COMBINING DATA MINING AND CALL CENTER PLATFORMS TO MITIGATE ACCOUNT OUTFLOWS FOR FINANCE COMPANIES

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Combining Data Mining and Call Center Platforms to Mitigate Account Outflows for Finance Companies

ABSTRACT

Mitigating deposit outflows for financial organizations is the focal point to preserving a stable revenue stream. Given the competitive nature of this industry, organizations are continuously confronted with customers allocating their assets to competitors or withdrawing their deposits for alternative consumption patterns. One way to help reduce fund outflows is to identify those factors that help explain where and why withdrawals may be occurring. This work incorporates data mining analytics to analyze data of a major credit union to identify those factors that lead to significant outflow of funds. The results of the analytic process have been incorporated into a model that will provide a framework for organizational decision makers to better manage customer accounts and maintain longer term customer relationships.

Keywords: Data Mining, CRM, Data Management, Decision Support Systems, Business Intelligence,

INTRODUCTION TO PERFORMANCE OF BANKING ORGANIZATIONS

A major strategic initiative for banking institutions to enhance revenue and profitability is to increase the amount of deposits available in the marketplace. This could be achieved by extracting a larger share of the pocket from existing customers or increasing its customer base and therefore market share. In order to enhance their deposit base, financial companies must initially address the problem of reducing the loss of their existing funds. Reduction of funds could be the result of customer attrition or switching of customer assets to competitor organizations or through account withdrawals to meet demand for general consumption activities. Mitigating fund outflows has been a formidable task given the competitive nature of the industry where firms continuously compete through interest rates policies and the diversity of products and services offered. Additionally, financial organizations are susceptible to losing customer funds from behavioral factors on an individual basis. Consumption patterns that increase customer expenditures lead to withdrawals from funds held at financial organizations. In order to address this problem (e.g. depletion of account balances) decision makers must identify those factors that
explain consumer behavior. With this information, they can utilize strategic initiatives incorporating customer relationship management concepts to manage the problem.

**Customer Relationship Management**

Customer relationship management incorporates tactics that help organizations maintain customers, increase the value of current customers and acquire new ones (Romano-Fjermestad, 2003). Enhancing customer relationship management tactics in order to achieve increased market share, revenue and profitability has been the focal point of organizations across industry sectors. Maintaining a consistent customer base can enhance the stability of income and increase profitability for organizations as it mitigates the substantial costs of re-acquiring lost customers (Reichheld & Sasser, 1990). Financial organizations seek to provide their consumers with baskets of goods and services that best meet their needs in order to reduce customer attrition (Chen & Hitt, 2002). They can also incorporate essential customer service policies, which often include effective technology platforms, to better inform and serve their customers regarding financial market conditions and available strategies to preserve their general financial health.

**CRM, Life Time Value and Breadth of Products and Services**

Established research has asserted that some strategic initiatives can help enhance the customer management process, thus resulting in a more consistent client base and income stream. One of these concepts includes the management of consumer needs on a life time value basis. More specifically, companies develop product and service offerings that address the needs of their customers as their consumption patterns evolve over time (Bolton, 1998). Generally, younger and lower consumption customers should be maintained and nurtured with the idea that as they age, their rate of consumption for financial products increases, increasing the value to the financial company.

Another factor underpinning effective CRM includes the notion of providing consumers with a one stop shopping environment, or meeting all the needs of customers with a portfolio of financial products. This helps mitigate customer churn as it reduces the need of customers to seek the products and services of competitors. This latter issue requires effective customer service capabilities involving technology platforms to inform customers of those products and services that best meet their needs within a given financial environment (Delone & Mclean, 1992).

Effective CRM however assumes that companies understand their customers’ behavior in relation to their general operations (e.g. product and service capabilities) (Gale, 1997). Previous work suggest that an increased understanding of customer propensities can be achieved through the incorporation of sophisticated analytic techniques that identify patterns existing in company data (Piccoli & Watson, 2008).

