Study on Anti-Money Laundering Service System of Online Payment based on Union-Bank mode

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Abstract—online payment becomes a convenient way to launder money with the development of e-commerce. In order to solve this problem, we constructed an anti-money laundering system as a service function of union-bank centre. This system can monitor and analyze the transaction data dynamically, and provide auxiliary judgment and the decision support for anti-money laundering. It utilized many technologies synthetically, such as multi-agent neural network, text mining, genetic Algorithms, velocity analysis and case-based reasoning, technologies, to finds out the hidden money laundering behavior. The logical frame of this system was proposed and some of the key technologies were introduced. Finally, we discussed the practicability and the development of this system and the union-bank online payment mode. In our opinion, this mode will become the lead online payment mode and its anti-money laundering service system will perform a very useful role.

Keywords- anti-money laundering, union-bank mode, online payment, multi-agent

I. INTRODUCTION

Almost every government is committed to the fight against money laundering, because it is such a serious problem to the security of the international finance system and the international political and economic order. We can know the situation from the report below: The worldwide total amount of money laundered gets 3,000 billion, which is 5% of the GDP of the whole world and 8% of the total international transaction amount [1]. However, each government, financial institute and international organization have made corresponding laws and regulations against it, and used the most advanced technological methods to prevent and monitor the money laundering activities, most of them seems to be faint as the popularity of the internet. Especially, the anonymous, fast, safe and no area-limited characteristic of the e-money led itself to become the best way to launder money and brings big challenge to the anti-money laundering (AML) work.

The methods of online money laundering are various which include transfer by the online bank, online payment, online gambling. Among them the online payment is the easiest way with least cost and risk, and become the trend in the future [2]. Convenient information transmission and unsound law system cause the online payment to facilitate the money laundering. For example, it’s easy to open an online shop and the authenticity of the sale record is difficult to be distinguished. So the seller only need to sell their goods to some fictitious customers and fake the sale record, then the income is turned to be legal. It is possible to launder money even without any goods and customers, especially for some online service because no one will know if the service was done. Besides, some art goods and keepsake whose value can not be measure definitely, and the online auction system is usually used by the money launderer.

However, the measures against this situation are weak, and the biggest problem is that the AML obligation is distributed to many financial institutions or non-financial institutions who are not interested on it, and there is no national AML institution whose data will cover all the online transaction record. The Union-Bank online payment mode mentioned in this paper is available to improve the ability of AML because it is a special financial institution used for administering online payment which can collect all the online transaction data. In this mode all the information about the capital flow includes the source and destination can be monitored. Based on this, the AML service system discussed below constructs the transaction information data resource database, and uses the data mining technology to judge the validity of the transaction behavior. This is effective in identifying the money laundering activities by online payment.

II. MODEL OF THE AML SERVICE SYSTEM BASED ON UNION-BANK

A. Union-Bank online payment mode

In the existing online payment mode, the AML task is implemented by the commercial bank or third-party Payment Company. But the AML work can not bring any benefit for them and will cost them a lot, so they will not be positive on this. Moreover, AML work need to analyze abundant data which may refers to several places along the route of the money flow by. But in the existing mode, the data is recorded and keep by many institutions which bring much difficult to collect all the data. So it is necessary to centralize the obligation and data so as to carry on the AML work successfully and effectively.

The Union-Bank Online Payment Mode: Compare with existing electronic payment such as credit card and online bank, it stresses on constructing a special joint-stock bank to deal with online payment and its extensive service. It can offer the inter-bank transfer service of online payment so as to realize the integration and collaborative work of the
information flow, capital and logistics flow during the e-commerce process, build the national e-commerce management information basic data resource base, and utilize the development and application of this database to supply with online payment innovative service. Its main characteristics include that the information transmission of each step during the whole process is finished by application system transaction drive (Transaction from Application to Application), and all the information is kept in the database of relevant application system completely. This mode is advantageous apparently compare with existing electronic payment mode such as credit card and online bank, and will solve their key difficult problems that low collaboration caused by manual interference and poor connection, and it’s difficult to integrate the information, capital and logistics flow and share the information resource.

B. AML service system model

The AML service system is shown in figure 1. From the figure we can see the AML service system is a service function department of the union-bank centre which is a branch institution belongs to PBC. All the data of the online transaction should transit through the union-bank centre, so the centre can analyze this data and then report the result to the PBC (People’s Bank of China). At the same time, it connects to the police bureau, procuratorial office, CIQ, revenue, foreign exchange administration, court and each commercial bank. One the one hand, the centre can collect the information of the user and the money from them in order to judge the possibility of money laundering. On the other hand, it can offer the information and evidence for them if the money laundering is confirmed.

