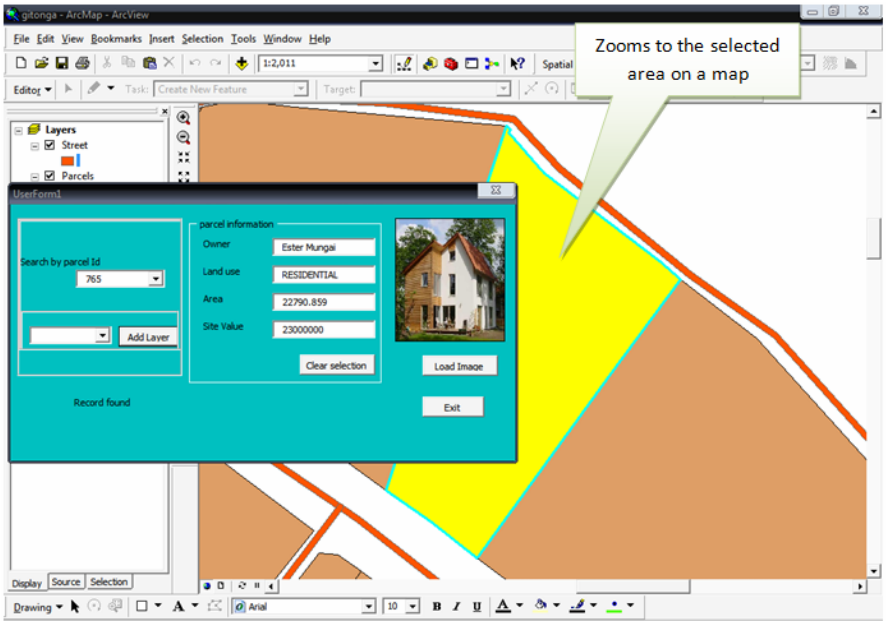

Figure 6 Connection of customer information with the spatial parcel information

Figure 6 shows the connection between non spatial customer information with the spatial information about the parcels. Through this connection, it is therefore possible to identify properties that may already be charged (there are un-cleared loans for which it was used as collateral). The system provides a graphical representation of all loan securities showing their spatial location, distribution and the value attached to the property, showing the location of the assets and their access to roads. It can also provide reports on all customers servicing loans, location and value of the property used as collateral and generally can be used to view all parcel of interest to the bank

5 Conclusion

A system has been developed which allows saving, editing and loading customers of a bank with user restrictions which can be used in order to flag customers and users who may be involved in fraudulent allocation of loan facilities. This system has the capability of viewing the client as well as the security offered by the client in a pictorial representation for better identification. It also has the capability of creating and viewing reports which could be used to support decision making and may inform such strategies to increase market penetration.

This solution addresses the objectives of the research and it is recommended that it be considered for adoption by the Cooperative Bank of Kenya for all its branches as it has been demonstrated as being capable of reducing data entry errors, greatly minimizing opportunities for fraudulent transactions and also ensures speedy and efficient processing of loan applications and appraisal of property values.

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