**Data Mining and CRM**

Investment in and utilization of information technologies that manage data and information have proven to augment an organization’s ability to enhance the customer relationship management process by enabling decision makers to better understand consumer behaviors and preferences for existing products and services (Nemati & Steiger, 2002). More specifically, sophisticated analytic technologies that process company data help uncover repetitive and consistent patterns regarding consumer behavior. These technologies involve the utilization of mathematical processes (e.g. equations and algorithms) that analyze data and identify reliable patterns among key variables. Data mining techniques such as neural networks and segmentation applications help uncover repetitive trends in data that help decision makers better understand operational activities of their company and consumer responses to them (Chye & Gerry, 2002).
Financial organizations have been known to utilize advanced analytic techniques to process customer data to enhance operational resources in order to improve the CRM process. Some applications for which financial organizations incorporated data mining have included enhancement in direct marketing initiatives and the identification of customer risk assessment (Berger, 1999), (Fabris, 1998). Companies such as Chase Manhattan Bank, Bank of America and Charles Schwab have cited successful results from incorporating data mining analytics (Lach, 1999), (Schober, 1999), (Stedman, 1998). These works illustrated the use of data mining techniques to enhance marketing initiatives and better identify consumer credit problems. Data mining techniques can be largely categorized as analytic methods used to identify associations and classifications in data or to enhance predictive capabilities.

Robust customer information available in financial company data repositories provide a strategic resource to increase the knowledge of consumer habits and behaviors relating to attributes of the organization. These can include customer responses to breadth of product offerings, characteristics among those products (e.g. minimum balance requirements for particular accounts) and effectiveness of technology infrastructure to service customers (Cigil & Dogac, 2000).

The focus of this work is to illustrate the effectiveness of data mining analytics to better understand consumer behavior; in this case, to identify factors that lead to fund outflows for financial organizations. The results of the analysis are incorporated into a conceptual model that provides decision makers with the framework to enhance the customer account management process for financial companies. The model has been utilized by a major US based credit union to manage customer mortgage exposure.

This work differs from other models that focus more on the capture of customer data from ongoing interactive transactions as an information source for strategizing. The methodology in this case incorporates data captured during customer interactions and generates actionable information via data mining and business intelligence techniques. The results are used to enhance the knowledge of service representatives to better manage customer accounts in a proactive way and therefore mitigate switching costs in the form of fund outflows.

Data Mining Methodologies

Organizations store vast amounts of data describing various facets of their operations. Data resources provide the building blocks to actionable information for decision makers. However in order to leverage data resources effectively, sophisticated analytic techniques are necessary to identify and quantify relationships and patterns that exist within data variables that underpin business processes.

Data mining techniques can be largely categorized as analytic methods used to identify associations and classifications in data or to enhance predictive capabilities. Techniques such as clustering, CHAID and CART methods address the former while regression and neural networks identify patterns in data to augment predictive capabilities. There are a number of well known works (Berry & Linoff, 1999), (Hand & Mannila, 2001) that describe various data mining methods and their analytic capabilities. The neural network methodology is the utilization of complex computer algorithms that perform multivariate analysis to explain variances in historical data. One of the advantages of this method is the ability to identify both linear and non-linear patterns that exist among data variables, which is achieved through the incorporation of the Multi-layer Perceptron technique (Rumelhart & McClelland, 1986).

Data and Methodology

The following analysis incorporates a case study approach where data was gathered from Affinity Credit Union who was experiencing noteworthy deposit depletions from the period from 2006 to 2007. Data was extracted from numerous data repositories within the organization with collaboration with the CIO. The overall analysis was conducted with close collaboration with senior executives of strategy.
The dependent variable in this study involves a flow of funds approach which incorporates existing customer deposits over a one year period (2006 to 2007). This time period was of particular interest to the credit union as it depicted a marked outflow of funds across a number of client accounts. Data mining analytics were incorporated to identify patterns and trends in existing data that explained customer fund withdrawals.

**Data Descriptions**

The data file concentrated on 10,000 existing customers which included customers that accounted for substantial overall deposits for the credit union. Behavioral, demographic and transactional independent variables according to individual customers included:

- **Age** (Age of member)
- **Gender** (Gender of member)
- **Duration as a client** (Number of months of CU membership)
- **Income** (Income segment of member)
- **Number of Individuals in Household** (Number of individuals in member household)
- **Total Credit Cards** (Number of credits cards held by customer)
- **Number of Accounts with CU** (Total of accounts maintained with CU)
- **Credit Score** (Credit Score of member)
- **Monthly Loan Payments** ($ Amount of monthly CU loan payment)
- **Previous Year’s Account Balance** (Sep 2006 account balance)

The dependant variable was estimated as the total account balances of individual members with the credit union at the end of the third quarter of 2007 less the total balances held by the customer at the end of the 3rd quarter 2006. Various time segments were considered as well (e.g. different end dates in 2006 and 2007) along with considering alternate estimates of fund flows (e.g. three month averages in total balances of 2006 and 2007) which depicted similar outcomes.