Figure 1. Model of AML service system based on union-bank mode

Because the encryption technology makes the anonymity possible and some of important information of the user and the transaction is encrypted, the monitoring of the money on the internet gets more difficult. So we suggest the government construct a third-party key escrow institution for online payment transaction. If there is evidence to the court indicates that the user of the key endangers the security of the nation or violates the law, the government can acquire the key form the escrow institution with the admission of the court, and decrypt the information of the user and the transaction.

Another idea is we need a function department of the Ministry of Information Industry (MII) to protect the privacy of the user [3]. For the sake of preventing some one in the union-bank centre or key escrow institution betray the information to some commercial institutions, a commercial information security department takes charge of supervising the union-bank centre and the key escrow institution. Before the request of the decryption key, the evidence should be sent to this department, and it will judge the rationality of the request as a reference to the court. In order to protect the security of the user privacy on the premise of preventing money laundering, all the investigation of the union-bank centre on the transaction record data should carry on according to prescribed procedure under the supervising of the information security department of MII.

III. LOGICAL FRAMEWORK OF AML SERVICE SYSTEM

The logical framework of the AML service system can be divided into five layers: database layer, basic data resource base layer, data analysis layer, application service layer and interface layer as shown in the figure 2.

1) Database layer: It is composed of transaction information database and history database. The transaction database including the user information, transaction information, and capital flow information provides the data support for the basic data resource base layer and AML real-time dynamic monitoring agent and they are updated by the data import from the union-bank centre.

a) User information It is about the relevant data of the company or customer, including the register information (register identity, register time, company or customer detail introduction, encrypted account information), use information (use time, use IP address and use aim) and credit information (times of successful transaction, times being complaint about and the credit evaluation of both sides of the transaction and union-bank).

b) Transaction information It is about the data relating to the transaction between the users which compounds of the transaction content (bargainers of both sides, goods information, price, paying time and paying amount), transaction process (bargain record, order of the payment and goods delivering, banks of opening account of both sides, order and invoice) and transaction result (successful or failing, failure reason, loss by the failure, complaint and the process result).

c) Capital flow It includes the capital source, capital destination, capital transfer route and amount. We suggest that two layers of the source at least above this transaction should be traced (This means not only the one who transfers the money to the buyer should be confirmed, but also the source of his money).

History database is used for storing the historical data of the transaction information database which maybe will be cleaned up every year. The history data finally will be sent to AML data warehouse. Given the large amount of the information...
referred in AML area, we construct the history database as a temporary buffer memory between database layer and AML data warehouse.

Figure 2. The logical framework of the AML service system

2) Basic data resource base layer: It analyzes the relation of the data from database layer so as to find some laws of these data and provide support for the data analysis layer. It includes knowledge base, case base, model base and shadiness base.

a) Knowledge Base: KB is based on the expert experience and booklore, and refreshed dynamically by the connection to the database. The basic structure of KB is hierarchy. Its lowest layer is “fact knowledge” such as theoretical knowledge and factual data of the money laundering, the middle layer is knowledge which controls the “fact knowledge” such as some rules and processes of the money laundering, and the highest layer is “strategy” which controls the middle layer which we call “AML strategies”.

b) Case Base: It collects the case in the money laundering and anti-money laundering area, analyses the relation between them in order to extract the laundering methods and their representations. This will be helpful for AML real-time dynamic monitoring agent to judge if the current case matches the characteristic from the case base.

c) Money laundering shape model Base: There are many models of the money laundering which classify the transaction behavior and money laundering shape according to economic theory and the money flow rule in the model base. The model can be imported by operator or constructed itself based on the information of the database and case base.

d) Shadiness Base: This stores the knowledge of the suspicious transaction which can learn, adapt and update itself. The real-time dynamic monitoring agent will obtain relevant cue from the shadiness base, and if it finds some suspicious transaction, it will send a feedback report to the shadiness base.

e) AML data warehouse: The data in the database layer is just about certain kind of information and the relation among them can’t be reflected. The history database just keeps the independent structural data and won’t analyze its rule. The AML data warehouse is data integration oriented AML area for decision supporting of AML real-time dynamic monitoring agent. All the information from database layer will flow into this warehouse.

3) Data analysis layer: Its main function is to analyze the data from database and basic data resource base layer utilizing the AML multi-agent technology. The AML real-time dynamic monitoring agent cleans up the data from database and basic data resource base layer, format and filtrate it through several agencies, and then analyzes the feedback information and output the result to the union-bank centre. These agencies include neural network agent, text mining agent, fuzzy logic agent, and data mining agent, expert systems agent, genetic Algorithms, velocity analysis and case-based reasoning agent.

