KNOWLEDGE DISCOVERY IN DATABASES
FOR CUSTOMER RELATIONSHIP MANAGEMENT
IN EGYPTIAN BANKS

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ABSTRACT

In this paper, a study of Knowledge Discovery in Databases (KDD) and its effects on Customer Relationship Management (CRM) is presented, focussing on the banking sector in Egypt. This area of research is closely related to the research areas of Data Mining (DM), customer loyalty, and customer retention. This study may serve as a guideline for the development of intelligent knowledge engineering in the banking sector in Egypt.

KEYWORDS: Knowledge discovery in databases (KDD), Data mining (DM), Customer Relationship Management (CRM), and Banking sector.

1 INTRODUCTION

As a result of the continuous increase of business needs, the amount of data in database systems is growing fast. Since the cost of data storage is decreasing continuously, users tend to store all available information in databases, to retain information that might be useful in the future, even if it is not of direct value [1].

In the banking sector, increasing competition, deregulation, and the introduction of new technologies, have contributed to the growth of customer's power. Customers may switch banks on a whim. To win new customers and retain existing customers, banks may employ new technological solutions, such as Knowledge Discovery in Databases (KDD), Data Mining (DM), Data Warehousing (DW), and analytical Customer Relationship Management (CRM), for analysing the customers' behaviours and needs.

In the banking sector of Western Europe and the United States, CRM has been widely adopted. In other countries, such as Egypt, retaining customers and minimising attrition are still major concerns for the banking sector. In a field survey we discovered that Egyptian banks are, in general, unsuccessful in their attempts to apply CRM to increase customer retention. We call this "the problem of CRM and Egyptian Banking". We expect KDD to be a suitable approach to solve this problem.

In this paper, we will propose a customer framework for studying the effect of KDD on CRM in the banking sector in Egypt. We will present the results of the aforementioned field survey, which supports our belief in the validity of our proposal.

The outline of this paper is as follows. Section 2 gives a detailed description of the problems with CRM in the banking sector in Egypt. Section 3 presents the results of a survey we conducted in the Egyptian banking sector, to identify causes and solutions for the problem. Section 4 describes the proposed solution to the problem. Section 5 proposes a framework to investigate the viability of the proposed solution. Section 6 concludes and points at future work.

2 PROBLEM DESCRIPTION

The purpose of this section is to describe the problem of CRM and Egyptian Banking. We will discuss three subjects, namely (1) the banking sector in Egypt in subsection 2.1, (2) Customer Relationship Management (CRM) in subsection 2.2, and (3) the problem of CRM and Egyptian Banking in subsection 2.3.

2.1 THE BANKING SECTOR IN EGYPT

Prior to 1974, the banking sector in Egypt knew four commercial public-sector banks. It also had four specialized banks serving the banking needs of the Egyptian economy. Between 1975 and 1983, following the introduction of an "open-door policy", local and foreign private investors started establishing new Egyptian banks. Since 1983, no new licenses were issued for the establishment of new banks.

Currently, 62 banks are operating in Egypt under the supervision of the Central Bank of Egypt (CBE). These are classified into three main categories: (1) commercial banks, (2) business and investment banks, and (3) specialised banks [2].

We observe that two important changes took place in the Egyptian banking sector during the last thirty-five years.

The first important change happened in the 1970s, when competition among banks, and between banks and financial service firms, increased considerably. The increased competition has placed new emphasis on the value of customer retention. In this respect, Vitria [3] states that "the cost of acquiring new customers continues to rise as competition forces providers to offer increasingly better incentives, encouraging customers to move from service to service, never giving banks a chance to recover their acquisition costs".

The second important change happened in 1991, when Egypt introduced an extensive Economic Reform and Structural Adjustment Program (ERSAP). The economy changed from an inward centrally-planned economy dominated by the public sector to an outward-looking economy led by the private sector. Liberalisation and privatisation of the financial sector in general, and of the banking system in particular, were crucial to the intended transformation of the economy.

2.2 CUSTOMER RELATIONSHIP MANAGEMENT

Customer Relationship Management (CRM) is a business strategy of which the purpose is to classify and manage customers in order to optimise long-term value. CRM is involved in the processes of finding, approaching, handling, satisfying, and retaining customers. Edelstein [4] refers to these combined processes as "the customer life cycle". The customer life cycle has three stages [4,5], namely the following:

1. Acquiring customers.
2. Increasing the value of customers.
3. Retaining good customers.

In each of these stages KDD can improve the profitability when integrated with operational CRM systems or when implemented as independent applications [4].

To manage the relationships between a company and its customers, it is of foremost importance that the company knows who its customers are, specifically, it should know each individual customer. Of each customer, the company should be able to answer questions such as:

- Is the customer profitable?
- Why does the customer do business with the company?
- What does the customer like about the company?
- Does the customer do business with the company's competitors?

The significance of CRM is that it can help to answer these questions, and thus may guide a company in managing its customers' interactions [6,7].

