

## Loan Fraud Detection System for Banking Industries in Nigeria Using Data Mining and Intelligent Agents: the Way Forward

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### Abstract

Criminal elements in today's technology-driven society are using every means available at their disposal to loan the money from their illegal activities. Bad management of banks' loan portfolio in Nigeria often results in bad loan and subsequent bank distress. The high incidence of bad debts resulting from commercial bank's loans and advances is a reflection of the growing problem of distressed banks within the Nigeria's financial system. This research seeks to focus on loan fraud control and prevention, which aim to automate the monitoring and diagnosing of loan fraud detection schemes in order to report suspicious bad debts to banks. The research adopted the technology of intelligent agents and data mining to provide a more adaptive, flexible and knowledge-based solution for loan fraud system. Based on analysis of monitoring, diagnosing and reporting of loan fraud system activities occurring in transactions, several types of intelligent agents are proposed and a multi-agent framework is presented for loan fraud detection system. The proposed multi-agent framework is a stand-alone system which can be integrated by banks to combat loan fraud system.

### Keywords:

Data mining,  
Intelligent agents,  
Customer profiling,  
Financial institution  
and Risk  
management

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## **Background to the Study**

Frauds have plagued telecommunication industries, financial institutions and other organizations for a long time (Jia and Jongwoo, 2005). The types of frauds addressed in this thesis include credit card transaction funds a cellular identity theft. These frauds cost the banks millions of dollars per year. As a result, fraud detection has become an important and urgent task for these businesses. Currently, data mining is a popular way to combat frauds because of its effectiveness. Hand et al (2002) define data mining is “a well- defined procedure that takes data as input and produces output in the forms of pattern.” In other words, the task of data mining is to analyze a massive amount of data and to extract some usable information for future uses. In doing so, we have to define the clear goal of data mining, and find out the right structure of possible patterns that is fit to the given data set. Once we have the right model for the data, we can use the model for predicting future events by classifying the data. In the terms of data mining, fraud detection can be understood as the classification of the data. Input data is analyzed with the appropriate model and determined whether it implies any fraudulent activities or not. A well-defined classification model is developed by recognizing the patterns of former fraudulent behaviors. Then the model can be used to predict any suspicious activities implied by the new data set.

By the intelligent agents we mean computer programs that can act on behalf of a person to do various jobs. Intelligent agents can automate a large portion of the fraud detection process and require little human intervention. Additionally, intelligent agents do not stick to one model or rule. They can construct new models and rules for fraud detection with their machine capabilities. It will be harder to deceive intelligent agents than other computer programs for fraud detection. Besides, in a multi-agent system, many intelligent agents can work in parallel and cooperate with each other. This not only accelerates the detection process but also increases the detection accuracy. Moreover, intelligent agents can be deployed online for real-times detection. It is an extremely desirable feature for online credit card fraud detection and network intrusion detection.

Fraud in Organizations and industries of late has taken on new dimension. This is due to the advances that have been made information technology, its increasing waves has resulted in a whole lot of havoc in various organizations. For businesses and organizations alike, fraud alongside financial crime an acceptable way of carrying out day to day operations. Fraud schemes are ever on the increase, its cost is on the increase same as customers expectations. Fraud has resulted in financial losses, it drives high cost to investigate and pursues litigation, fraud eats away customer/consumers confidence and ruins brand image. It is indeed the number one enemy of the business world. According to Merriam websites dictionary, the term fraud is defined as “the crime of using dishonest methods to take something valuable from a person or a person who pretends to be what he or she is not in order to trick people. In recent times, surveys conducted by leading internal consulting firms indicates that fraud in the financial sector is increasing rapidly as information technology in these sector advances and most of the reported cases involve data manipulation with assistance of bank staff working hand in hand with external fraudsters (lee et al,2005).

Annually banks and financial sectors have lost billions of dollars to fraudsters due to falsification of client's information, disclosure of client information and abuse of position by staff members. Nigerian Deposit Insurance Corporation (NDIC) report as at June, 2016 indicates that banks in the Nigeria recorded 12,279 fraud cases involving the sum N18, 02billion in 2015, which represented a 15.7 percent increase over the year 2014. One such aspect of banking where there is high rate abuse of office and some level of collaboration in perpetrating fraud is in the case of credit loan. Evidence from various previous researches reveal that non-performing loan (NPI) recent times had been one major cause of fraud in banks in the country (Ajah and Inyiama, 2016). Nigerian Deposit Insurance Corporation (NDIC) report as at June, 2016 also indicates that non-performing loan (NPLs) of Deposit Money banks (DMBs) in the country increased to N648.89billion in 2015 and that bad loans also increased by 82.87percent compared to 2014. IT mainly drives the development in credit risk management as it enables for example, electronic servicing and administration of loans, thus, reducing transaction costs within the bank and allowing the realization of economies of scale. From a risk management perspective, data-warehousing of credit, loss data, and its accessibility on aggregated portfolio level is crucial. This data is important in analyzing the risk and return of a loan portfolio and sub-portfolios. By offering the possibility to calculate risk measures on portfolio level and run simulations of the loan loss distribution within a reasonable time frame due to highly effective computing power. IT enables the implementation of a risk-adjusted pricing throughout the bank. Risk-adjusted prices can be provided via online applications to the origination units and credit risk management can be transformed into an active risk management approach.