When the data flow from database has been input to the data analysis layer, the AML real-time dynamic monitoring agent will clean up and filter the information, and then construct the channels to the basic data resource base layer which will control and drive its action. For example, when the AML real-time dynamic monitoring agent receive the data, it will send a “How to deal with” request to the basic data resource base. The basic data resource base then give a “Transfer case-based reasoning agent” response according to the knowledge structure itself. The AML real-time dynamic monitoring agent will transfer the case-based reasoning agent, and produce an interrupt. When the case-based reasoning agent receive the transferring order, it will response immediately and analyze the data through the case reasoning, find out if there is a matching and bring the matching transaction into the shadiness base, return the remainder non-matching data which is undistinguishable afterwards. The AML real-time dynamic monitoring agent then send the request to basic data resource base again and keep this operation repeatedly transferring each agent in certain order till the basic data resource base think that it’s unnecessary to do any transferring.

4) Application service layer: This layer mainly includes two function services: transaction record saving and legality judgment of the transaction behavior. When receiving the data from union-bank centre, application service layer will extract relevant information from the data and format it according to the standard format of the database, and then output it to each database. When receiving the result from data analysis layer, application service layer will display the information to the user terminal and request a decision if the result is ambiguous, and send an alarm to early warning centre if the money
laundering is ascertained. The final result is output to the union-bank centre.

5) Standard Interface layer: It is the external interface integration. The transaction information from the company or customer transmits to the union-bank centre through internet, and then to the AML service system. Likewise, the AML service system uses the interface of union-bank centre to transmit the result to PBC and National information security centre. When there is a money laundering behavior, the AML service system will cooperate with the other institutions and transmit information to there using this interface.

IV. KEY TECHNOLOGY

The AML service system can monitor and analyze the transaction data utilizing many technologies synthetically, finds out the hidden money laundering behavior, and improves the ability and efficiency of union-bank centre while cut down its cost. The core of the AML service system is intelligent multi-agent technology. Besides, the system uses neural network technology to identify the information, uses data mining and text mining technologies to extract valuable information, and uses the fuzzy logical, case-based reasoning and so on technologies to judge the legality of the transaction.

![Figure 3. Internal structure of each agent](image)

The intelligent agent technology is useful to processing enormous amount of repeated AML work dynamically. There are many agencies in this system. Each agent takes charge of one part of system function. The intern structure of each agent is shown in figure 3.

In each agent, there is a router which provides flexible network connection and manages the synchronous communication among agencies. The main use of the controller is to initialize, send register or logout information and control the agent. The inference engine carries on the logical reasoning according to the knowledge base and blackboard structure, and touch off the application procedure to complete relevant task. KQML (knowledge Query and Manipulation Language) explainer is to analyze and process the KQML, and response [4]. The application procedure is the character and the concrete representations of the main function of each agent. The AML technologies are embedded into these application procedures. The knowledge base, model base and case model store the knowledge about AML supply the application procedure with knowledge transferring. The shadiness base stores the data which have been processing or need to be processing.

Neural network technology: The neural network agent first identifies the useful information from enormous amount of AML data, classifies the data in different kinds on different level, and predicts the trend and impossibility of money laundering. Using the cases in the case base, the neural network agent can find out the important relation and mode, and learn self continuously. The difficulty in using this technology in AML area is to simulate the brain function to judge the abnormal data [5].

Genetic Algorithm: genetic algorithm is a search optimizing algorithms based on Genetics. In AML service system, we use this algorithm to mine the data in shadiness base so as to find out the new attribution of money laundering, and input to the knowledge base as new identifying method. The main use of the genetic algorithm is to provide optimizing solution for AML service system.

Case-based reasoning: When receiving transferring order, the case-based reasoning agent will search the most similar case and its solution according to the question. And then it defines the characteristic of the question and searches the case with most valuable, matches relevant transaction data and judge the shadiness of the transaction. Moreover, it will absorb new case and learn itself.

V. CONCLUSION

The union-bank online payment mode is the lead online payment which is needed in domestic environment that online payment of multi-standard, multi-gateway blocks the development of e-commerce. Utilizing the multi-agent technology, the AML service system can monitor and analyze the transaction data dynamically, and provide auxiliary judgment and the decision support for anti-money laundering. As an innovative service system of union-bank centre, this system will play an important role in preventing the money laundering behavior which is one of the key problems of online payment.

VI. REFERENCES