2.3 THE PROBLEM OF CRM AND EGYPTIAN BANKING

Because recruiting new customers is considerably more expensive than retaining existing ones, it is imperative to determine which customers are likely to leave the bank, and which customers the bank prefers to retain, so that the necessary steps can be taken to change a customer's mind [8].

Egyptian Banks and financial institutions recognise that they can no longer look at a consumer from a specific product perspective, but must encompass the entire customer relationship to understand fully a customer's profitability [9]. In this respect two points of views on CRM are important, namely (1) a strategic point of view, and (2) an analytical point of view. First, from a strategic point of view, CRM is able to use a variety of resources about a customer rather than concentrating on product groups. Second, from an analytical point of view, CRM provides a host of analytical data tools that enable banks to (1) understand customer segments, (2) assess and maximise the lifetime value of each customer, (3) predict customer behaviour, and (4) design and track effective marketing campaigns.

In a field survey (of which the results are described below) we discovered that Egyptian banks are, in general, unsuccessful in their attempts to apply CRM to increase customer retention. We call this "the problem of CRM and Egyptian Banking".

3 SURVEY RESULTS

To identify why the problem of CRM and Egyptian Banking exists, and which issues need to be resolved to remove the problem, we conducted a survey to study the current tools used by the Egyptian banking sector to achieve their strategies, and the main obstacles that this sector is facing to introduce KDD techniques. The survey was conducted among customers, CRM specialists, and IT specialists of one of the largest banks in Egypt. In this section, we will describe the survey results, focussing on the current situation in the bank in subsection 3.1, and the obstacles to apply KDD

techniques in subsection 3.2. We provide a summary of the results in subsection 3.3.

3.1 CURRENT SITUATION

In this subsection, we clarify the survey's findings from three different points of view. The first is the customers' point of view, which examines the customers' attitude and behaviour towards their bank. The second is the point of view of the CRM department. The third is the point of view of the IT department.

The customers' point of view

The survey analysis for the customers considered five aspects, namely interior design, reliability, responsiveness, assurance, and empathy.

For the interior design aspect we observed the following:

- Most of the customers are not satisfied with the interior design of their bank.
- Neither the bank's facilities and materials, nor the bank's employees, look representative for their bank.

For the reliability aspect we observed the following:

- The bank does not always make good on its promises.
- The bank lacks in providing services with acceptable speed.
- The bank lacks in showing sincere interest in solving the customers' problems.
- The bank lacks in informing customers of the services offered.

For the responsiveness aspect we observed the following.

- The bank fails to inform the customers how much time is needed to perform certain services.
- The bank's employees fail to provide prompt services.

For the assurance aspect we observed the following.

- The bank's employees do not instil confidence.
- Customers feel safe and behave courteously when dealing with the bank.

For the empathy aspect we observed the following.

- The bank does not give individual attention to the customers.

- The bank's opening hours are inconvenient to the customers.
- The customers do not feel that their interests are at their banks' heart.
- The bank's employees do not always understand the customers' needs.

The CRM department's point of view

The CRM staff has complaints about the inaccuracy of the systems they use, the lack user-friendliness of said systems, and the constant need for assistance from the IT staff.

The IT department's point of view

The systems and applications currently in use are unable to provide all the necessary customer data and information in an adequate and accurate way.

3.2 APPLICATION OBSTACLES

In this subsection, we present the survey results on the obstacles to supplementary development or an establishment of new techniques from the point of view of the CRM department, and of the IT department.

The CRM department is, in general, not acquainted with modern techniques, such as KKD, DM, DW, and OLAP. The IT department is not satisfied with the current level of service they deliver. The IT department strongly supports the application and use of modern techniques to improve their service level.

Both departments listed the following seven obstacles to the incorporation of modern techniques, namely the following:

- the lack of information on expected profitability;
- the lack of a capital;
- the lack of information on customer needs and requirements;
- the lack of information on all services offered and accepted by customers;
- the lack information on service quality standards and new markets;
- the lack of information on modern technologies; and
- the lack of qualified engineers, DW experts, managers, and consultants.

3.3 SURVEY SUMMARY

In summary, from the survey the following three conclusions can be drawn:

- Most of the bank's customers are neither satisfied in dealing with the bank, nor have any

loyalty towards the bank. However, they feel safe in dealing with the bank.

- The CRM department employees are not satisfied with the existing service systems.
- The IT department is not satisfied with the existing service level they offer to other employees' bank. They fully support the new proposed techniques.

4 SOLUTION DESCRIPTION

Based on literature surveys on KDD and CRM, which addressed the same issue before (e.g., [9]), we can assume that the application of KDD is likely to resolve the identified issues in the banking sector in Egypt. KDD places special emphasis on finding useful or interesting knowledge for businesses [10,11,12]. It focuses on the overall process of knowledge discovery from data. The following four issues constitute the main focus points of KDD:

1. how data is stored and accessed;
2. how algorithms can be scaled to massive datasets and still run efficiently;
3. how results can be interpreted and visualised; and
4. how the overall human machine interaction can be modelled and supported.