**Table 1** provides aggregate information on withdrawal activity for the credit union.

<table>
<thead>
<tr>
<th>Deposit Activity (3rd Quarter 2006 to 3rd Quarter 2007)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fund Outflows</td>
</tr>
<tr>
<td>Members withdrawing funds</td>
</tr>
<tr>
<td>Average</td>
</tr>
</tbody>
</table>

The data mining process included a neural network architecture involving the incorporation of an input layer, hidden layer and output layer that utilized a back propagation testing technique. The statistical results of the analysis are illustrated in **Table 2**.

**MODEL RESULTS**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Impact Statistic</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>Duration as a client</td>
<td>1.57 **</td>
<td>-</td>
</tr>
<tr>
<td>Income</td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td>Number of Individuals in Household</td>
<td>5.31 **</td>
<td>+</td>
</tr>
</tbody>
</table>

Combining Data Mining and Call Center Platforms
Table 2 illustrates the relationships existing between the independent variables and the outflow of funds (dependent variable).

In short, the number of accounts that a customer maintains with the credit union has the highest influence on the amount of fund outflows, with a customer’s previous year’s balance as next highest in impact. This is followed by number of individuals in household, credit score, monthly loan payment and duration as a member in order of influence.

Many of the more basic demographic variables (e.g. gender, age, income) were not statistically significant, results which are supported by earlier findings achieved in data mining research in financial organizations (Chen & Hitt, 2002).

**Interpretations and Implications of Results**

When considering the relational impact of the independent variables on account depletions, some interesting conclusions are evident. The variable Duration as a Client, which measures how long a member has maintained accounts with the credit union, illustrates that clients with longer relationships result in less fund outflows, where shorter durations depict a higher withdrawal and potential switching of assets to competitors. These results support existing research that asserts that lifetime value of customers should be considered when assessing a customer’s profitability to a firm. As customers evolve and incomes or assets grow, their value as a client may increase (Bolton & Tarasi, 2006).

Another noteworthy finding in this work involves the relationship of the number of accounts a customer maintains with the credit union. The results indicate that the outflow of funds decreases with customers who maintain a larger number of accounts with the credit union. This supports the concept that an effective breadth of products and services that best meet the needs and preferences of customers helps reduce customer switching. This coincides with earlier findings by (Chen & Hitt, 2002) who found that customer demographics had little significance in explaining customer switching in the brokerage industry.

The remaining significant factors driving fund outflows can be grouped into a similar category which involves consumption patterns of customers and the demand for available deposits. Individuals with lower credit scores, those that had more individuals in the household and had higher monthly loan payments, all resulted in higher outflow of funds from the credit union. At first glance it may be appear that these factors are beyond the realm of available CRM strategies for the credit union, however emerging tactics in CRM for financial organizations that involve customer educational and informational strategies can be incorporated. These include programs to help customers manage their income and expenditures more effectively and utilize existing financial products to facilitate their savings and consumption behaviors.

**Comparison to other methods**

The model proposed in this work extends the reach from previous work that emphasizes the advantage of
collecting data from various customer service transactions (e.g. card swipes, log-ins etc.) to generate insights into strategic customer focused initiatives as proposed by Piccoli, 2008. The digital all experience described in the work focuses on leveraging the currency of customer related data (data captured during customer transactions) as a source of information to generate strategic initiatives to strengthen relationships with customers. The model proposed in this analysis however involves the incorporation of customer transactional, demographic and behavioral data that is processed with quantitative analytics as a mechanism to generate robust information regarding customer product and service needs relative to the evolving marketplace along with their propensities to respond to initiatives. With this information, financial organizations can better manage their customers with proactive product and service offerings that perversely their financial stability in the in the evolving marketplace.

A Model to Manage Customer Accounts

A conceptual model that incorporates the above findings can now be developed to provide a structural framework for decision makers to better manage customer accounts. This model resembles the general structure of a balanced score card with a focus on managing customer relationships for financial firms.

Figure 1

Customer Analysis and Management Platform

| Data Management to store external market and internal customer and process data | Analyze data with Data Mining and BI to identify explanatory factors and trends of customer and process attributes |
| Communication platform to education & inform customers on available products and extract feedback. | Provide Products & Services that address customer preferences to increase duration of relationships |

The model begins with essential data management initiatives that include storage of data elements that provide the building blocks to information creation via analytic methods such as Business Intelligence (OLAP and Data Mining). Data elements include customer and process specific internal factors along with market based external factors. Analytic techniques such as data mining and OLAP are applied to data resources to identify trends and patterns in consumer activities relative to organizational products and services. Analytic results can identify product and service effectiveness in meeting existing and evolving needs of customers relative to the ongoing financial environment around them and provide actionable items to improve existing portfolios. In order to fully leverage the breadth of products and services available to consumers, organizations need to achieve effective communication with customers to better inform them on product and service attributes available to meet their financial needs. This is achieved through the incorporation of corresponding platforms (e.g. call centers and web platforms). These platforms also provide an essential mechanism to extract feedback on customer behaviors.
and preferences, which can be stored in data repositories. The results of ongoing analysis of data along with effective customer communication enables financial companies to adjust the breadth of products and services to evolving customer needs relative to the financial environment. This enables the company to maintain longer term relationships and mitigating customer switching of assets.