The role of IT in the risk management process is to assist the organization throughout each risk pillar; to support in the obtaining of risk data, to measure risks, communicate the results and to help mitigate operational risk. Measurement of risk will require the gathering of information concerning the current state of the company (comprising financial positions, loss data, and current process flow) as well as external and internal information concerning the likelihood and occurrence of various risk events. Evidence from various researches reveals that Information Technology has contributed immensely in mitigating the problems of Non-performing loan (NPL) for banks that implemented it (Ajah and Inyiama, 2013). IT can be applied to reduce the risk associated with lending due to fraud as well as find an appropriate solution to the borrower's need for funds, with proper assessment of risk and the inclusion of sufficient control systems to ensure repayment. This can be achieved with the aid of Credit Risk Management System (CRMS). The CRMS adopted by banks in Nigeria has failed in managing credit risk. This research work perceives the failure to be as a result of lack of standard IT-Driven CRMS, prevalence of unethical practices by the management of banks, identity fraud caused by poor system of identification and collateral fraud.

Available statistics showed that Credit risk is a major contributor to the distress of the liquidated banks. This is evident in the outcome of banks reformation exercise of 2009, in which eight (8) out of the remaining twenty-five (25) commercial banks were declared distressed by Central Bank of Nigeria (CBN). Banks have begun to see the need to build credit risk management (CRM) groups that are tasked with a wide array of responsibilities, including governance over the credit lifecycle, ensuring proper risk distribution and sourcing channels, motivating improved portfolio-wide risk metrics, as well as increasing risk-

adjusted performance. These CRM groups often establish risk tolerances for concentrations, stress-limits, and capital requirements - usually at the industry, market and business unit level. CRM groups are in regular contact with a wide array of risk management networks, both internal and external to the bank. Such direct connection to risk markets allows the bank to ensure that deal terms are consistent with the market's expectation, thereby enhancing risk-pricing and increasing enterprise risk awareness. Furthermore, a challenge for today's commercial banks is their inability to understand large amounts of information and reveal useful knowledge to improve decision making. Modern bank managers are flooded with data. The sustainability of their banks depends on their capabilities to sift through large volumes of data, to extract useful knowledge and apply this knowledge in their decisions. An intelligent information system that is based on artificial intelligence will provide managers with added value information, to reduce the uncertainty of the decision outcome and to enhance banking service quality. Thus, the application of new technologies such as Data Mining and intelligent Agents can give a bank a competitive advantage and lead to a higher performance.

Financial institutions can avoid high incidence of nonperforming loan, and costly loan write-offs when a thorough background investigation is conducted at the start of the loan review process. Bankruptcies, defaulted loans, and aliases are flags that require further investigation. The performance of loan contracts in good standing guarantees profitability and stability of a bank. Screening the customer's financial history and financial background is a very significant factor before any credit decision is taken and it is a key process in reducing credit risk. Loan approval will be given to good applicants with low credit risk, whereas high risk applications will be rejected. Therefore, banks should control credit management thoroughly and quickly adopt automated Credit risk management system that will collect borrower's credit information from multiple databases and uses a score card to process this data according to the bank's screening criteria. The score aids risk managers by highlighting areas that require further review. Moreover banking loan decisions require the use of huge and various data and substantial processing time to be able to serve a large number of variables and a variety of different cases related to different customers. The application of the new technologies can give banks a competitive advantage and lead to high loan performance.

### **Objectives of the Study**

The general objective of this paper is to model a fraud Detection system for banking industries using Data mining and intelligent Agents.

The specific objectives are as follows:

- i. To identify what constitutes loan fraud in a banking system.
- ii. Modeling an applicable system for credit card fraud in a real-time transaction on the internet credit care.
- iii. To identify the causes of loan fraud in Nigeria commercial banks.
- iv. To work out a judicious use of Data Mining and intelligent Agent in bank fraud detection.
- v. Model an intelligent agent based system that is capable of detecting and preventing loan fraud and alerts to the credit manger
- vi. To model a fraud detection system for banking industries using Data Mining and intelligent Agent.

### **Significance of the Study**

The process of searching for the fraud is lengthy due to the amount of data involved and also in most cases auditors unknowingly get the information they need from the involved employees whom deliberately mislead them and waste their time. With an intelligent agent fraud detection system in place to check for unusual transactions, the work load is distributed among the agents thus a search is faster and also blocking a transaction can be faster since the different agents communicate and carry out the verifications otherwise done manually. Thus they can be able to detect a fraud on the fly, before a transaction frauds concluded. Without an effective system to check against internal attacks, management of these financial institutions rely on auditors both internal and external to trace the fraud, if they know that one has taken place. The problem is that some fraud can go undetected or by the time they figure out that fraud has occurred it's either too late and the fraudsters have disappeared or they have had enough time to cover their tracks and the trail goes. The main significant is to reduce the risk that involved in the bank.