An effective KDD for CRM enables banks to collect data about their customers from every touch point, to combine this information with a single view of the customer, and to use this information for customer profiling, segmentation, cross-selling, up-selling and retention. According to studies conducted by Meridien Research Inc. [8] and Gartner Research Inc. [13], investment in CRM systems supported by KDD/DM was expected to grow at a compound rate of nearly 38 per cent in Europe, 40 per cent in North America, and 17 per cent in Asia Pacific per year. An effective KDD for CRM would increase the quality of customer relationships, thereby increasing retention in the following three ways:

1. by supporting predictive modelling to help identify which customer is likely to leave, and why the customer is leaving, and what to do about it;
2. by enabling a new level of personalisation in service offers and marketing approaches, which in turn fosters loyalty; and
3. by enriching customer interaction, thereby increasing customer satisfaction and retention.

5 THE FRAMEWORK

Below we propose a framework to apply KDD to help the banking sector in Egypt improve CRM, in particularly by increasing customer retention.

Subsection 5.1 briefly describes the proposed framework and its variables. Subsection 5.2 illustrates the steps of the implementation.

The proposed framework is designed to investigate how KDD can be successfully introduced in the CRM of the banking sector in Egypt. The framework has the following three objectives:

1. To study the current status of methods and tools for analysing and providing information through the existing system in Egyptian banks, to find the degree of adaptability to state-of-the-art technology.
2. To explore how CRM may benefit from KDD and DM.
3. To discuss how successful CRM can be measured, and how it can be based effectively on data stored in the banking databases and data warehouses.

The expected significance of applying the proposed framework is to provide bankers in the banking sector in Egypt with the requisite toolset for increased understanding of existing and prospective customers, and better tailoring of products and services for those customers. The intention is that successful completion of the study will allow banks in Egypt to gain better customer retention, which gives them a competitive advantage. Specifically, it enables them to offer the right set of products for each customer, at the right price for each customer, and to ensure maximum retention of customers.

5.1 PROPOSED FRAMEWORK

Wangler *et al.* [14] define a customer framework of a bank as "A set of high-level 'solution attributes', demonstrating ways to implement the strategies."

The framework we propose documents the attributes that bankers desire to know about their customers, and attributes of the bank itself. The attributes refer to the interaction between the customer and the bank, either when it has been initiated by the customer, or by the bank [14]. The framework points out the objects and object attributes, related to the aforementioned measures, that need to be taken into consideration in the bank's decision-making and strategic-planning processes [14,15].

The contents of the proposed framework are structured according to generally accepted standard variables [8,14,16,17]. We distinguish between independent variables and dependent variables.

Independent variables are divided into two types, namely (1) information needs, and (2) discovered knowledge. *Information needs* describe the information that needs to be maintained within the bank's system

about individual customers (and about business with individual customers), in order to implement proposed bank' strategies. *Discovered knowledge* contains the results of knowledge discovery experiments, mainly expressed in the form of rules.

Dependent variables are also divided into two types, namely (1) customer profiling, and (2) bank profiling. *Customer profiling* describes the knowledge items that need to be discovered about customers, so that banks can understand them better, measure their profitability, and retain them. *Bank profiling* deals with the issues that a bank needs to consider in order responding effectively to different classes of customers.

5.2 IMPLEMENTATION STEPS

Abdullah *et al*. [18] list the following six steps for implementing a customer framework in the banking sector:

1. Development of business knowledge.
2. Development of a data warehouse.
3. Use of the business modelling technology in order to define data mining tasks.
4. Use of the business modelling technology in order to develop data marts.
5. Data mining runs.
6. Integration of the mining results with developed knowledge models.

Currently, the Egyptian banks have developed and implemented the data warehouse applications, i.e., the first two steps. The third step will navigate through the proposed framework that describes the bank's knowledge intentions about bank's objectives and mission. The fourth step deals with the extraction of the appropriate data for a confident knowledge discovery operation and data preparation (which includes transformations, calculations, and cleaning). The fifth step starts with the application of data mining techniques and applications to extract useful knowledge from the bank's data warehouse (this is an exploratory step in which comparison studies should be performed between the situations before and after the implementation of discovered rules). Finally, in the sixth step business analysts and domain experts will evaluate the results from the previous steps from a business perspective. Once the discovered knowledge has been found to be significant, it will be applied to the affected business activities, support systems, and employees of the bank.

6 CONCLUSION

In this paper, we propose a framework for studying the effect of KDD on CRM in the Egyptian banking sector. We believe that the KDD process and applications may perform a significant role in Egyptian banks to improve CRM, in particular for customer retention. Our believe is supported by the results of a field survey at a large Egyptian bank, that indicated that

- most of the bank's customers are neither satisfied in dealing with the bank, nor have any loyalty towards the bank, but do feel safe in dealing with the bank;
- the bank's CRM department is not satisfied with the existing service systems; and
- the IT department is not satisfied with the existing service level they offer to other employees' bank through all services, and supports the introduction of new techniques.

Literature indicates that these problems can typically be solved by the introduction of KDD. We have started to apply KDD to CRM in the banking sector in Egypt according to the proposed framework. We expect the first results to be available at the end of 2005.

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