This model provides a structural framework for organizational decision makers to implement CRM initiatives to better serve their customers. The underpinnings of the various stages of it have been validated by data mining techniques and are also supported by earlier research (Bolton, 1998), (Chen & Hitt, 2002). The implications of the models’ capabilities are noteworthy in light of the turmoil transpiring in the financial sector in the US. We will illustrate a strategy, utilizing the above framework which could result in increased value for both the customer of a financial organization and the profitability of the organization itself.

**Proactive Product and Service Adjustments for Customers**

The model begins with organizations implementing effective data management tactics to establish the building blocks for extracting vital information to better understand customer activities. This involves storage of data elements corresponding to demographic and behavioral attributes of customers. This data source is augmented by essential external market data describing the financial marketplace and activities of competitors. This data platform can then be analyzed by Business Intelligence methods such as On line Analytic Processing and Data Mining. The results of the analytic process can reveal attributes of customers that can enable the financial company to become more proactive in meeting customers’ needs.

Proactive strategies leveraging off the model introduced can include:

1) offering fixed rate mortgage products to customers with adjustable rate structures in a rising rate environment

2) partnering with financial/investment organizations to offer a wider spectrum of investment vehicles

3) offering flexible interest bearing account structures to provide customers with the ability to achieve returns on deposits and also withdraw funds to meet ongoing expenses.

An essential factor to achieving success with these scenarios is incorporating informational and educational communication platforms corresponding to individual customer needs. This includes call centers and web platforms with live chat capabilities to facilitate individual customer needs. The core to the above model assumes that the organization maintains essential data management and analytic capabilities which help them better understand their customers and the marketplace and meeting the needs of those customers with an effective breadth of products and services. The results should be a financial organization with more stable revenue streams from a consistent and growing customer base over an extended period of time. This methodology not only benefits the organization but should enhance the financial status of the customer as organizations become proactive in matching the right products and services to individual customer needs. Affinity Credit Union in this case was able to incorporate the first strategic initiative above (switching customers to fixed rate structures) which helped it maintain and strengthen its customer relationships.

**Obstacles to Consider and Concluding Remarks**

The model described above is not without its limitations. Anoteworthy obstacle to be considered in the development and implementation of new products and services that address evolving consumer preferences relates to a potential conflict between short term and long term profitability. New products and services sometimes may
reduce short term profitability for organizations in the pursuit of preserving longer term customer relationships and corresponding profitability. A prime example of this relates to the concept of switching customers out of ARM mortgages to fixed rate structures in a rising rate environment. Increased short term profitability through higher rates charged to customer with ARMs would be forgone in the pursuit of preserving a higher credit standing for their customers through fixed rate products in a rising rate environment. This tactic however would preserve longer term customer relationships and profitability over the long run. Market analysts often punish companies for missing near term earnings estimates which sometimes causes organizations to pursue shorter term initiatives to boost the bottom line in place of focusing on building longer term relationships. However, the current fallout in the financial sector due to suboptimal short term strategies of many organizations may turn the focus of companies towards longer term strategies that benefit both the customer’s and company’s financial health. A key component to maintaining longer term relationships with customers is maintaining a greater understanding of their needs. Maintaining this understanding requires sound data management principals, analytic techniques and a communication platform.

Data resources continue to grow year after year. In order to more fully leverage essential information from all this data, organizations can utilize analytic techniques that help identify trends and patterns in demographic, behavioral and transactional elements. Data mining techniques which are grounded in sophisticated quantitative methods identify vital information existing in vast data repositories. The results of identifying relevant, actionable, strategic initiatives through these analytic techniques can help decision makers in financial organizations help design a breadth of products and services that meet the evolving needs of their customer base. As customers adopt a greater number of those products and services the duration of the company/customer relationship increases. Companies avoid reduction of revenue from lost customers and the added costs of re-acquiring them.

References


dependent variable, Information Systems Research, 3 (1) pp. 60-95.