### **Methodology**

Biometrics based Personal Identification Number called National Reference Number (NRN) will uniquely identify each customer. The NRN will be assigned by Federal Inland Revenue for every permanent worker and directors of corporate business as a proof of identity. This idea must be backed with strong policies that will (i) stop registration of corporate business whose directors have not got NRN. (ii) Mandate directors of already registered business to obtain NRN and update their record with Corporate Affairs commission. (iii) Stipulate one NRN per person no matter the number of company he /she has got. This will check or stop using fake collaterals to obtain loan or same collaterals to obtain multiple loans from various banks. (iv) Deny access to loan to individual/directors with no NRN. Fingerprint scanner integrated in the CRMS fake NRN.

Global Positioning System (GPS) will be used to read and record the coordinates of landed/housing collateral obtained by a loan officer or bank approved property valuer. This will also guard against use of fake collateral in obtaining loan. The values read in this exercise will be matched with the existing values in the land Registration database.

Intelligent agents will provide an effective means for systematic monitoring of loan transactions in the bank, to detect and report to CBN any abnormal financial transactions that may signify a high risk, fraud, and other financial inconsistencies. Such monitoring tasks involve fraud detection, credit risk monitoring, and position risk monitoring. We are confident that intelligent agents are well suited to dealing with the problem of monitoring vast volumes of dynamic information in a distributed fashion. In this way, they are able to detect hidden financial problems, such as financial fraud, handle risks, and other inconsistencies. By utilizing a society of intelligent agents, each charged with carrying out a different function autonomously, credit risk monitoring systems will not only be able to analyze credit risk qualitatively, but will also deduce useful information regarding the state of current investments. There must be one consistent database of knowledge that enables the various agents to exchange knowledge regarding the entities involved.

Data mining technique will help to distinguish borrowers who repay loans promptly from those who do not. It also helps to predict when the borrower is at default, and in determining the credit worthiness of borrower by analyzing the behavior and reliability of the customers. With data mining techniques, banks can do a thorough profiling and ranking of their branches with respect to loan fraud risk. CBN in the same manner can profile and rank commercial banks. To accomplish this, relevant information can be gathered from the credit risk information service databases. These files contain all the essential information pertaining to a loan. That includes characteristics such as identity of loaner and borrower, location of the branch/bank where the loan was issued and changes that were made to the loan. This data is the cornerstone from which the search for any irregularities in the loan process begins. These are specific sets of instructions the bank personnel must comply with. An example of one such rule is whether a loan has been issued without consultation with the CBN credit guidelines. We need to ascertain if clients have loans at other banks before bank A can confidently issue one. Another rule serves to determine whether the pay back account really belongs to the credit owner.

However, the application will go much further than just data mining. Fraud rule results are converted into risk scores and then displayed by the systems reporting application. The reporting application gathers all the information from the rules and transforms these absolute numbers in percentages and relative scores. This data is then combined to create total risk scores for each branch/bank, countrywide. The higher this score, the more likely irregularities occurred at that specific branch/bank.

In addition, the system should have the capability of generating a report or an offer letter after loan approval to a borrower in a clearly tabularized manner on all the interest and charges involved such that from the day one, the customer have a clear knowledge of the repayment plan. It should also generate a report or a Rejection Letter outlining the reasons for rejecting a loan application that did not pass credit check test.

### **Multi Agent Concept**

A multi-agent system is a computerized system composed of multiple interacting intelligent agents within an environment. Multi-agent systems can be used to solve problems that are difficult or impossible for an individual agent or a monolithic system to solve. Intelligence may include some method, functional, procedural approach, algorithmic search or reinforcement learning. (Wikipedia free encyclopedia 2015).

The emergence of multi agent technology has resulted in a new paradigm, hence transforming software development, design and implementation. The intelligent agent based system for loan fraud system is considered effective due to the multi agent capabilities. The desired optimal solution should be proactive and independent. Our desire is to demonstrate an alert notification to the key system (customer database and loan fraud system) on any suspicious transactions on the loan process during run time.

### **Finding**

The system will have a dedicated database for all the banks where summarized records of every approved loan will be stored respectively including the expiry date of the facility. It will

also keep information on the status of any loan that has expired (whether it has been cleared or turned bad). The system should timely update the CBN bureaus with the information in the form of a credit report; Bank must be mandated to report all liquidated loans to CBN and should be ready to report the status of any unreported loan when such request arises from the CBN. This will deal with the problem of banks not reporting their bad loans to the CBN. Stiff penalty will be awarded to a bank that fails to report a bad loan good to a degree of revoking the license.

### **Conclusion**

Adaptive data mining and intelligent agents can play an important role in the loan fraud detection domain. They are robust enough to defeat sophisticated fraudsters, they are fast enough to minimize fraud damages, and they are scalable enough to tackle huge volumes of data. Intelligent agents will eventually be the ultimate means to fight against loan frauds. However, there is still a long way to go before the wide adoption of intelligent agents for loan fraud detection. The accuracy of fraud detection needs to be improved; the reliability of the agents needs to be ensured by testing the system on a real bank server to check its performance and acceptability.

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